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**CONSTRAINING INTERPRETATION:  
SENTENCE FINAL PARTICLES IN JAPANESE**

A Dissertation Presented

by

CHRISTOPHER DAVIS

Submitted to the Graduate School of the  
University of Massachusetts Amherst in partial fulfillment  
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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Department of Linguistics

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CHRISTOPHER DAVIS

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## ACKNOWLEDGMENTS

I remember reading the acknowledgements in Rajesh Bhatt's dissertation (Bhatt 1999)<sup>1</sup> during my first year at UMass. He opens by saying that he had figured the acknowledgments would be the easiest and funnest part of the writing process, leading to procrastination and a last-minute writing task. I was amused. And now here I am, in the same position. I'll stick to tradition, and begin with the committee members.

I would most definitely not be the linguist I am today were it not for Chris Potts. He has been involved with this work from the very beginning. He has been not only an enthusiastic mentor, but an inspired and inspiring research collaborator. From an early stage in my grad student career, he encouraged me to think like a researcher, and more importantly, to *work* like one. I am sincerely grateful for Chris's time, his expertise, and his encouragement. Thanks, Chris!

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John Kingston provided detailed comments and enlightening discussion about various aspects of this work, from its earliest version to the final draft. Probably because the material is far from his primary field of interest, he has always provided

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<sup>1</sup>A citation in my acknowledgments? And now a footnote? Are the grad school margins enforcers going to let this slide?

an excellent “outside eye” on the issues involved. Many of his comments brought to light fundamental questions that I had overlooked, and his perspective on the data has always kept me from making unwarranted assumptions. Thanks, John!

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As I conclude these acknowledgments, I am forced to acknowledge that my time with this project has concluded. I send it out into the world, warts and all. Whatever is good in it is due in large part to the help and support of the people I mentioned above. The warts are all mine.

## ABSTRACT

### CONSTRAINING INTERPRETATION: SENTENCE FINAL PARTICLES IN JAPANESE

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This dissertation is concerned with how pragmatic particles interact with sentential force and with general pragmatic constraints to derive optimal dynamic interpretations. The primary empirical focus of the dissertation is the Japanese sentence final particle *yo* and its intonational associates. These right-peripheral elements are argued to interact semantically with sentential force in specifying the set of *contextual transitions* compatible with an utterance. In this way, they semantically constrain the pragmatic interpretation of the utterances in which they occur. These conventional constraints on interpretation are wedded with general pragmatic constraints which provide a further filter on the road to optimal interpretation.

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# CHAPTER 1

## INTRODUCTION: FORCE, PARTICLES, AND PRAGMATICS

### 1.1 Sentential Force

Frege (1892) introduced the distinction between the sense and the reference of an expression, laying the foundation for the modern distinction between intension and extension, and thus setting the stage for modern truth conditional semantics. A compositional semantics, in this view, provides us with a means for building up the meaning of a sentence (its “thought”, in Frege’s parlance), which is modeled by truth conditions. Under this view, meaning at the sentence level is nothing more and nothing less than a statement of the conditions under which the sentence is true, forming the foundation for modern formal semantics since at least Davidson (1967).

This view has formed the foundation not only for formal semantics, but also for formal pragmatics, beginning with the seminal work of Grice (1975). In the Gricean approach to pragmatic enrichment, the meaning of a sentence is spelled out as truth conditions in a suitable logical language, and is then enriched by general principles of rational communication. Grice’s program is designed to account for the various ways in which conventional meanings are enriched by the process of what he labels *conversational implicature*. This division of labor also allows for an account of meaning that is that is free, at the level of what is (in Grice’s technical sense) *said*, from what is merely *implicated* at the pragmatic level. For example, Grice argues for an analysis of natural language disjunction as being no different from  $\vee$  in formal logic. Apparent differences, such as the common intuition that natural language

disjunction is not inclusive, are handled pragmatically, allowing for a simple logical treatment of the underlying semantics.

What results is a very simple model of the semantics-pragmatics interface. Semantics determines the truth conditions of a sentence, which we can label  $\alpha$ . These truth conditions are then enriched by a general, possibly non-linguistic, module of pragmatic reasoning, which can be labeled PRAG, to give back an enriched meaning, which we can label  $\alpha^+$ . This model is sketched in the diagram in (1).



There is a wrench thrown into this simple picture, however, due to what Grice labeled *conventional implicature* (CI). A CI is a conventionalized meaning which nevertheless does not influence what is “said”. To frame it another way, a CI is conventional meaning that does not influence the truth conditions of the sentence in which it is found. This class of meaning was anticipated over 80 years earlier by Frege (1892), as discussed at length by Horn (2007). In Frege’s terminology, such meaning “colors” or gives “tone” to a sentence, without affecting its sense. He provides as an example the German conjunctive particle *obgleich*, translated in English as “although”. Frege notes that the difference between this conjunction and a neutral one like “and” is not to be found in the truth conditions (sense) of the resulting sentence:

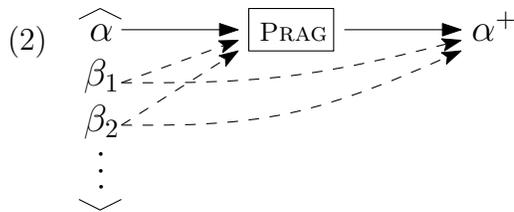
We could indeed replace the conditional clause [headed by “although”] without harm to the truth of the whole by another of the same truth value; but the light in which the clause is placed by the conjunction might then easily appear unsuitable, as if a song with a sad subject were to be sung in a lively fashion.

(Frege, 1892, p.38)

Research on CIs has undergone a renaissance following the multi-dimensional semantic treatment introduced by Potts (2005). The basic problem is how to keep these

meanings conventional, while also keeping them separate from the truth conditions of the sentence in which they occur. The solution offered by Potts is to place these meanings in their own dimension, so that the core truth conditions of the sentence,  $\alpha$ , remain unaffected by meaning in the CI dimension,  $\beta$ . A more general multi-dimensional model is suggested in Potts (to appear), whereby sentence meaning is modeled by an  $n$ -tuple, the first element of which represents the *at-issue* dimension, and the rest of which constitute the CI dimension(s).

We can then ask what sort of meaning is found in the CI dimension(s). Potts (2005) sticks to a truth-conditional treatment in his book, but has recently argued (Potts, 2007) for a radically different model theory for the subset of CIs that he labels *expressive*. Regardless of the way CI meanings are modeled, they are still in some way subsidiary to the at-issue content, the first element of the  $n$ -tuple encoding the sentence's conventional meaning. Whatever the correct treatment of CIs might be, their independence from and subordination to at-issue content means that the truth-conditional enthusiast might still take refuge in this privileged dimension of meaning. But the semantics-pragmatics connection is going to be complicated by the influence from these other dimensions. We now have to revise our basic model of pragmatic enrichment (1) to incorporate these other dimensions, replacing it with something like the picture in (2).

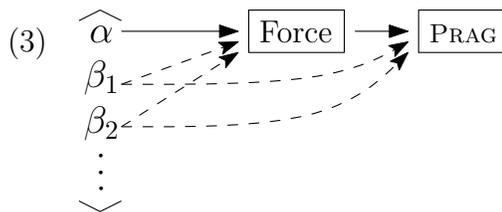


The introduction of the CI dimension(s) complicates the semantics-pragmatics picture. If we still posit the existence of a single level of pragmatic enrichment taking us to our enriched meaning  $\alpha^+$ , then the question arises how CI meanings impinge on this calculation. Perhaps pragmatic enrichment relies simultaneously on all dimensions of conventional meaning in determining its output. Perhaps the CI dimension

contributes directly to the enriched meaning in some way. Or perhaps both. But if we set aside the contributions of the non-at-issue dimensions of meaning, and also assume that at-issue content spells out truth-conditions, then a basic picture of pragmatic enrichment might still be stated on the basis of truth-conditional meanings.

It would seem then that at-issue content is safe for the study of semantic-pragmatic interactions based only on truth conditions. But Frege envisaged a third dimension along with the sense and color/tone of the utterance, which following Dummett (2001) I label *force*. Frege considers only declarative sentences (those with “assertoric” force) and interrogatives. Both declaratives and interrogatives, under the Fregean view, share a common sense at their core. The difference is at the level of force. In English, the interrogative clause type provides overt evidence of a conventionalized representation of force, through the syntactic device of subject-auxiliary inversion. Declaratives might be thought defective, in that there is no overt evidence of a force-indicating device. The apparent asymmetry depends on the assumption that subject-auxiliary inversion is in some way derived from a non-inverted underlying order. The asymmetry disappears if we treat the syntax of each clause type on its own terms. At some abstract level, then, declaratives in English are encoded for something like assertoric force, in a manner parallel to the way in which interrogatives are encoded for interrogative force.

If matrix sentences come along with a Fregean force indicator in the at-issue dimension, then an additional step is needed in the semantics-pragmatics interface. Force mediates the truth-conditional content in the at-issue dimension, labeled  $\alpha$ , as sketched in (3).



The picture sketched in (3) gives a picture in which the at-issue truth-conditional content of a sentence is fed to a level of sentential force, with the resulting semantic object being the input to pragmatic reasoning. This post-force component of pragmatic reasoning will be justified in the body of the dissertation. It is of course entirely possible that there are other points in the calculation at which pragmatic enrichment takes place. For example, there might be pragmatic enrichment that takes place on the basis of at-issue truth-conditions, before the level of sentential force has been reached. We might even have (certain kinds of) pragmatic enrichment operating “all the way down”, enriching the meaning at each step in the compositional mapping from syntax to meaning, as proposed by Chierchia (2004, 2006). It is very much an open question how non-at-issue dimensions should influence the calculation; perhaps they apply at the level of force, perhaps directly in the pragmatic calculation, perhaps both.

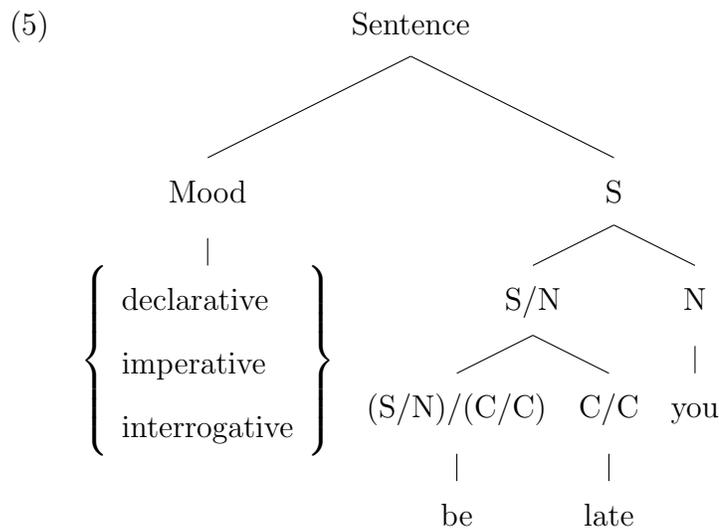
If we ignore these influences, we have a three step model: truth conditions  $\rightarrow$  force  $\rightarrow$  pragmatics. This dissertation is concerned with how sentential force combines with the truth conditional core of the sentence, and how the resulting meaning is constrained by pragmatics. The first step in this picture, taking us from truth conditions to another level of conventional meaning, is laid out by Lewis (1970), who spells out a two-tiered model sentence meaning in which truth conditions are combined with an indicator of sentential force. It should be emphasized that the adoption of force-indicating (mood-indicating, in Lewis’s terminology) devices is not for Lewis an abdication of the primacy of truth conditions in modeling natural language semantics; far from it. Lewis begins his article by saying (in an effort to distinguish his project from the “semantic markerese” of generative semantics) that “Semantics with no treatment of truth conditions is not semantics” (Lewis, 1970, p.18). But the meaning of non-declarative sentences, about which it seems absurd to ask for

judgments of truth or falsity, present an apparent problem for a theory of meaning-as-truth-conditions. Lewis suggests the following solution:

One method of treating non-declaratives is to analyze all sentences, declarative or non-declarative, into two components: a *sentence radical* that specifies a state of affairs and a *mood* that determines whether the speaker is declaring that the state of affairs holds, commanding that it hold, asking whether it holds, or what. (Lewis 1970:55)

Lewis suggests that the sentences in (4) should be analyzed in such a way that they share a common radical at their core, the differences between them being spelled out at the level of mood/force. Structurally, Lewis provides the analysis in (5).<sup>1</sup>

- (4) a. You are late. (declarative)  
 b. Be late! (imperative)  
 c. Are you late? (interrogative)



The sentence radical lives at node S in (5). Lewis stresses that it is at *this* level of structure at which our theory of truth conditional semantic meaning should apply.

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<sup>1</sup>The node labels indicate categories in a categorial grammar, and word order is not handled. These details do not matter for the present discussion.

We do not look for truth conditions at the level of the entire sentence, but at the level of the radical.

The picture in (5) treats declaratives in a fashion completely parallel to the other basic clause types. It takes away the privileged position often given to declaratives/indicatives, a tendency noted by Stenius (1967):

There is a well-known tendency to regard the indicative as a privileged mood, and thus to try to reduce all other moods to the indicative. This is connected with a tendency to identify the sense of an indicative sentence with its descriptive content, and accordingly, to regard the indicative as an unproblematic mood. From this, again, follows the tendency to say something like this: An indicative simply describes the case that something is so, whereas an imperative or an interrogative describes a certain mental attitude to the state of affairs it mentions. Thus, the imperative describes the will or desire of the speaker that something should be in a certain way, whereas the interrogative describes a feeling of uncertainty or curiosity in the speaker as to whether a certain state of affairs obtains or not.

(Stenius, 1967, p.255)

Once we have accepted a two-part picture of at-issue sentence meaning like that sketched in (5), we must ask what kind of meaning we end up with at the level of force. Lewis points to Stenius's proposal, which in turn is likened to an analogy due to Wittgenstein (1953). The descriptive content, denoted by the sentence radical in this view, is like a picture of a boxer. Such a picture may be used in various ways: as a means of indicating some fact about the world (such a boxer stood in such a way on such an occasion), as an instruction to the listener (this is how one should stand while boxing), and so on. The force or mood of the sentence is a means by which the speaker indicates the way he is using the picture described by the sentence radical.

The notion of a *language game*, introduced by Wittgenstein (1953), is a useful way to frame the issue. The utterances of natural language are used to make moves in a game of a particular kind. One view of sentential force/mood is that it serves to turn the description provided by the radical into a move of the appropriate type. And what is a move? Whatever it is, it would seem that it is the kind of thing that takes us into the world of action and speech acts. Under such a view, it is unclear how the standard tools of semantic theory are useful at the level of sentential force. Instead, we would need to rely on a theory of speech acts. Stenius advocates something like this view, providing semantic rules that regulate the correct use of indicatives (that they be true) and the correct response to imperatives (that they be followed). Under this kind of model, sentential force takes us directly into the world of speech acts and their attendant conditions, which are now understood as semantic properties of the sentences themselves.

This is by no means the only possible analysis of conventionalized sentential force. In this dissertation, I explore a model of sentential force that relies on the notion of a *context change potential* (CCP). I briefly describe a basic picture for such a model in the next section, before going on to describe how the pragmatic particles that are the focus of this dissertation motivate certain departures from and extensions to this basic model.

## 1.2 The Common Ground and Context Change

The starting point for the model of discourse contexts and context change developed in this dissertation is the *common ground* (CG). The CG, as conceived by Stalnaker (1978), is a repository of the shared assumptions of the participants in a conversation. The CG evolves as the conversation proceeds. This evolution is triggered by a number of things. The ongoing non-linguistic experience of the interlocutors will impinge on the CG, so that if, for example, an aircraft flies overhead in

view of all discourse participants, the CG will be updated with this information. The utterances of the conversational participants also affect the CG. One way in which they do so is by virtue of the very fact that they are uttered. For example, if discourse participant A utters the sentence “there’s a spider in the salad”, then the fact that he uttered this sentence is added to the CG. This is no different than the way in which non-linguistic events like plane-flyings cause changes to the CG.

But utterances have another, more abstract relation to the context as well. In *dynamic* theories of sentence meaning (e.g. Kamp 1981, Heim 1982, Groenendijk and Stokhof 1991b), a sentence is interpreted as a function mapping input discourse contexts to output discourse contexts. For the simple model of discourse contexts considered here, consisting only of the CG, a declarative sentence is interpreted as a function mapping an input context to an output context just like the input context, except that the propositional content of the declarative is added to the CG.

Let’s make things a bit more formal. First, there are two distinct possibilities for modeling the CG within a possible world semantics. First, we might model the CG as a set of *propositions*. The view adopted by Stalnaker is one in which the CG is a set of *possible worlds*. We can always get a Stalnakerian set of worlds from a consistent CG-as-set-of-propositions by taking the intersection of the elements of the set. I adopt the more articulated model, where the CG is modeled as a set of propositions. As the model of contexts will be extended later to include objects other than the common ground, it will be convenient to think of the CG as a *function* from contexts to sets of propositions. So,  $CG^c$  returns the common ground (a set of propositions) in context  $c$ .

The propositional content of a declarative sentence is itself a set of worlds, given to us by the truth conditions of the sentence. Update of a Stalnakerian context with the content of a declarative sentence is standardly defined as the *intersection* of the two sets of worlds, as long as the presuppositions of the declarative are satisfied in the

input context (an issue I return to shortly). In terms of the CG-as-set-of-propositions model outlined above, update will proceed by addition of the declarative's propositional content to the input CG. The update is associated with the speech act of *assertion*, and for the update to actually go through, a number of requirements (such as acceptance of the assertion by other discourse participants) will have to be met. We have a choice in how to get from the truth-conditional content of the declarative to the contextual update conventionally associated with its utterance: We can assume that a matrix declarative sentence denotes a proposition at the root node, and that update via addition or intersection is achieved purely pragmatically, or we can assume that a matrix declarative sentence actually denotes the appropriate sort of update. Under a model of sentence meaning in which declaratives denote a proposition at the root level, this update will be generated purely pragmatically. But in the radical+force model of sentence meaning advocated here, we can build this update into the semantics at the level of force. Under the simplest version of such a model, a declarative force head will combine with a propositional radical to return a function from contexts to contexts in which the proposition denoted by the sentence radical is added to the CG of the output context.

The notion that declarative sentences denote context change potentials has been used to explain at least two aspects of such sentences. First, we have a way of encoding the effect an utterance of the sentence is canonically intended to have on the context. In the case of declaratives, this effect is to add the propositional content of the sentence to the common ground of the input context, thereby increasing mutually shared information in a particular way. Second, the model provides a way of understanding the contribution of (pragmatic) presuppositions. The Stalnakerian model of context-as-common-ground allows us to state *definedness conditions* on input discourse contexts compatible with our CCP, rather than definedness conditions on the truth-value of a proposition. In short, the context-based account of presupposition

works by having presuppositions restrict the set of input contexts for which the CCP denoted by the sentence is defined. This means that such a sentence can only be used felicitously or meaningfully in contexts compatible with the presuppositions of the sentence; the CCP's domain is conventionally restricted by its presuppositions, and a CCP cannot be used in a context which is not in its domain. This view of presupposition has a large literature, much of it focused on the problem of *presupposition projection*; see among many others Stalnaker (1973), Karttunen (1974) Heim (1982, 1983, 1992), and Soames (1982). Beaver (2001) gives an extensive overview of the literature along with novel contributions that link the theory of presupposition with that of assertion in a dynamic semantics.

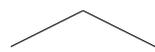
While the standard effect of contextual presuppositions is simply to limit the range of discourse contexts in which an utterance is felicitous, they are also associated with an indirect means of conveying information, via the process of *accommodation* (Lewis 1979, prefigured in Stalnaker 1973). In cases where the presuppositions of an utterance are apparently violated, this is often dealt with not by crying foul, but by accommodating the presuppositions by updating the context in such a way that they are satisfied. The discussion in von Stechow (2008) provides a summary and background on the contextual theory of presupposition and accommodation, complaints about the theory, and some suggestions for how these complaints might be handled.

For my purposes, it is sufficient to adopt this approach for at least a certain subset of what are called presuppositions, and consider the resulting model of meaning-in-context. In such a model, an utterance depends on certain features of the context for its interpretation, and is itself understood as an object whose semantics indicates a means by which this context is to be modified. The standard model gives us indeterminacy about what the input context is like: this is a matter of world-knowledge and non-linguistic reasoning, in addition to the result of the conventional updates to the context made by prior discourse moves. A pragmatic presupposition provides a

means for restricting this indeterminacy, by narrowing down the set of input contexts for which the discourse move is well-defined, coherent, or felicitous. Once an input context has been selected, however, everything else is mechanical and deterministic, at least on accounts in which CCPs denote *functions* from contexts to contexts, specifying one and only one output context for a given input context.

The CCP model of sentential force is more conservative than one in which sentential force is associated directly with speech acts. It is not completely clear exactly what form the latter kind of theory would take; presumably, sentential force would impinge directly on the various usage conditions that characterize speech acts, along the lines proposed by Stenius (1967). In the CCP approach, the meaning of force markers is not equated with the sort of usage conditions they engender. What we have, semantically, are functions from contexts to contexts. That is all. It is then a matter for general language-game conventions (not conventions encoded by the linguistic signal itself) how such functions are to be interpreted. A natural enough convention is that they be interpreted as constraining the discourse move that the speaker is understood to be making, where a move is a suggestion (or request, demand, etc.) that the discourse context be updated from one state (to be found in the domain of the function) to another state (to be found in the range of the function). The semantics of an utterance, at the root level, is just a function. The translation of this object into some kind of discourse move is the job of pragmatics.

The resulting model keeps speech act theory as such strictly outside the semantic theory. But the level of the CCP, encoded at the level of force, provides a crucial bridge between a sentence's descriptive content (the radical) and its canonical use. The empirical focus of the dissertation involves the fine-grained structure of this bridge. The picture in (5) builds this bridge from a single beam, headed by a single morpheme, which Lewis calls mood, and which I refer to as force. The basic picture that emerges for the semantics of a declarative is shown in (6).

$$(6) \quad F : C \rightarrow C$$


proposition    DECL

In this picture, we have a propositional radical combining with a declarative force head DECL. The resulting semantics is a function  $F$ , whose domain and range is the set of all possible contexts  $C$ .

In exploring the contribution of pragmatic particles in Japanese, I argue that the CCP of the sentence is not determined simply by a single force morpheme in conjunction with a radical. There is more structure to this level of meaning than the picture in (6) suggests. Sentence-final pragmatic particles in Japanese provide a window into this level of meaning, giving some clues as to how it is organized and how it connects sentence radicals with the discourse moves whose ultimate analysis is left to general pragmatic pressures. At the same time, the theoretical model provides a means of analyzing at least a subset of pragmatic/discourse particles, whose meaning contributions are notoriously difficult to pin down formally. In the next section, I briefly describe the particles whose semantics is the focus of the dissertation, before returning to a discussion of to the extensions to the basic picture in (6) that will be motivated in the analysis of these particles.

### 1.3 Pragmatic Particles

There exists a rich literature on the semantics and pragmatics of discourse markers and discourse/pragmatic particles, much of it focused on the Dutch and German *modalpartikeln*, including among many others Blakemore (2002), Fraser (1990), Hartmann (1998), Zeevat (2000, 2003, 2005), Abraham (1991), Jacobs (1991), Kaufmann (2004), König and Requardt (1991), Lindner (1991), and Waltereit (2001). Zimmermann (to appear) provides a useful survey of this literature, and proposals for three of the German modal particles. There is also a substantial literature on non-Germanic

particles, including Mandara (Fluckiger and Whaley 1983, Pohlig and Pohlig 1994), Taiwanese (Li 1999), and Mandarin Chinese (Li 2006, Li and Thompson 1981, Wu 2004, Wu 2005, Chu 1984, 1985, 1998, 2002, King 1986, among many others).

While it may be tempting to seek a unified theory of these particles across a wide range of languages, Zimmermann (to appear) cautions that even within a single language (German), individual particles exhibit a range of different characteristics, including differences in their structural position, resulting in differences in how they compose with other elements of sentence meaning, and even the kind of meaning (expressive, presuppositional, etc) that a given particle contributes. The lesson seems to be this: individual particles must be studied in some detail before a general theory of “discourse particles” is to be proposed, and any attempt at such a general theory might in fact be misguided.

In this dissertation, I investigate a small number of Japanese pragmatic particles in detail. I argue that these particles are pragmatic in the specific sense that they contribute to the interface between the conventional meaning of a sentence and the use to which that sentence is put in a particular context. This level of meaning is located above force/mood in the Lewisean model sketched in (5), and is semantically associated with the CCP denoted by the entire sentence. In brief, I will argue that the particles analyzed in this dissertation serve as conventional means of *modifying* or *restricting* the context change potential associated with the sentences in which they occur. These particles are all found at the right periphery of the sentence in Japanese, whose structure I now briefly describe.

### 1.3.1 The Japanese Right Periphery

The central particle whose analysis drives the dissertation is the Japanese particle *yo*. The particle *yo* is one of a number of sentence final particles (SFPs) in Japanese.<sup>2</sup> Japanese has a rich inventory of elements appearing at the right edge of the sentence, after the verb. These elements have a variety of semantic roles: there is a large range of modal-like elements indicating the evidential source of the embedded proposition (McCready and Ogata, 2007), the epistemic (un)certainty of the speaker (Hara, 2006), as well as morphemes like *nda* (Hiraiwa and Ishihara, 2002) whose semantic contribution is difficult to characterize. These right peripheral elements obey strict ordering requirements when they co-occur in a sentence, a fact that can be taken to reflect a syntactic and/or semantic requirement on their hierarchical ordering. Also, these right-peripheral elements show different degrees of embeddability, with the number of potential embedders decreasing as a function of how far to the right the element is found. By the time we reach the level at which *yo* occurs, embedding is blocked completely.

Within the *Nihongogaku* (Japanese-language-studies) tradition of descriptive grammar, researchers have long recognized evidence for a hierarchical structure in the ‘extended predicate’ (verbal complex + modals + evidentials + particles etc.) at the right edge of the clause in Japanese. Much of this work is summarized by Minami (1993). For example, Kindaichi (1953) argues for a split in the Japanese verbal complex into a lower region encoding “objective” information, and a higher region encoding “subjective” information, like the speaker’s epistemic evaluation of the situation described by the lower, more objective level. Hayashi (1960) argues for a four-way split of the Japanese verbal complex, with “description” at the lowest level, followed

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<sup>2</sup>That is, standard (roughly, “Tokyo”) Japanese. The inventory of SFPs and their range of uses are subject to dialectal variation.

by “evaluation”, “presentation” and “transmission”. These views are summarized in Table 1.1, from Minami (1993):

Verb Root			
Causative ( <i>sase</i> )			
Passive ( <i>rare</i> )			
Negation ( <i>nai</i> )			
Past ( <i>ta</i> ), Copula ( <i>da</i> )			
Epistemic ( <i>darou</i> )			
		SFP <sub>1</sub> : <i>ka</i> , <i>wa</i>	
		SFP <sub>2</sub> : <i>yo</i>	
		SFP <sub>3</sub> : <i>ne</i> , <i>na</i>	
Description	Evaluation	Presentation	Transmission
Objective		Subjective	

**Table 1.1.** Sketch of the Japanese right periphery. (From p.52 of Minami 1993)

With the exception of the question particle *ka*, the SFPs at the right periphery in Table 1.1 are not embeddable, and seem to contribute a thoroughly pragmatic kind of meaning (that is, a meaning that affects discourse conditions and pragmatic felicity, but not truth-conditions). These elements can be roughly characterized as contributing to the speech act that the utterance conveys. The question is how this comes about:

- What kind of object (proposition, context change potential, something else?) do these elements take as a semantic complement?
- What kind of object (proposition, context change potential, something else?) do these elements return?

- How can we best characterize the way in which these particles contribute to the speech act? Felicity conditions? Presuppositions? Expressive meaning? Something else?

The discussion in the previous section has already suggested a starting point for answering these questions. The particle *yo*, I argue, is located just above the force indicating morpheme. Assuming that linear order in Japanese is a first approximation to hierarchical order, with structurally higher morphemes appearing farther out in the right periphery (an assumption justified by the strongly head-final nature of Japanese syntax), this means that force itself, if spelled out morphologically, is expected just to the left of *yo*. It is highly suggestive that the two particles occurring to the left of *yo* in Table 1.1 are in fact strongly connected with particular clause types. The particle *wa* is used, mainly by older women, to make what are sometimes described as “soft assertions”. The particle is only compatible with declaratives, and might therefore be analyzed as a type of declarative force marker that (in contrast to the default declarative marker, which is null) contributes some kind of sociolinguistic or expressive meaning as well. The particle *ka* is the well-known question particle, which, as the name suggests, is often employed in the formation of interrogatives. Not appearing on the chart but also occurring to the left of *yo* is imperative morphology. Imperatives in Japanese are marked by an overt morphological particle, which appears after the verbal root and just before *yo*, as I describe in §4.2.1. These initial observations support the idea that *yo* is found just above the site of sentential force.

Like other sentence final particles, the syntactic position of *yo* is extremely rigid. It must occur sentence-finally,<sup>3</sup> and cannot be embedded, as seen in (7), which is

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<sup>3</sup>Sentence final particles can co-occur in Japanese, and must obey the ordering conditions sketched in Table 1.1 and illustrated by the following example, so that strictly speaking it is the particle cluster that has to appear sentence finally.

(1) mou kaetta yo ne  
 already returned yo ne

ungrammatical unless the complement of *omotta* “thought” is interpreted as a direct quotation of John’s thoughts.

- (7) \*densha-ga kita *yo* to John-ga omotta  
train-NOM came *yo* COMP John-NOM thought  
“John thought [that the train had come *yo*].”

What then does *yo* contribute to an utterance? I begin with the simple example in (8).

- (8) eiga-wa hachi-ji kara da *yo*  
movie-TOP 8-o’clock from be *yo*  
“The movie starts at eight *yo*.”

As noted by McCready (2005, 2009), the presence of *yo* has no obvious effect on the truth conditions of a sentence in which it occurs. Thus, the sentence in (8) is true just in case the movie starts at eight; these truth conditions hold with or without the presence of *yo*. If *yo* does not affect the truth conditions of a sentence, what does it do? The literature is rich in data and insights into the conditions governing the felicitous use of *yo*, but with the exception of the proposals of McCready (2005, 2006, 2009) and Davis (2009, 2010), these accounts are not typically presented in the context of a formal semantic and pragmatic theory. McCready (2005) identifies three main perspectives on the use of *yo*; these are summarized below, along with relevant references.

Uttering (8) is infelicitous if the hearer already knows that the movie starts at eight, reflecting the observation (Suzuki Kose, 1997a,b; Kamio, 1994) that a sentence with *yo* marks information that the speaker assumes is new to the hearer, or that

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‘(He) already went home.’

The only (segmental) particles that can follow *yo* are *ne* and *na*, which are themselves in complementary distribution.

the speaker thinks the hearer has forgotten. Also, uttering (8) often carries a sense of urgency or insistence, a fact that can be attributed to the use of *yo* (Suzuki Kose, 1997a; McCready, 2009). Finally, (8) is odd unless the hearer is assumed to have some interest in the starting time of the movie, as noted by McCready (2005), citing Noda (2002), reflecting the observation that *yo* marks the relevance of the asserted content to the addressee.

These characterizations might make it seem like the pragmatics of *yo* is a real grab-bag of possibilities, too vague and multifarious for a straightforward formal analysis. The situation is improved by paying close attention to two factors: context and intonation. This can be illustrated for the example in (8) by considering its use in the two distinct conversational contexts in (9).

(9) a. **Guide to Action Context**

A: eiga-o miru mae-ni gohan-o tabe-you ka  
 movie-ACC watch before food-ACC eat-HORT Q  
 “Shall we eat before watching the movie?”

B: mou shichi-ji sugi deshou? eiga-wa hachi-ji kara da *yo*  
 already 7-o'clock past right movie-TOP 8-o'clock from be *yo*  
 “It’s already past 7, right? The movie starts at 8 *yo*.”

b. **Corrective Context**

A: eiga-wa kuji kara dakara gohan-o taberu jikan-wa  
 movie-TOP 9.o'clock from because food-ACC eat time-TOP  
 juubunni aru ne  
 sufficiently be PRT  
 “Since the movie starts at 9, there’s plenty of time to eat.”

B: chigau *yo*. eiga-wa hachi-ji kara da *yo*  
 wrong *yo*. movie-TOP 8-o'clock from exist *yo*  
 “That’s wrong *yo*. The movie starts at 8 *yo*.”

The example in (9a) is one in which the speaker is *guiding* the addressee's behavior, by pointing to an implicitly optimal action. For this example, the suggestion is that there is not enough time before the movie to go out and eat, so that it is better to just head straight to the movies. The example in (9b) is one in which the speaker is *correcting* a mistaken addressee. The addressee here has claimed (or presupposed) that the movie starts at nine. The speaker uses a *yo*-marked declarative to correct the addressee's mistake. These two examples exemplify what I argue to be the two main ways in which *yo*-marked sentences are used: as a *guide to action* or as a *correction*.

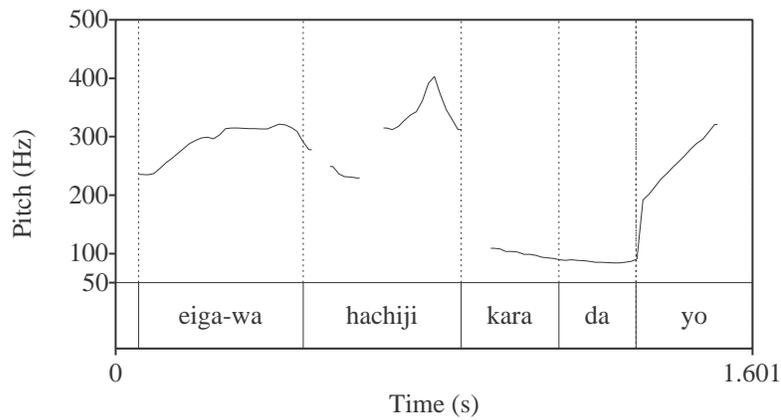
To understand the pragmatic role of *yo* in these two kinds of context, I argue that it is crucial to consider two kinds of contrast, both involving sentence final intonation. First, there is a pragmatic contrast between the same sentence with and without *yo* in examples like those in (9). Here, the examples are declaratives, and the contrast is between a declarative with *yo* and a bare declarative without *yo*. The basic observation is that the bare declarative tends to be less felicitous, or to have different pragmatic implications, than the same declarative marked with *yo*. One goal of the dissertation is to account for this pragmatic contrast. In doing so, I argue that it is crucial to analyze the “bare” declarative as not really bare at all. The relevant contrast in Japanese is between *yo*-marked declaratives and “bare” declaratives with a *final fall*. I argue, following Gunlogson (2003), that the final fall in bare falling declaratives spells out an intonational morpheme. This morpheme, I argue, is of the same semantic type as *yo*, so that the two stand in complementary distribution. Looking beyond declaratives, I show that for every sentence with which *yo* can be used, a minimally contrasting “bare” sentence with final fall is also possible, with pragmatic contrasts mirroring those for declaratives. This final fall, then, is another sentence-final particle, on par with *yo* but spelled out in the intonational tier.

Sentences with *yo* show an intonational contrast as well. Based on native speaker intuitions, the use of *yo* in context (9a) is most natural with a rising intonational

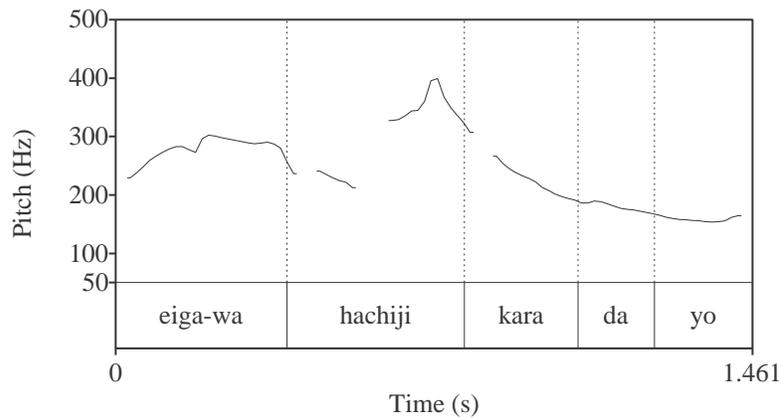
contour. The corrective use in context (9b) is natural with a final fall. The use of a final falling intonation in context (9b) seems to be strongly corrective, even to the point of abruptness or rudeness. A final rise can perhaps be used instead, but the effect is then softer or less direct; with a final fall, native speakers report an intuition that the speaker is directly registering the fact that the addressee is mistaken.

The pitch tracks in (10) show the  $f_0$  contour for a single speaker's production of the relevant sentence in the two contrasting contexts in (9).

(10) a. **Guide to Action Context (9a)**



b. **Corrective Context (9b)**



The pitch track in (10a) shows a sharp rise at the end of the *yo*-marked sentence. The same sentence in (10b) is characterized by a final fall. In the body of the dissertation,

I argue that this contrast is due to two intonational particles that appear in *yo*-marked sentences. The “guide to action” in examples like (9a) is contributed by a sentence-final rising intonational particle, while the “corrective” flavor of examples like (9b) is due to a final falling particle. These sentence-final intonational contrasts in *yo*-marked sentences, as well as the semantic significance of intonation in “bare” sentences, suggests that we must look to the intonational tier for a full picture of the Japanese right-periphery and how it helps shape sentential force. This is the topic of the next section.

### 1.3.2 Sentence Final Intonational Particles

Pragmatic particles bring into focus a number of issues concerning how conventional meaning interacts with general pragmatic pressures, blurring the line between semantics and pragmatics envisioned by many models of the “interface”. Intonational meaning has led researchers in parallel directions. Pierrehumbert and Hirschberg (1990) (P&H) set the stage for many investigators, arguing that intonational *contours* or *tunes* in English can be given a systematic and compositional semantic treatment. The semantics of these tunes, however, is not to be sought in truth-conditions:

[W]e propose that a speaker (S) chooses a particular tune to convey a particular relationship between an utterance, currently perceived beliefs between a hearer or hearers (H), and anticipated contributions of subsequent utterances.

(Pierrehumbert and Hirschberg 1990:271)

This sets the stage for the ambitious project of mapping out a compositional system in terms of which intonational meaning in English can be described. Ignoring the details of this and subsequent proposals for such intonational meaning in English, it is striking how similar in spirit the *kind* of meaning P&H propose for these tunes is

to that of discourse particles. This is meaning describable at the level of *utterances*, and makes reference to the (perceived) state of the hearer in the discourse.

The importance of this view is two-fold for the purposes of this dissertation. First, we have morphemes whose contributions are pragmatic in the sense that they must be described at the level of discourse-situated utterances. Second, we have *intonational* morphemes, giving us meaning that is spelled out only on the intonational tier. This means that the semanticist/pragmaticist should not be exclusively concerned with segmental material, any more than the phonologist should assume that prosody can be divorced from semantics. Ignoring the possibility of intonational meaning and its interaction with meaning derived from segmental material may leave one blind to important patterns in the data.

This is particularly true when looking at the Japanese right periphery, because Japanese has been shown to be rich in right-peripheral intonational particles, in addition to its rich set of segmental particles. This seems to be an areal feature of East Asian languages. The situation is summarized in some detail by Yip (2002), who makes explicit the connection between segmental and intonational/tonal particles by pointing out that in many languages particles may be spelled out either segmentally or tonally. She cites Chao's (1968) count of 28 final particles in Mandarin, of which 26 are segmental and 2 are (exclusively) tonal. These tonal particles are described as a final high tone, generating a final rise, and a final low tone, generating a final fall.

As in Japanese, final particles in Mandarin can be stacked, and the tonal particles are no exception. The sentences in (11) show the effect of stacking the particles *ne*, signaling a “continuing state”, and *ba*, signaling “supposition”. The sentences in (12) show the effect of stacking the particle *a*, signaling a command, and the purely tonal particle, manifested as a final fall, which signals “reassurance”. These data suggest that tonal particles are semantically of a kind with segmental particles in Mandarin,

and that particle clusters can contain a combination of both segmental and tonal particles.

- (11) a. ta mei lai  
he PERF.NEG come  
“He hasn’t come.”
- b. ta mei lai ne  
“He hasn’t come yet.”
- c. ta mei lai ne ba  
“He hasn’t come yet, I suppose.”

- (12) a. bie pa  
IMP.NEG fear  
“Don’t be afraid!” (straight command, as to a soldier)
- b. bie pa a-FALL  
“Don’t be afraid!” (reassuring, as to a small child)

(Yip 2002:271-272)

Yip cites data from a variety of other languages that further demonstrate the fact that final particles can be spelled out both segmentally and tonally/intonationally. Law (1990) examines the unusually rich inventory of sentence-final particles in Cantonese, which contains some 35 to 40 particles and many more particle clusters. Law argues that this inventory can be reduced by dividing the particles into three classes: segmental particles with inherent tone, segmental particles that are toneless, and particles consisting purely of a tone. These different kind of particles can then combine in a variety of ways, constrained by semantics, syntax, and phonology. The important insight is that a given particle in this system might be spelled out purely at the tonal level, and require some other segmental particle as a host.

Japanese exploits so-called *boundary phrase markers* (BPMs) for a range of meanings (Kawakami 1995, Venditti et al. 1998). Venditti et al. (1998) describe five of these right-edge tunes and their associated linguistic and paralinguistic meanings. As a typical example, they give the two sentences in (13), differing only in the intonational contours at the right edge of the sentence.

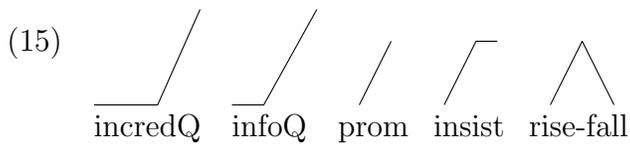
- (13) a. sou        na no?  
           that.way be *no*?  
           asking “Is that true?”
- b. sou        na no!  
           that.way be *no*!  
           insisting “It’s true!”

The sentence-final punctuation in these examples corresponds to two distinct final rise contours. According to Venditti et al. (1998), a final pitch rise to a high level signals a question interpretation, while a final rise to a mid level signals strong insistence by the speaker that the proposition is true. Although both of these final tunes constitute a “rise”, the details of the final  $f_0$  contour trigger drastically different interpretations. Venditti et al. (1998) argue that BPMs can be distinguished by features including  $f_0$  height, pitch shape, segment duration, and contour-segment alignment.

On the basis of perceptual and production data, Venditti et al. (1998) argue for the existence of at least five different BPMs in Japanese, each of which signals a distinct meaning. Their taxonomy is given in (14), along with schematized drawings of their canonical  $f_0$  realizations in (15). Venditti et al. (1998) stress that this set of BPMs is not to be taken as exhaustive. What connects these and other BPMs together is the distributional fact that they occur at the right edge of some kind of prosodic phrase. Which one? Venditti et al. (1998) propose that these BPMs occur at the right edge of an *accentual phrase* in the system of Pierrehumbert and Beckman

(1988), while they are taken in Venditti (2005) to be associated with the right edge of an *intonational phrase* in the J\_ToBI system (Venditti, 1995).

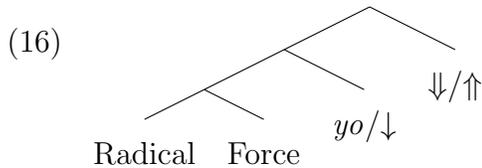
- (14)
- a. Incredulity question rise (incredQ)
  - b. Information question rise (infoQ)
  - c. Prominence-lending rise (prom)
  - d. Insisting rise (insist)
  - e. Rise-fall boundary movement (rise-fall)



A full taxonomy of the right-edge BPMS in Japanese is beyond the scope of this dissertation. Instead, I focus attention on a few key tunes whose distribution interacts crucially with that of *yo*. These were seen in the pitch tracks (10). I close the section by outlining how these intonational particles, along with *yo*, are configured above the level of force in the Japanese right periphery. The resulting structure forms the basis for the analysis of these particles in the rest of the dissertation.

### 1.3.3 The Structure of the Right Periphery

The intonational distinctions we saw in this section lead me to posit three intonational particles that interact semantically with *yo*. The first such particle is the final fall in “bare” falling sentences. This particle, written  $\downarrow$ , stands in complementary distribution with *yo*. When *yo* is used instead of a final fall, the sentence-final intonational slot is free to host a different intonational morpheme. This slot is filled by either a final rising morpheme  $\uparrow$  or a final falling morpheme  $\Downarrow$ , responsible for the contrasting pitch tracks in (10). The picture that emerges from these investigations is summarized by the diagram in (16).



The tree in (16) gives the basic structural analysis of every construction considered in this dissertation. At the bottom node we have a *radical* combining with *force*. The analysis of force in this dissertation builds in particular on the work of Gunlogson (2003), but extends this model to imperatives and interrogatives. The idea is that the basic clause types (declaratives, imperatives, and interrogatives) can be decomposed into a radical and a force head, as in the Lewisean analysis sketched in (5). Force morphemes form the first layer of sentence-final particles whose semantics is the focus of the dissertation.

After force, we have another layer in the right periphery. In this dissertation, I focus on the contrast between *yo* and  $\downarrow$ . The semantics of  $\downarrow$  is taken directly from Gunlogson’s account of falling declaratives in English. In the body of the dissertation, it will be seen that every sentence ending with *yo* stands in a minimal pair with a sentence without *yo*, ending instead with  $\downarrow$ . The crucial claim is that  $\downarrow$  is a morpheme of the same type as *yo* itself. This is the second layer of the right periphery. This layer can be filled by (at least) two particles, one segmental and the other intonational.

The third layer can be filled by one of two other intonational morphemes,  $\downarrow$  and  $\uparrow$ . The presence of these morphemes seems to depend on the presence of *yo*, but semantic arguments given in the body of the dissertation support a decompositional analysis of *yo* and its intonational associates. The final fall associated with *yo* sentences is homophonous (at least at the coarse-grained level of phonological/phonetic analysis I rely on) with the final fall in “bare” sentences. The semantics of the final fall associated with *yo*, however, is strikingly different from that of the other final fall, justifying the morphological and semantic distinction between  $\downarrow$  and  $\downarrow$ . The final rise associated with *yo* is similarly homophonous (to a first approximation) with various

rising tones that can associate with the same sentence without *yo* (for example, the question and insistence rises in (13)). The semantic contribution of the final rise that comes after *yo*, however, is distinct from these other kinds of final rise. These two intonational particles,  $\uparrow$  and  $\downarrow$ , form the final layer of the right periphery as schematized in (16).

While these four particles form the empirical focus of the dissertation, they are by no means the only elements occurring in the Japanese right periphery. There are a number of particles, some of which appear in Table 1.1, whose contribution must be incorporated into a full picture of right-peripheral particles in Japanese. In the body of the dissertation, we will encounter a number of other elements, both overt and covert, that find their place in the structural skeleton schematized in (16). It is hoped that the resulting picture will provide a framework within which other right-peripheral particles, both segmental and intonational, can be analyzed.

## 1.4 Extensions to the Basic Model of Context Change

The structure derived in (16) gives a more articulated view of the level at and above force than the simple one sketched earlier in (6). This more fine-grained model of sentential force and particles forms the basis for a number of additional extensions I make to the simple picture of CCP meaning outlined in §1.2. These extensions run in three dimensions. First, we need a way to model the dynamic contribution of imperatives and interrogatives. I follow a number of other researchers (Roberts 1996, Ginzburg 1996, Han 1999, Portner 2004, a.o.) in introducing contextual objects whose update is targeted by these non-declarative clause types. Second, I adopt an agent-specific model of discourse commitments, whereby “common” commitments like those represented by the common ground are derived from agent-specific sets of public commitments. Third, I argue for a fundamentally pragmatic view of contextual update. Rather than matrix sentences denoting *functions* from contexts to contexts, I

argue that they instead denote *relations* over contexts. It is the job of sentential force and its associated particles to specify which transitions are *semantically* consistent with the utterance. General pragmatic constraints are then used to find an optimal transition from among the resulting set.

Each of the extensions summarized above has been articulated in various places in the literature, with a variety of empirical and theoretical motivations. I cannot hope to do justice to the full range of data and theory-internal considerations that support each of these moves, but empirical motivation for each will be provided in the body of the dissertation. In the rest of this section I give a basic motivation for these extensions, and references to further discussion of each.

#### 1.4.1 Beyond Assertion: Imperatives and Interrogatives

The model of CCPs outlined in §1.2 is designed to handle declarative clauses, whose conventional use is to make assertions. When one moves beyond declarative clauses and assertoric force, the context-as-common-ground model must be extended in some way, whether by further articulation of this object itself (as in the extension to interrogatives in Groenendijk’s (1999) logic of interrogation), or by the introduction of additional contextual objects whose update is targeted by these other clause types (an approach adopted by Roberts (1996) and Ginzburg (1996) for interrogatives, and by Han (1999) and Portner (2004) for imperatives, among others). For the purposes of this dissertation, there are two main clause types where this limitation is an issue — imperatives and interrogatives. Roughly, imperatives are conventionally associated with a discourse move involving *action* or *intention*. Interrogatives are conventionally used to *raise issues* or *ask questions*, rather than to contribute information to the common ground.

As I argue at length in the dissertation, the semantics of *yo* and its associates is fundamentally dynamic, and best understood as a means by which the CCP meaning

of the sentence in which they occur is conventionally constrained in a way that feeds pragmatic reasoning. I argue that these particles engage the semantics of a sentence at a point above that of the force head, which is the locus for the differing CCP semantics associated with the different clause types. This view will require me to develop a model of the CCP dynamics of imperatives and interrogatives, which in turn necessitates further articulation of the basic model of context. The details of these extensions will be spelled out in the body of the dissertation, when the behavior of pragmatic particles in each of these clause types is examined in detail.

#### 1.4.2 Distinguishing Speaker and Addressee Commitments

The second limitation of the standard model is that the commitments of all discourse agents are collapsed into a single common ground. As will be seen, the analysis of *yo* requires a model in which the commitments of speaker and addressee are kept separate. This can be most easily seen in examples like (17), due to McCready (2009), in which the use of a bare declarative and a *yo*-marked declarative are pragmatically distinguished. Roughly speaking, the use of *yo* here indicates an effort on the part of the speaker to *change the addressee's mind*, or to get the addressee to change her contextual commitments, as we saw in (9b). According to McCready, the bare declarative has no such implications, and in this context is used to simply restate the speaker's own commitments.

- (17) B: saki      Jon-ga      kaetta  
           just.now John-NOM went.home  
           “John just went home.”
- A: uso!  
       lie  
       “No way!”

B: kaetta (yo)  
went.home (yo)  
“He went home yo.”

To model dialogs like this, we need to be able to keep the commitments of the different discourse agents distinct. In this example, the speaker and addressee are committed to mutually incompatible propositions. The common ground will support neither proposition, modeling the fact that the discourse participants have not mutually endorsed either proposition. To model the conflict, however, we need a way to represent the fact that one agent is publicly committed to  $p$  = “John just left”, while the other is committed to  $\neg p$ . The pragmatics of *yo* must be made sensitive to this state of conflict, and to the different commitments of the speaker and addressee. One way to efficiently model such conflicts is to decompose the common ground into a model of individual commitments.

Gunlogson (2003) argues for a model of contexts in which each discourse agent has an associated set of *public beliefs*. These agent-specific public beliefs can then be used to define a common ground, which pools the common components of every discourse participant’s public beliefs. At the same time, we can model other aspects of the context, including conflicts over the truth of particular propositions. For example, if  $p$  is in one agent’s public beliefs, while  $\neg p$  is in another’s, the common ground will not of course contain  $p$  or  $\neg p$ . In addition, we can use this fact about individual public beliefs to model dispute; for the example at hand, the truth of  $p$  is being disputed.

Gunlogson uses this more articulated model of public beliefs to model the semantics and pragmatics of rising versus falling declarative clauses in English. Gunlogson makes use of the more articulated contextual model to provide analyses of empirical phenomena that the simpler model (CG only) has not yet been able to account for. In a similar fashion, I will argue that Gunlogson’s more articulated model of public beliefs is useful in modeling the contribution of pragmatic particles in Japanese, like

the example in (17), in which a description of the data seem to require us to keep track of speaker and addressee commitments separately.

### 1.4.3 Relational CCPs

The context change potential of a sentence is treated by many researchers as functional, taking us to a single output context for any context in the CCP's domain. The notion of non-deterministic update is, however, hinted at from the earliest points in the literature. Lewis (1979), in articulating his scoreboard metaphor of conversational states, says the following:

Score evolves in a more-or-less rule-governed way. There are rules that specify the kinematics of score:

If at time  $t$  the conversational score is  $s$ , and if between time  $t$  and time  $t'$  the course of conversation is  $c$ , then at time  $t'$  the score is  $s'$ , where  $s'$  is determined in a certain way by  $s$  and  $c$ .

Or at least:

... then at time  $t'$  the score is some member of the class  $S$  of possible scores, where  $S$  is determined in a certain way by  $s$  and  $c$ .

(Lewis, 1979, p.345)

A *relational* view of context change has precedent in dynamic semantics as well. The CCPs in Dynamic Predicate Logic (Groenendijk and Stokhof 1991b) are relations over assignment functions; for an input assignment function, we end up with a *set* of minimally different output assignment functions. Brasoveanu (2007) exploits non-determinism in such an assignment-based dynamic framework in a treatment of the semantics of plurality.

The example in (17) gives us an initial motivation for a relational, non-deterministic model of dynamic update. The use of *yo* in this and many other examples serves to indicate the need for an agent to make a revision to their commitments. Revision involves elimination of previously accepted information, and thus requires *non-monotonic* update to an agent’s commitments. The functional view of CCPs is wedded to an approach under which update is fundamentally monotonic. In contrast to monotonic updates, where we can easily state a function taking us from an input context to one that is strictly more informative, non-monotonic updates require the elimination of previously accepted information, which leads to non-determinism. The logic of belief revisions is a complicated and ongoing area of research; the “AGM” theory introduced by the eponymous Alchourrón et al. (1985) is a classic starting point; see Gärdenfors (1988) for an accessible discussion, and Fermé and Hansson (2011) for a recent overview of the AGM theory.

For the example in (17), the problem may seem relatively trivial. Intuitively, what we have is an update whereby the agent A is requested to give up some proposition  $p$  and replace it with the negation of that proposition  $\neg p$ . In the course of examining the use of *yo*, however, we will see more complex examples in which the relation between the requested update and the “downdate” is less direct. Modeling these non-monotonic updates require methods for representing non-deterministic updates. The particle *yo*, especially when coupled with the intonational particle  $\Downarrow$ , is used for such updates in many contexts, and so understanding its behavior requires this move toward a non-deterministic, relational semantics of the update denoted by an utterance.

A relational model of CCP semantics gives rise to non-determinism in how update should proceed. We thus require methods for sorting through the semantically compatible alternative updates in order to find the optimal update, given the context of utterance. I follow Beaver (2002) and argue for a set of general pragmatic constraints that serve to *rank* the transitions compatible with the CCP semantics of the sentence.

These constraints will give us a formal means for calculating an optimal transition, or set of such transitions, from those compatible with the semantics of an utterance.

For Beaver, a primary problem facing dynamic theories of meaning is this: Many sentences require for their interpretation some kind of disambiguation. For pronouns, the semanticist will want to decide which index to associate with the variable that pronoun is taken to denote; anaphora resolution is to be done by constraints on co-indexation. More broadly speaking, natural language utterances are rife with other kinds of ambiguity, including structural and lexical ambiguities. As with the ambiguity introduced by variable-denoting elements, lexical ambiguity is standardly resolved by affixing an index to the word, so that the form is represented by the analyst with its ambiguity already resolved.

For all these kinds of ambiguity, the standard approach of the semanticist is to analyze a structure whose ambiguity (at the level of syntax, content words, and variables) is fully resolved. The job of the semanticist, and of semantic theory, is to provide the correct denotation for these disambiguated forms. Beaver points out that this basic approach is adopted by a large number of dynamic semantic theories, including File Change Semantics (Heim 1982), Dynamic Predicate Logic (Groenendijk and Stokhof 1991b), and Dynamic Montague Grammar (Groenendijk and Stokhof 1991a). These theories require formulae for which the indices in question are already specified, and thus for which the relevant kind of ambiguity has already been resolved.<sup>4</sup>

The trouble comes when we attempt to embed such a dynamic approach within a more general theory of how sentences are interpreted in context. In particular, it seems that the resolution of ambiguity is largely a pragmatic concern, barring certain constraints introduced by, say, syntax. But, as Beaver notes, a standard approach

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<sup>4</sup>As Beaver points out, the situation in DRT is different; it does not use pre-indexation, but relies on a *resolution algorithm*. While this leaves more room for the development of satisfactory means of resolving ambiguity, Beaver argues that “it is not yet obvious just what form such an account should take.”

for spelling out this pragmatic reasoning is precluded by the formal requirements of these dynamic systems, which would require pragmatics to rule out certain forms prior to their interpretation. Instead, Beaver suggests that it is more natural to assume pragmatics works as a kind of post-semantic filter, or works in tandem with semantic interpretation. Either of these latter possibilities seem plausible: what seems unlikely and unworkable is any kind of system which demands that possible forms are filtered out by pragmatic constraints before they have even been interpreted.

Beaver proposes that the mechanics of ambiguity resolution can be better integrated into the semantic interpretation of an utterance by doing away with the functional view of CCPs, and replacing it with a view in which CCPs denote *relations*, with a potentially large number of possible output contexts defined for a single input context. At an intuitive level, this picture is justified by considerations like the following:

In making an utterance, speakers attempt to convey ways in which they think the common ground should be modified. But hearers live in ignorance. They cannot be sure what transition the speaker intends. They do not know what ground was assumed initially common by the speaker, and, even if they had known, ambiguities of the utterance mean that they cannot be 100% sure what the speaker takes to be the final common ground.

(Beaver 2002, p.6)

The picture highlighted in the above quote is one in which the speaker can be taken as having a definite, functional CCP in mind, and also perhaps a definite starting context, so that he also has a definite output context in mind as well. This is surely an idealization, but fine for present purposes. The issue of ambiguity is purely a problem for the hearer. The signal gives some hint of the way the speaker wants the context to evolve (that is, it provides some hint at the function from contexts to contexts he intends to convey), but the signal is ambiguous in many ways, and

moreover, it is uncertain what sort of input context (common ground) the speaker was taking for granted in making his utterance, and thus what sort of context he expects to result from the acceptance of his utterance.

Now, this picture is certainly compatible with a model in which the semantic interpretation of the sentence *intended* by the speaker is one in which all relevant kinds of ambiguity are pre-resolved. Another view is possible. While it may be perfectly reasonable, if a bit unrealistic, that the utterer of a sentence has a definite transition between contexts in mind, and a definite model of the input context and resulting output context in mind as well, we might still maintain that these fully-specified intentions are *not* part of the semantics of the sentence itself. This is the view sketched by Beaver:

Here's the big picture. Or at least, *a* big picture. Syntactic analysis and compositional interpretation, yield a set of alternative meanings. Each meaning is itself a set of transitions, i.e. pairs of information states conceived of as inputs and outputs, where an information state is one possible common ground. What do we need pragmatics for? The main reason we need it is to choose the right single transition, the one intended by the speaker, from amongst the set of sets of transitions provided by earlier stages of interpretation.

(Beaver 2002, p.7)

In this picture, there are *two* distinct layers of indeterminacy. The first layer involves the treatment of CCPs themselves. Each such CCP is taken to be a *set* of “standard”, functional CCP meanings; that is, a set of input-output pairs of contexts, or a relation over contexts. This level of indeterminacy has nothing to do with lexical ambiguity or indexing possibilities. Instead, it is taken as a basic feature of CCPs that they are relations over contexts, and thus potentially indeterminate as to the output context for a given input context. The second layer of indeterminacy is the one at

which ambiguity in the signal as such is represented. If, for example, the sentence has two possible ways in which an element might be indexed, this is represented at this second level by having each indexing possibility realized as its own relational CCP.

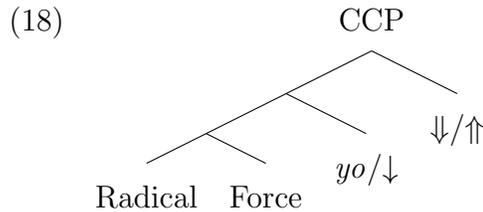
As Beaver is interested only in the level of indeterminacy introduced by ambiguity of various kinds, he ends up simplifying the picture above by eliminating the indeterminacy at the first level. That is, he ends up adopting a functional view of CCP meanings themselves, so that an ambiguous utterance is associated with a set of functional CCPs, and thus with a set of alternative functions from contexts to contexts. In this dissertation, I simplify in the opposite direction: I assume disambiguated semantic forms which denote non-deterministic CCPs. Simplifying in either direction gives rise to the same sort of indeterminacy, and hence the proposals regarding pragmatic reasoning suggested by Beaver have applicability for me as well.

The resulting system is rather indirect when compared with a functional semantics of CCPs. This indirectness, I argue, is a virtue. For one thing, it opens the door to handling non-monotonic update on a par with monotonic update, a fact that will be useful in the analysis of *yo*. Moreover, I would like to suggest that things are never as deterministic as a functional CCP model requires. A crucial component of pragmatic reasoning will be to determine the best update from among the candidate updates compatible with an utterance. By not hard-wiring this decision into a semantic function, we leave the door open for principled pragmatic mechanisms to play a role in determining exactly how the context is updated.

## 1.5 Overview of the Dissertation

The discussion in this chapter leads to the following picture of CCP semantics and pragmatics. The at-issue dimension of sentence meaning is divided into two layers, per the Lewisian picture in (5). The particles analyzed in this dissertation show that the force layer is more articulated than this picture suggests, so that a CCP is built

from a sentence radical in a distributed fashion; in Japanese, force can combine with at least two layers of particles in deriving the final CCP of the sentence, as sketched in (18).



The semantics of such structures fills in the first two steps in the mapping sketched in (19), where  $\alpha$  corresponds to the sentence radical in (18). The box labeled Force in (19) corresponds to the post-radical level of at-issue sentential meaning, and involves not only a force head, but also pragmatic particles that attach at a level above force.



The top node of (18) denotes a *relation between contexts*. Pragmatic particles, in conjunction with sentential force, provide a means for *conventionally constraining* the contextual transition that the utterance pragmatically points to. But these relations do not *determine* the transition. There will in general be a large number of output contexts that are semantically compatible with a given input context. What we have is a *set* of semantically compatible transitions for any given input context. This indeterminacy is resolved by *pragmatic constraints*. These constraints spell out the box labeled PRAG in (19). Interpretation at the level of contextual transition is thus constrained in two ways: by the conventional CCP semantics of the sentence itself, and by a set of general pragmatic constraints.

This basic picture is further articulated and motivated in the body of the dissertation, in which a detailed analysis of the semantics and pragmatics of structures like (18) is developed. An analysis of declarative clauses with and without *yo* is laid out in §2. The semantics is based on the work of Gunlogson (2003), but modified to

the relational framework for CCP meanings sketched in this chapter. The analysis is extended to the intonational particles  $\uparrow$  and  $\downarrow$  in §3. Imperatives with these particles are analyzed in §4, and an analysis of interrogatives is given in §5. These chapters provide empirical motivation for the picture of force and pragmatics introduced above. In §6, I conclude by considering the implications of this picture for semantic and pragmatic theory, and point to directions for future research.

## CHAPTER 2

### DECLARATIVES WITH *YO*

In this chapter I present the first part of my analysis of the Japanese sentence final pragmatic particle *yo*, focusing on its use in declaratives. This analysis derives from that presented in Davis (2009), from which some passages are taken. While some descriptive generalizations and underlying ideas of the analysis are maintained, the proposal differs from that earlier work in a number of ways. The particle itself is argued to be of a kind with the sentence-final falling and rising intonational morphemes of English, as analyzed by Gunlogson (2003). The basic idea is that declarative force indicates an update to an agent's commitments, but does not specify *which* agent's commitments are targeted. Following Gunlogson, I argue that the final falling particle  $\downarrow$  resolves this open agent to the speaker. The contribution of *yo*, I argue, is to make the update target *all* the agents in the discourse. For the dialogs considered in this dissertation, this amounts to saying that an utterance with *yo* denotes a CCP that targets the commitments of both the speaker and the addressee for update.

Empirically, *yo* seems to occur with one of two distinct intonational contours, rising or falling. I will use  $yo\uparrow$  to designate *yo* with a rising contour, and  $yo\downarrow$  to designate *yo* with a falling contour. The semantics of the intonational particles  $\downarrow$  and  $\uparrow$  will be discussed in detail in the next chapter. In this chapter, I focus on the semantics of *yo* itself. Distinguishing the contribution of *yo* from that of its intonational associates is tricky. Justification for the decomposition ultimately depends on the picture that emerges once the semantics of  $\downarrow$  and  $\uparrow$  have been integrated with that of *yo*. For now, I consider generalizations that apply to *yo* with either intonation.

Before moving on to the Japanese data in §2.2, I present Gunlogson’s theory of rising and falling declaratives in English, which forms the foundation for my own account of declaratives with *yo* in Japanese. I modify Gunlogson’s account for the relational model of CCP meaning adopted in this dissertation, and introduce an overview of the associated system of pragmatic constraints in §2.1.

## 2.1 The Semantics and Pragmatics of Relational CCPs

In this section, I briefly sketch a modified version of Gunlogson’s account of rising and falling declaratives in English. I will not attempt to justify the details of the approach. Instead, I briefly lay out the major aspects of the account, recasting some of the formal mechanics along the way. I make one major departure from Gunlogson’s system, by having utterances denote *relational* rather than *functional* CCPs. The semantics is laid out in §2.1.1, followed by a discussion in §2.1.2 of how the non-determinism in the resulting denotations is resolved pragmatically.

### 2.1.1 The Semantics of Declaratives

In Gunlogson’s (2003) model, each agent  $x$  in a context  $C$  is associated with a set of *public beliefs*, a set of propositions to whose truth  $x$  is taken to be committed, at least for the purposes of the conversation. Gunlogson’s definition of public beliefs is given in (20).

- (20) Let  $PB_A^C$  and  $PB_B^C$  be sets of propositions representing the public beliefs of  $A$  and  $B$ , respectively, with respect to a discourse in which  $A$  and  $B$  are the participants, where:
- a.  $p$  is a public belief of  $A$  iff “ $A$  believes  $p$ ” is a mutual belief of  $A$  and  $B$
  - b.  $p$  is a public belief of  $B$  iff “ $B$  believes  $p$ ” is a mutual belief of  $A$  and  $B$

As Gunlogson stresses, the definition of an agent’s public beliefs relies on *mutual* or *common* beliefs about beliefs. As Stalnaker (2002) puts it:

The common beliefs of the parties to a conversation are the beliefs they share, and that they recognize they share: a proposition  $\varphi$  is common belief of a group of believers if and only if all in the group believe that  $\varphi$ , all believe that all believe it, all believe that all believe that all believe it, etc. (Stalnaker, 2002, p.704)

A conversational context  $C$  is a tuple whose elements are the set of discourse participants, along with the public beliefs of each conversational participant. In case there are two participants  $A$  and  $B$ ,  $C = \langle \{A, B\}, PB_A^C, PB_B^C \rangle$ . I use the notation  $PB_x^C$  to represent the public beliefs of agent  $x$  in context  $C$ .<sup>1</sup>  $DP^C$  returns the set of discourse participants. For the above context,  $DP^C = \{A, B\}$ . The common ground can be reconstructed by taking the intersection of the public beliefs of each discourse participant in a given discourse context  $C$ . In case there are just two discourse participants  $A$  and  $B$ , a simplifying assumption I make throughout the dissertation, this reduces to the following:

$$(21) \quad CG_{A,B}^C = PB_A^C \cap PB_B^C$$

The common ground, related to two agents, is equal to the *intersection* of those agents' respective public beliefs.

Gunlogson takes a dynamic view of sentence meaning, so that an utterance denotes a CCP. Gunlogson adapts the CCP idea to her more articulated model of contexts by arguing that a given sentence corresponds to an update to a particular substructure of the context. Since in her system the common ground consists of the intersection of the public beliefs of the discourse participants in that context, the semantics of a declarative sentence is interpreted as an update to the public beliefs of some discourse participant  $x$ .

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<sup>1</sup>In Gunlogson's model, the public beliefs of an agent are identified with what are called *discourse commitments*. Later in the dissertation, I expand the notion of discourse commitments to include other commitments than public beliefs.

For declarative sentences, the basic idea is this. A declarative operator DECL returns a function from a *commitment set* to a *commitment set*, where a commitment set is the set of worlds compatible with the public beliefs of an agent. That is, for an agent  $x$  in a context  $C$ ,  $x$ 's commitment set  $cs_x^C = \cap PB_x^C$ . The declarative operator does not specify *whose* commitments are so updated. This job is left to intonation. Rising and falling intonation specify which discourse participant is to be identified with  $x$ ; falling intonation identifies this variable with the speaker, while rising intonation identifies it with the addressee. Gunlogson achieves this determination by stating syncategorematic composition rules for the intonational morphemes.

Gunlogson adduces a variety of evidence in favor of this account of rising and falling declaratives in English, and I will not provide a recapitulation of her arguments here. Briefly, however, we can see how the analysis works for minimal pairs like that in (22), based on (44) from p.31 of Gunlogson.

(22) [A & B are looking at a co-worker's much-dented car]

A: His driving has gotten a lot better.

B's response:

a. It has. #I don't see much evidence of that.

b. It has? I don't see much evidence of that.

This example has A committing to the proposition  $p$ . With the falling declarative in (22a), the speaker commits himself to this proposition as well. This explains why the skeptical follow-up is infelicitous. The rising declarative in (22b), by contrast, does *not* commit the speaker, and is perfectly felicitous with the skeptical follow-up.

Gunlogson's analysis of rising declaratives on contexts like that in (22), in which the addressee has already committed to the propositional content of the speaker's declarative. In such contexts the update encoded by the rising declarative is uninformative, since it does not result in a change to the public beliefs of either the speaker

or the addressee. She notes that the analysis should also extend to informative uses of the rising declarative, but leaves the details of that extension to future research. Only the analysis of falling declaratives will be important for my discussion of the Japanese data, meaning that my adoption of Gunlogson’s basic model of declarative and intonational meaning does *not* commit me to her particular analysis of rising declaratives, but only to her analysis of falling declaratives. For the sake of exposition, I will provide a reformulation of Gunlogson’s system for both rising and falling declaratives, but it is only the latter that will play a role in the rest of the dissertation.

I will reformulate Gunlogson’s account, in order to (I hope) better capture its compositionality, and in order to give us non-deterministic, relational CCP meanings. The declarative operator, in combination with a propositional complement, returns a function of type  $\langle e, \langle c, \langle c, t \rangle \rangle \rangle$ , where  $c$  is the type of discourse contexts, and  $\langle c, \langle c, t \rangle \rangle$  is the type of relational CCPs (a function from contexts to sets of contexts).

$$(23) \quad \llbracket \text{DECL } p \rrbracket = \lambda x \lambda c. \left\{ c' \mid \llbracket p \rrbracket \in \text{PB}_x^{c'} \right\} \\ = \lambda x. \left\{ \langle c, c' \rangle \mid \llbracket p \rrbracket \in \text{PB}_x^{c'} \right\}$$

The above denotation takes an argument  $x$ , and returns a relational CCP meaning whose range is restricted to those contexts in which the public beliefs of  $x$  contain the proposition denoted by the complement of DECL. The denotation differs from the semantics given by Gunlogson primarily in that the CCP is relational, rather than functional. We can represent this relation as a function from contexts to sets of contexts, so that DECL applied to a propositional sentence radical returns an object of type  $\langle e, \langle c, \langle c, t \rangle \rangle \rangle$ , with  $c$  the type of discourse contexts. Equivalently, we can represent the meaning as a function from entities to a set of ordered pairs of contexts. I will adopt this second representation throughout the dissertation.

The semantics in (23) directly reflects Gunlogson’s idea that a declarative sentence (at least in English) denotes an update to an agent’s commitments, leaving the agent to be so committed unspecified. In Gunlogson’s account, sentence-final intonational

morphemes serve to resolve the open argument in the formula returned by [DECL  $p$ ]. Falling intonation resolves this variable to the speaker, while rising intonation resolves it to the addressee. In order to spell this semantics out, I first define two functions that return the speaker and the addressee of the context.

$$(24) \quad S_C = \text{the speaker in } C$$

$$(25) \quad A_C = \text{the addressee in } C$$

The definitions of  $S_C$  and  $A_C$  give us discourse agent in context  $C$ , the speaker in  $C$  for  $S_C$ , and the addressee in  $C$  for  $A_C$ . Throughout the dissertation, I make the simplifying assumption of a single speaker and a single addressee; that is, I will focus on duologs. To expand the account to dialogs with three or more participants, we can allow the functions defined above to return sets of discourse participants; I ignore the issue for simplicity.

With these speaker and addressee functions in place, a denotation can be given for sentence-final rising and falling intonational morphemes that combines with declaratives to return the semantics argued for by Gunlogson.

$$(26) \quad \llbracket \downarrow \rrbracket = \lambda S_{\langle e, \langle c, ct \rangle \rangle} \cdot \left\{ \langle C, C' \rangle \mid \langle C, C' \rangle \in S(S_C) \right\}$$

$$(27) \quad \llbracket \uparrow \rrbracket = \lambda S_{\langle e, \langle c, ct \rangle \rangle} \cdot \left\{ \langle C, C' \rangle \mid \langle C, C' \rangle \in S(A_C) \right\}$$

These denotations take a function from entities to CCPs, and return a CCP in which the open argument is resolved to the speaker or the addressee.<sup>2</sup> When combined with a declarative [DECL  $p$ ], we get the following denotations:

$$(28) \quad \text{a.} \quad \llbracket \text{DECL } p \downarrow \rrbracket = \left\{ \langle C, C' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{S_C}^{C'} \right\}$$

$$\text{b.} \quad \llbracket \text{DECL } p \uparrow \rrbracket = \left\{ \langle C, C' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{A_C}^{C'} \right\}$$

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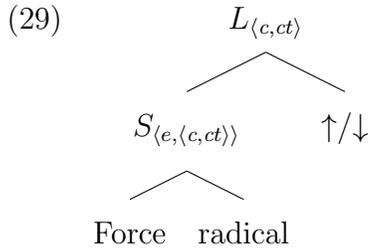
<sup>2</sup>It may seem like a simpler denotation, such as  $\llbracket \downarrow \rrbracket = \lambda S.S(S_C)$ , would work just as well. The problem is that the context parameter of  $S_C$  and  $A_C$  must be resolved to the input context of the resulting CCP. This is not achieved with the simpler denotation, which justifies the slightly more baroque formulations in (26) and (27).

The discourse agent is specified relative to the input context, while the public beliefs of that agent are specified relative to the output context. This means that a declarative combined with intonation gives us a CCP which takes an input context  $C$  and requires that all output contexts  $C'$  are ones in which the public beliefs in  $C'$  of the relevant agent (speaker or addressee) in  $C$  contain the propositional radical of the declarative.

As in Gunlogson's model, the relational CCPs defined above serve to commit an agent to the propositional radical of a declarative. With the basic pragmatic principle whereby the use of a relational CCP indicates an intention to move the context into one consistent with the output defined by the CCP, we end up predicting that falling declaratives make requirements on the speaker's commitments, while rising declaratives make requirements on the addressee's commitments. The agent so committed is determined by intonation, following Gunlogson.

The addressee's commitments are *not* updated by the mere utterance of the sentence. Rather, the addressee has certain commitments in all contexts in the range of the relation denoted by the sentence. Pragmatically, we interpret the CCP as a move whereby the speaker *suggests* or *requests* that the actual context be updated in accordance with this CCP. Whether this update is accepted is a matter for further negotiation with the addressee. The analysis is thus immune to any criticism that the mere utterance of a rising declarative is able to directly affect the addressee's commitments. The theory is not dynamic in this sense; contexts are not updated by the mere utterance of a sentence. A matrix sentence denotes a CCP, and this is interpreted pragmatically as a suggestion for how the speaker intends the context to evolve.

The analysis sketched above gives us a skeleton for building CCP meanings, represented in (29).



The tree in (29) breaks the derivation of a CCP into three steps. First, we need to build a radical for the sentence. For declaratives, this radical will be propositional. The radical is combined with a force head, which returns an object of type  $\langle e, \langle c, \langle c, t \rangle \rangle$ . Throughout the dissertation, I will use the variables  $S$ ,  $S'$ , and so on to refer to objects of this type, which we can think of as “forced sentences”, that is, sentence radicals combined with the force head.

The crucial element of Gunlogson’s proposal is that radical+force is not enough. In addition, we have to specify the agent whose commitments are to be updated. In English this is achieved by one of two intonational morphemes, which when combined with a forced sentence gives us what Gunlogson terms *locution*  $L$ , of type  $\langle c, \langle c, t \rangle \rangle$ : a relational CCP. The Gunlogsonian model of sentential force is more articulated than the simple model envisaged by Lewis. The CCP of the sentence is not determined solely through the combination of a propositional radical with a mood/force head. There is an additional step. The sentential force particle determines what kind of commitment is targeted for update, and the operators  $\downarrow$  and  $\uparrow$  determine which agent’s commitments this update targets.

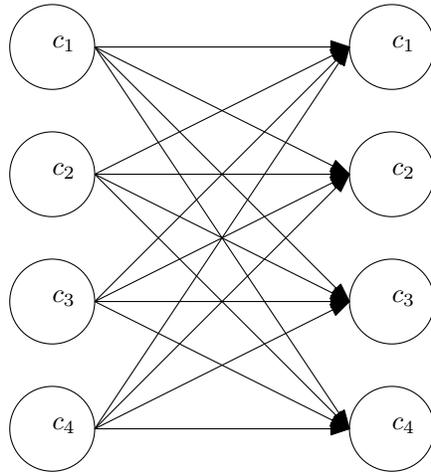
I will not give further consideration to how this reformulation of Gunlogson’s account applies to the English data that Gunlogson deals with. The model forms the basis for my own analysis of the contrast between declaratives with and without *yo* in Japanese. Before moving on to the Japanese data, I briefly discuss how the relational view of CCPs interacts with pragmatic constraints, giving us a way to calculate the optimal transition(s) among those compatible with the semantics of the utterance.

### 2.1.2 CCP Pragmatics

Looking at the denotation for a declarative with falling intonation, we see that the essential contribution of force (in this case, DECL) in combination with sentence final intonation is to eliminate certain contexts from the range of the relation. This treatment has an interesting parallel with the dynamic treatment of presuppositions. Essentially, presuppositions in a dynamic framework can be treated as a way of placing constraints on the domain over which the context change potential of the sentence is defined. A relational CCP operates over a domain of input contexts, and maps these onto sets of output contexts. The force head narrows down the range of this relation; in a declarative clause, it reduces the range to those contexts in which the public beliefs of some agent support the proposition denoted by the complement of DECL. It thus mirrors the effect of a presupposition, by inducing a sort of “postsupposition” about the set of output contexts compatible with the sentence. Postsuppositions help narrow down the set of output contexts compatible with the CCP, just like presuppositions help narrow down the set of input contexts.

While presuppositions and postsuppositions serve to narrow down the intended transition to some extent, the resulting CCP is still highly non-deterministic. I argue that this semantic non-determinacy is resolved pragmatically, following suggestions of Beaver (2002). In the rest of this section, I illustrate how I think the pragmatics should proceed. For the purposes of illustration, consider a universe of only four possible contexts. The CCP denotation of every sentence is selected from the space of all possible contextual relations. One such relation is the trivial relation, linking every context to every context. For the toy space of four contexts, this relation can be illustrated with the following diagram:

(30) Unconstrained Relation over Contexts



This unconstrained relation can be thought of as encoding all possible updates over this set of four contexts.

How to narrow down these possibilities? First, we have a general non-linguistic plausibility metric in terms of which input (and, presumably, output) contexts can be ranked. Beaver refers to this as an *information ordering*:

[A] hearer is typically uncertain about what common ground is being assumed by the speaker, although common sense induces a partial ordering over alternative common grounds. I refer to this ordering as an information ordering. For example, it is possible, although unlikely, that I or any speaker will assume that we commonly know that Mary's car was on fire. Given that it is implausible that a speaker will make such an assumption, contexts which support that proposition will be relatively low on a hearer's information ordering.

(Beaver, 2002, p.11)

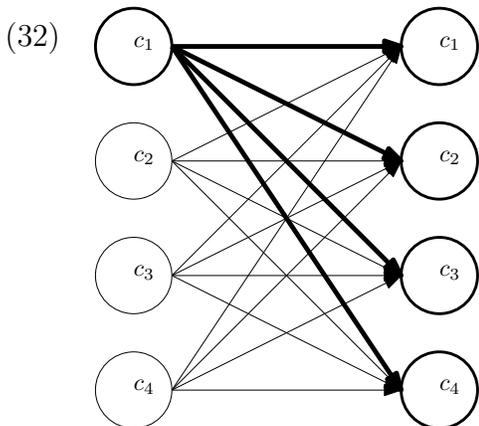
The information ordering expresses extra-linguistic knowledge about what an agent takes as a likely input context; that is, what is a likely representation of the common ground and other relevant aspects of the discourse context that the agents find themselves in. Returning to our toy example, with only four possible contexts, we might

have an information ordering that ranks the context  $c_1$  over all the others, so that  $c_1$  is taken as the most plausible input context. In case we have an utterance with *no* presuppositions, this information ordering will (all other things being equal) lead to a preference for input-output pairs with  $c_1$  as the input context (that is, the pairs  $\langle c_1, c_1 \rangle, \langle c_1, c_2 \rangle, \langle c_1, c_3 \rangle, \langle c_1, c_4 \rangle$ ) over the other input-output pairs.

While world-knowledge and other considerations might favor a context, these considerations are no match for a conventional presupposition. Beaver provides the following example: A context in which it is common knowledge that Mary’s car is on fire may be considered quite unlikely by an information ordering in terms of which possible input contexts are ranked. An utterance of (31), however, presupposes this fact, and hence knocks out all input contexts which fail to support it, regardless of how highly ranked they might be by general world knowledge.

(31) Mary didn’t realize that her car was on fire.

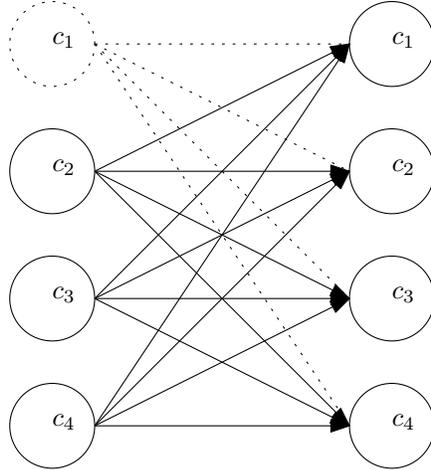
In our toy example, the principle can be illustrated as follows. The information ordering ranks  $c_1$  above all the other candidate input contexts, thus favoring the set of contextual updates in which  $c_1$  is the input context. This situation can be illustrated graphically as in (32), in which the favored transitions are indicated in bold.



The CCP semantics of any actual utterance  $U$  is unlikely to be trivial. Its presuppositions will knock certain possibilities out of the domain of the relation, and its

postsuppositions will knock certain possibilities out of the range. For the case at hand, assume that  $U$  contains a presupposition incompatible with context  $c_1$ . Then  $c_1$  is not in the domain of the relation denoted by  $U$ , and the information ordering is overridden. This is how accommodation is modeled.

(33) Context Constrained by Presupposition



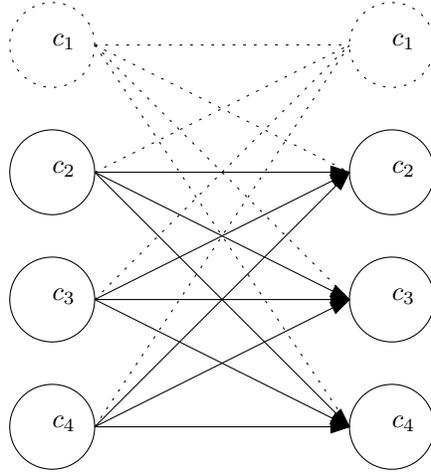
Note that  $c_1$  would still remain in the range of the relation. It seems like a plausible constraint on CCPs that the range should not typically contain contexts that are not in the domain, so that we don't find ourselves with an update mapping from a context compatible with a sentence's presuppositions onto a context incompatible with that sentence's presuppositions. To achieve this, we can introduce a constraint stating that for all legitimate contextual relations, the range of the relation is a subset of its domain.

(34) **Constraint on Valid Contextual Relations**

A contextual relation  $R$  with domain  $D$  and range  $D'$  is valid only if  $D' \subseteq D$ .

With this constraint in place, the relation is further constrained, as shown below:

(35) Domain and Range Restricted by Presupposition



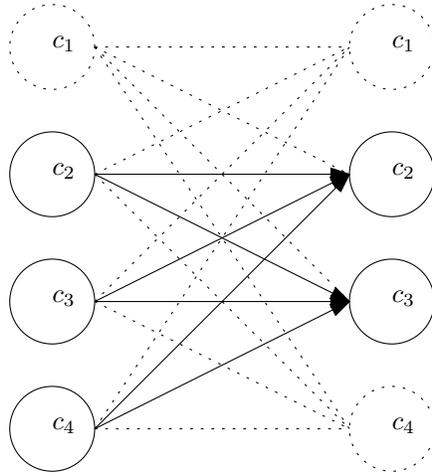
This takes care of the presuppositions of  $U$ , since the relation is not defined for the input context  $c_1$ , and furthermore the presuppositionally eliminated context is not in the relation's range, so there is no way we can end up in a context that violates the presupposition.

Now we turn to postsuppositions. Intuitively, the postsuppositions of an utterance constitute the requirements placed by that utterance on all candidate output contexts. Assume that we have an utterance  $U$  denoting the following relation:

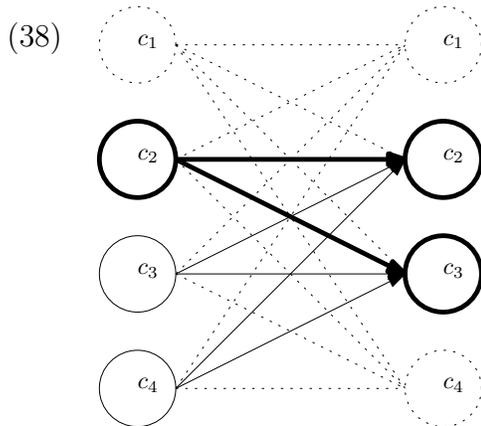
$$(36) \quad U = \{ \langle C, C' \rangle \mid C \in \{c_2, c_3, c_4\} \wedge C' \in \{c_1, c_2, c_3\} \}$$

This utterance has the presupposition just discussed, since  $c_1$  is not in the domain of the relation. In accordance with the constraint in (34), this context is also eliminated from the range of the relation, although it is not eliminated from the range semantically. There is also a postsupposition that eliminates  $c_4$  from the range of the relation. Our relation thus has in its range only the contexts  $c_2$  and  $c_3$ .

(37) Contextual Relation after Update with Postsupposition



Since  $c_4$  is not in the range of our contextual relation, it is not valid as an output context. What is the likely use of  $U$  in our toy model? It depends on which input context we choose. For the sake of illustration, assume that we identify context  $c_2$  as the input context for the intended discourse move, on the basis of our information ordering. This gives us one of two possible transitions consistent with the CCP semantics of  $U$ , which are highlighted in (38).



The two transitions  $\langle c_2, c_2 \rangle$  and  $\langle c_2, c_3 \rangle$  are compatible with the semantics of the utterance and also preferred by the information ordering. Even with our toy universe of four contexts, the semantics and ordering source have not given us a unique transition. What to do? It should be noted that we have a set of preferred transitions, all of which have the same input context. The problem has been reduced to one of making

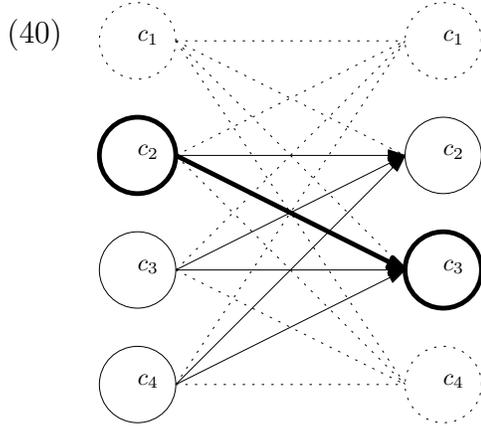
the correct choice from among these candidate transitions. Formally, the problem is of a kind with the sort dealt with in Harmonic Grammar (HG, Legendre et al. 1990a,b) and Optimality Theory (OT, Prince and Smolensky 1993/2004). The idea underlying Beaver’s Transition Preference Pragmatics (TPP) is of a kind with these approaches to finding optimal mappings from a set of candidate mappings, an affinity acknowledged by Beaver. The idea behind TPP is that we can (at least partially) resolve the indeterminacy inherent in a relational CCP with a set of constraints that serve to (partially) order sets of transitions. The transition ordered highest by these constraints is interpreted as the (most likely candidate for the) transition intended by the speaker.

In our toy example, TPP needs to help us choose between  $\langle c_2, c_2 \rangle$  and  $\langle c_2, c_3 \rangle$ . It can do so if there is a constraint favoring one of these transitions over the other. Such a constraint is not hard to imagine for the present problem, and is in fact one that Beaver himself posits (in terms of common grounds): roughly, input-output pairs should not be identical.

(39) \*TRIVUP (No Trivial Updates):

Assign a penalty to any pair of contexts  $\langle c_i, c_k \rangle$  in which  $c_i = c_k$ .

This constraint will penalize the transition  $\langle c_2, c_2 \rangle$ , but not  $\langle c_2, c_3 \rangle$ , since  $c_2 = c_2$  but  $c_2 \neq c_3$ . If this is our only constraint on transitions, then we end up with  $\langle c_2, c_3 \rangle$  as the winning candidate in this toy example. As before, we can indicate this via highlighting in the associated diagram:



We have thus “solved” for a particular transition from among the set of candidate transitions through the combined effect of presuppositions, postsuppositions, and pragmatic constraints.

This toy example has provided a big-picture overview of how conventional meaning and pragmatic reasoning can be combined in a theory of context update semantics/pragmatics. The particles considered in this dissertation will be argued to achieve their pragmatic effects by constraining the CCP denoted by the sentence. This, in conjunction with a set of general pragmatic constraints, will be used to derive a host of facts characterizing utterances with and without these particles. In the next section, I show how a Gunlogson-style declarative semantics, in conjunction with constraint-based pragmatics, can derive some basic contrasts between bare falling declaratives and *yo*-marked declaratives in Japanese.

## 2.2 The Semantics and Pragmatics of *yo*

### 2.2.1 Initial Observations

In this section I first examine a contrast between declaratives with and without *yo* in corrective contexts, in which the speaker is attempting to get the addressee to non-monotonically revise their public beliefs. This contrast was illustrated in (17), repeated in (41), where there is a pragmatic difference between bare falling declaratives and *yo*-marked declaratives:

- (41) A: saki Jon-ga kaetta  
just.now John-NOM went.home  
“John just went home.”
- B: uso!  
lie  
“No way!”
- A: kaetta ↓/*yo*  
went.home ↓/*yo*  
“He went home (↓/*yo*).”

McCready (2009) cites this as an example of the “insistence” that is a common feature of *yo*-marked sentences, saying the following about this example (emphasis added):

It’s easy to see this [insistence] in dialogs where the dubiety about  $\varphi$  in *yo*’s scope has been expressed. It is rather more natural to use *yo* than not in situations like these *if the speaker is actually trying to convince the hearer of the truth of  $\varphi$  . . .* Here, the use of *yo* is more natural than not in A’s second utterance. *When the particle is not used, there is a nuance that A does not care whether or not B accepts the content*; A is simply saying it again, not trying to convince B in any way. (McCready, 2009, p.3)

This contrast points to a feature of *yo* that is apparent from the characterizations of the particle summarized in §1.3.1. These characterizations of *yo* share a common emphasis on the *addressee*, on her commitments, beliefs, and the like. Examples like (41) show that bare falling declaratives do not seem to target the addressee’s public beliefs for revision, unlike *yo*-marked declaratives. The use of *yo* thus seems to involve the addressee’s public beliefs in a way that bare falling declaratives do not.

The addressee orientation of *yo* is reflected in the fact that the use of *yo* seems strongly tied to dialogs. The strong dialogic orientation of *yo* is apparent in its relative frequency in monologs versus dialogs in the Corpus of Spoken Japanese (CSJ, Kokuritsu Kokugo Kenkyuujo [National Institute for Japanese Language] 2006). To establish this fact, I counted the number of times *yo* was used in both the monologs and dialogs from the CSJ.<sup>3</sup> Table 2.1 is a contingency table showing the frequency of sentences with and without *yo* in both monologs and dialogs.

	Dialogue	Monologue
no <i>yo</i>	96,006	77,210
<i>yo</i>	713	80

**Table 2.1.** Contingency table for sentences with and without *yo* in dialogs and monologs in the CSJ.

The data summarized in Table 2.1 represent a total of 174,009 sentences. The chance that a given sentence will contain *yo* in either condition is relatively low, but we see that the proportion of *yo* sentences is much greater in dialogs than in monologs: The proportion of *yo*-sentences in dialogs is about 0.0074, while in monologs it is only 0.001, meaning that *yo* is over 7 times more likely to be used in a dialog than in a monolog in this corpus. A  $\chi^2$  test on the data confirms the statistical significance of this asymmetry:  $\chi^2(1, N=174,009) = 378.87, p < 0.001$ . The corpus data are clear: there is a systematic bias toward use of *yo* in dialogs relative to monologs.<sup>4</sup>

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<sup>3</sup>For dialogs, which are mostly in the form of an interview between one of two hired interviewers and a large set of interviewees, I consider only the interviewee's responses in my calculations, since the interviewees also provide the monolog data.

<sup>4</sup>The search method by which the counts in Table 2.1 were established includes quotative uses of *yo* as well as proper matrix uses. Hand-checking of a subset of the monolog uses suggests that many or most may be quotative, in which case the asymmetry may be even greater than these numbers suggest.

The dialogic orientation of *yo* is further supported by the contrast in (42), a minimal pair differing only in whether the declarative sentence ends with a final fall or with *yo*. In both contexts, there are two contextual agents, who have been engaged in prior dialog.

- (42) a. Context: The speaker is waiting for the bus, and sees it coming. She says the following, to no one in particular.
- a, basu kita (↓/#*yo*)  
 oh, bus came  
 “Oh, the bus is here (↓/#*yo*).”
- b. Context: The addressee and speaker are waiting for the bus. The speaker sees it coming, and says the following.
- a, basu kita (↓/*yo*)  
 oh, bus came  
 “Oh, the bus is here (↓/*yo*).”

In (42a), the speaker is taken to be, in some sense, “talking to himself”. In such contexts, the use of *yo* is felt by informants to be rather less natural, or certainly more marked, than use of the bare falling declarative. This is in contrast to the minimally differing context (42b,) in which the speaker is engaging an addressee in conversation. In such contexts, the use of *yo* is quite natural. The intuitions about pairs like that in (42) are rather subtle. By themselves, they are not the most solid basis upon which to build a theory of *yo* and of sentence final intonation. Nevertheless, informants report a consistent intuition that, in some sense, the use of *yo* involves the addressee in a context, if an addressee is present. This observation forms the initial motivation for the semantics of *yo* I present in the next section.

### 2.2.2 The Semantics of *yo*: An Inclusive Locutionary Operator

On the basis of the corpus data and examples considered above, I propose that *yo* is typically used with sentences that are intended to target the commitments of not only the speaker, but of the addressee as well. A falling declarative can be used to simply indicate the speaker’s own commitments, while a *yo*-marked declarative seems to involve the addressee more directly in the intended update. I propose a formal semantics of *yo* that generates these contrasts by making the update involve *all* discourse participants, rather than just the speaker. Technically, *yo* takes a forced sentence as complement, and returns a CCP in which the discourse commitments of *all* discourse participants are updated according to the semantics of its complement.

In order to spell this out formally, it will be convenient to define the public belief functions introduced earlier for *sets* of discourse agents, rather than just for individual agents. The public beliefs of a set of agents (for example, the set containing the speaker and addressee) consists of the *mutual public beliefs* of those agents. This in turn is defined simply as the intersection of their respective sets of public beliefs. This is spelled out formally for a set of two agents  $\{x, y\}$  in (43).

$$(43) \quad \text{PB}_{\{x,y\}}^c = \text{PB}_x^c \cap \text{PB}_y^c$$

More generally, the mutual public beliefs of a set of discourse agents containing  $n$  agents  $\{x_1, \dots, x_n\}$  is defined in (44).

$$(44) \quad \text{PB}_{\{x_1, \dots, x_n\}}^c = \bigcap_{i=1}^n \text{PB}_{x_i}^c = \text{PB}_{x_1}^c \cap \dots \cap \text{PB}_{x_n}^c$$

In short, to get the set of mutual public beliefs of a set of agents, we take the intersection of the public beliefs of all the agents. We get back the set of propositions that are in the public beliefs of *every* agent in the list. That is, we get the common ground, related to the agents in the set. To illustrate, consider a context  $C$  with just two agents,  $x$  and  $y$ . Imagine that  $x$  has a public belief in the two propositions  $p$  and

$q$ , while  $y$  has  $p$  and  $r$  as her set of public beliefs. Then the public beliefs, individual and mutual, of  $x$  and  $y$  in  $C$  are given in (45).

- (45) a.  $PB_x^C = \{p, q\}$   
 b.  $PB_y^C = \{p, r\}$   
 c.  $PB_{\{x,y\}}^C = PB_x^C \cap PB_y^C = \{p\}$

Note that for a trivial set consisting of a single agent  $x$ , we derive  $PB_{\{x\}}^C = PB_x^C$ , so that the public beliefs of single agents are equivalent to the mutual public beliefs of a set containing only that agent. What this means is that, at a technical level, we can feed a singleton set to the public belief function and get back the same result as if we had fed the single element of that set.

With these definitions in place, the denotation of  $yo$  is given in (46).<sup>5</sup>

$$(46) \quad \llbracket yo \rrbracket = \lambda S. \left\{ \langle C, C' \rangle \mid \langle C, C' \rangle \in S(DP^C) \right\}$$

The denotation in (46) encodes the idea that the attachment of  $yo$  to a forced sentence results in a CCP in which the commitments of *all* discourse participants in the input context are updated in accordance with the complement of  $yo$ . Combining  $yo$  with a sentence headed by DECL produces a CCP in which the public beliefs of both the speaker *and* the addressee in a duolog support the propositional complement of DECL.

The complement of  $yo$  must of course have an open argument of the right kind. In the beginning of the chapter, this argument was taken to be of type  $e$ , and was fed arguments denoting individual discourse agents. To handle the semantics of  $yo$ , we need instead for a forced sentence to accept a set of such discourse agents, and return a relational CCP. This is a trivial adjustment; as noted above,  $PB_{\{x\}}^C = PB_x^C$  quite

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<sup>5</sup>At first glance, it would seem that a simpler denotation would work just as well as the one in (46):  $\llbracket yo \rrbracket = \lambda S. S(DP^C)$ . The problem is that we need to set the context  $C$  in  $DP^C$  to the *input* context. This is not achieved in the above denotation. In fact, we have no way to set the value of  $C$  in  $DP^C$  given this formulation. Hence, the slightly more complicated denotation in (46).

generally, so that the semantics of DECL and  $\downarrow$  can be modified to deal with sets of singleton agents. These modifications are given in (47), along with a compositional denotation of a bare falling declarative  $[\text{DECL } p \downarrow]$ .

$$\begin{aligned}
(47) \quad \llbracket \text{DECL } p \rrbracket &= \lambda \mathbb{A}. \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\mathbb{A}}^{\mathbb{C}'} \right\} \\
\llbracket \downarrow \rrbracket &= \lambda S. \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \langle \mathbb{C}, \mathbb{C}' \rangle \in S(\{\text{s}_c\}) \right\} \\
\llbracket \text{DECL } p \downarrow \rrbracket &= \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\{\text{s}_c\}}^{\mathbb{C}'} \right\} \\
&= \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\text{s}_c}^{\mathbb{C}'} \right\}
\end{aligned}$$

The variable  $\mathbb{A}$  ranges over *sets of* discourse agents; the bare final fall  $\downarrow$  supplies the singleton set containing just the speaker in the input context. By the equivalence described earlier, we end up with exactly the same CCP as we did with the previous definitions.

The result is that  $\downarrow$  and *yo* are of the same semantic type, and are in complementary distribution. For a declarative with propositional content  $p$ , our semantics of DECL,  $\downarrow$ , and *yo* combine to produce the following structures and associated denotations.

$$(48) \quad \left[ \begin{array}{c} \llbracket \text{DECL } p \downarrow \rrbracket \\ \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\text{s}_c}^{\mathbb{C}'} \right\} \\ \swarrow \quad \searrow \\ \lambda \mathbb{A}. \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\mathbb{A}}^{\mathbb{C}'} \right\} \quad \downarrow \\ \swarrow \quad \searrow \\ p \quad \text{DECL} \end{array} \right] \quad \left| \quad \left[ \begin{array}{c} \llbracket \text{DECL } p \text{ yo} \rrbracket \\ \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \forall x \in \text{DP}^c : \llbracket p \rrbracket \in \text{PB}_x^{\mathbb{C}'} \right\} \\ \swarrow \quad \searrow \\ \lambda \mathbb{A}. \left\{ \langle \mathbb{C}, \mathbb{C}' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\mathbb{A}}^{\mathbb{C}'} \right\} \quad \text{yo} \\ \swarrow \quad \searrow \\ p \quad \text{DECL} \end{array} \right]$$

As can be seen,  $\downarrow$  and *yo* occupy the same position, and return a relational CCP denotation. A bare declarative with falling intonation is given a semantics like that for English. The update encoded by the semantics is purely speaker-oriented. Such a declarative is *compatible* with an update to the addressee's public beliefs, but the semantics itself does not *require* such an update. By contrast, a declarative with *yo* requires that the commitments of *all* discourse participants support the propositional

root of the declarative in the output context. Thus, in a dialog, the use of *yo* in a declarative is incompatible with a discourse move in which the speaker is merely registering his own commitments. It is instead an *explicit* attempt at getting the addressee to update his commitments as well. The pragmatic consequences of this explicit attempt at mutual update will be discussed in a bit. But we can see immediately that, *if* there is a contextual addressee, then a *yo*-marked declarative should *not* be possible as a way of merely indicating the speaker's own commitments. The semantics of the particle explicitly involves all discourse participants in the update.

We also see how the use of *yo* in monologs would be infelicitous, or at least highly marked. This gives us a way of understanding the contrast in examples like (42). The infelicity of *yo* in the first context would be due to the fact that, by using *yo*, the speaker is indicating that he expects his utterance to have an impact on the commitments of everyone in the conversation. In case there is an addressee present, this entails a pragmatic interpretation contrary to the one given in the context, in which the speaker is simply registering his own commitments. If, on the other hand, the speaker is alone, and simply speaking out loud, we get potential infelicity for another reason. In the context of such a monolog, the bare declarative with falling intonation is sufficient to commit all discourse participants, which in this case is the singleton set containing just the speaker, to the content of the declarative. Using *yo* is overkill. Such marked moves may in fact have some pragmatic utility, but will be marked in default contexts, and incompatible with unmarked discourse moves, in this case a simple update to the speaker's public beliefs with the propositional content of the declarative.

With the denotation of bare falling declaratives and *yo*-marked declaratives in place, I move on to discuss the pragmatic contrast illustrated in (41). This contrast will be explained in terms of the minimally differing semantics of the two kinds of sentence, in conjunction with a set of pragmatic constraints.

### 2.2.3 Optimal Transitions and (Non-)Monotonic Update

With the semantics of  $[\text{DECL } p \downarrow]$  and  $[\text{DECL } p \textit{yo}]$  in place, I show how the pragmatic contrasts introduced earlier can be derived. The crucial contrast is the one illustrated in (41), repeated in (49). A’s response to B is marked with either  $\downarrow$  or with *yo*. The contrast pointed out by McCready falls out naturally from the semantic contrast derived in (48). At the point where A makes his rebuttal in (49), the context is such that A’s public beliefs support  $p =$  “John just went home”, and B’s public beliefs support  $\neg p$  (assuming for simplicity that this is the update resulting from his utterance of “*uso*” in response to A’s claim). The context is thus *controversial* with respect to whether  $p$  holds.

- (49) A: saki Jon-ga kaetta  
just.now John-NOM went.home  
“John just went home.”
- B: uso!  
lie  
“No way!”
- A: kaetta  $\downarrow/\textit{yo}$   
went.home  $\downarrow/\textit{yo}$   
“He went home ( $\downarrow/\textit{yo}$ ).”

At this point, A makes one of two moves. First, consider a *yo*-marked declarative with propositional content  $p$ ,  $[\text{DECL } p \textit{yo}]$ . The CCP denoted by such an utterance requires that  $p$  be supported by the public beliefs of both the speaker and the addressee in the output context. That is, all output contexts compatible with A’s utterance are ones in which the public beliefs of both A and B support  $p$ . This is tantamount to a demand that B give up his commitment to  $\neg p$ , and replace it with a commitment to  $p$ , assuming a kind of “meta-constraint” on output contexts requiring that public beliefs be consistent. Thus, the use of *yo* in A’s rebuttal to B is understood as an

attempt to get the addressee to accept (publicly) the truth of  $p$ , per McCready’s characterization.

By contrast, the bare declarative with falling intonation [DECL  $p$  ↓] requires only that the public beliefs of A (the speaker) support  $p$  in the output context. While the CCP of this utterance will also include output contexts in which the addressee’s public beliefs have  $\neg p$  removed and  $p$  added, it does not demand this. Among the output contexts compatible with this utterance are ones in which A’s public beliefs support  $p$ , while B’s continue to support  $\neg p$ . The move is thus an inherently weaker one than the utterance with  $yo$ , and can be used to indicate that “A does not care whether or not B accepts the content”, per McCready’s characterization.

The semantics of declaratives with  $yo$  versus ↓ goes a long way in explaining the contrast in (49). However, the relational CCP semantics of a declarative with ↓ is in fact compatible with output contexts in which the public beliefs of B are updated to support  $p$  rather than  $\neg p$ . In order to account for the contrast in (49), we need to explain why the CCP encoded by the bare falling declarative, while in principle compatible with a transition to such a context, is (at least typically or preferentially) interpreted as a mere reiteration of A’s own commitments, with no attempt made at getting B to update his commitments as well.

To derive this fact, I introduce two pragmatic constraints. These constraints encode a plausible premise: Changes to the context are marked, and hence dispreferred, modulo the requirements of an utterance’s CCP, and the action of \*TRIVUP. What kind of changes? Focusing on public beliefs, there are two relevant kinds of change: *addition* of a proposition, and *subtraction* of a proposition. Addition of a proposition to an agent’s public beliefs corresponds to a standard update, while subtraction of a proposition corresponds to a downdate. I propose that two constraints be added to our set of pragmatic constraints, militating against each kind of change.

The formalization of such constraints has precedent in OT and related constraint-based formalisms. The relevant notion is this: any output which *lacks* a feature that was present in the input is penalized. Similarly, any output that *contains* a feature that is *not* contained in the input is penalized. Such constraints are, in OT, referred to as MAX and DEP constraints, respectively (McCarthy and Prince, 1995). The relevant constraints are stated in (50).

(50) MAX<sub>PB</sub>

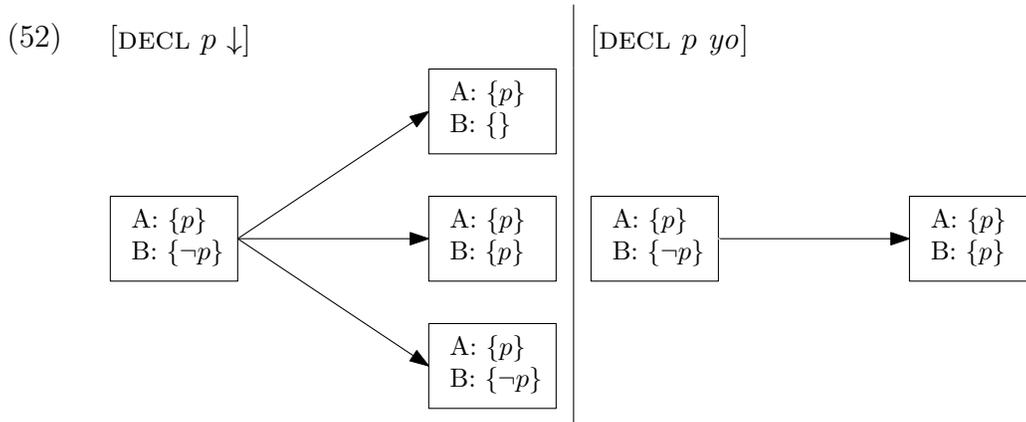
Assign a penalty to any transition  $\langle C, C' \rangle$  for every distinct proposition  $p$  such that there is some agent  $x$  such that  $p \in \text{PB}_x^C$  and  $p \notin \text{PB}_x^{C'}$ .

(51) DEP<sub>PB</sub>

Assign a penalty to any transition  $\langle C, C' \rangle$  for every distinct proposition  $p$  such that there is some agent  $x$  such that  $p \notin \text{PB}_x^C$  and  $p \in \text{PB}_x^{C'}$ .

The MAX<sub>PB</sub> constraint gives a penalty to a transition for every distinct proposition appearing in the public beliefs of some agent in the *input* context of that transition, but *not* appearing in the public beliefs of that agent in the *output* context of the transition. The DEP<sub>PB</sub> constraint goes the other way, penalizing the addition of each distinct proposition to some agent's *output* public beliefs that does not appear in their *input* public beliefs.

For the CCP denoted by A's utterance of [DECL  $p \downarrow$ ] in (49), there are three relevant transitions, as illustrated by the leftmost diagram in (52). Here,  $p$  is the proposition to which A already committed himself with a prior utterance, and to whose negation B has committed himself. The input context for the utterance is thus one in which A is committed to  $p$  and B is committed to  $\neg p$ .



Since the public beliefs of the speaker (A) do not change in any of the transitions, we can focus on the public beliefs of the addressee (B). The three competing transitions can then be written as  $\{\neg p\} \rightarrow \{p\}$  (taking B from a commitment to  $\neg p$  to a commitment to  $p$ ),  $\{\neg p\} \rightarrow \{\}$  (taking B from a commitment to  $\neg p$  to no commitment regarding  $p$  or  $\neg p$ ), and  $\{\neg p\} \rightarrow \{\neg p\}$  (leaving B's commitment to  $\neg p$  unaffected). The first transition violates both  $\text{MAX}_{\text{PB}}$  and  $\text{DEP}_{\text{PB}}$ , the second transition violates  $\text{MAX}_{\text{PB}}$ , and the third violates  $\text{*TRIVUP}$ , a situation illustrated by the tableau in (53). Since the input context is constant across all three transitions, we can use a standard OT tableau, in which the input context appears in the upper left corner, the constraints appear in the first row, candidate output contexts appear in the first column, and stars represent the violations incurred for a given input-output mapping by a given constraint (the output context determined by the row, the constraint imposing the penalty determined by the column).

(53)

	$\{\neg p\}$	$\text{MAX}_{\text{PB}}$	$\text{DEP}_{\text{PB}}$	$\text{*TRIVUP}$	$\mathcal{H}$
	$\{p\}$	*	*		-2
☞	$\{\}$	*			-1
☞	$\{\neg p\}$			*	-1

To determine a winner, we need to have some way of weighting the penalties assigned by each of our three constraints. The null hypothesis is that all three constraints are *equal*. In OT terms, this means that none of the constraints are ranked relative to

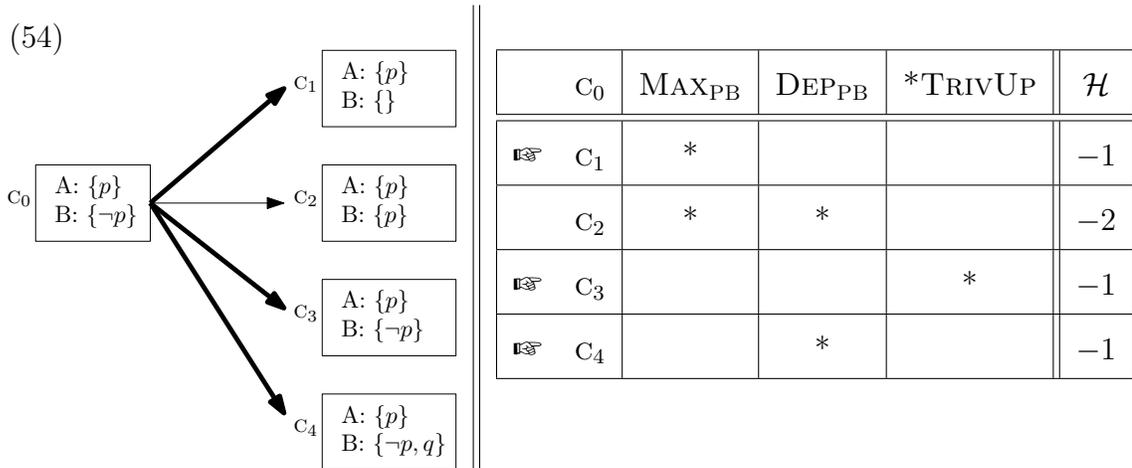
the others. I assume the null hypothesis, and show that it takes us quite a long way in the explanation of the pragmatic data to be considered.

To spell out the null hypothesis formally, I assume that each constraint is associated with a constant weight of 1. A star (representing a constraint violation) is associated with a penalty of  $-1$ . Each candidate transition can then be given a *harmony score* calculated by summing the penalties. In Harmonic Grammar (Legendre et al. 1990a,b, Smolensky and Legendre 2006), the sum of the penalties assigned by a given constraint is multiplied by the weight of that constraint, and a given candidate’s harmony score is determined by the sum of the resulting weighted penalties. Since we are taking the null hypothesis of equal weighting, we can ignore this step (which is equivalent to assuming that the weight of all constraints is 1). The rightmost column in tableau (53) gives the candidate’s harmony score  $\mathcal{H}$ . The set of winning transitions are those with the highest harmony score. Since all harmony scores are negative, this means the winners are the set of transitions with the lowest absolute harmony score.

Winners are indicated with the hand sign ✎. As shown in (53), there are two winners in this subset of transitions. The trivial update is a winner, but so is the (rather strange) update which eliminates  $\neg p$  from B’s public beliefs, but does not replace it with  $p$ . In order to derive McCready’s intuition, we might weight  $\text{MAX}_{\text{PB}}$  higher than  $\text{*TRIVUP}$ , meaning that (at least in this context) the constraint militating against non-monotonic revision to an agent’s public beliefs outranks the constraint militating against trivial updates. That is, a trivial update is apparently preferred to one that violates monotonicity.

Once we expand the candidate set to include output contexts in which other propositions are in play, we start to see that the ties are not necessarily a problem. The “triviality” of the update here is only with respect to the issue of  $p$  or  $\neg p$ . Consider again the pragmatic import of the bare declarative, according to McCready, who says that it indicates that “A does not care whether or not B accepts the proposition”. We

might, in fact, model this as part of a non-trivial update to A’s public commitments. If we set  $q$  to some proposition like “I do not care whether you believe me”, then we have the expanded set of competitors in (54). For convenience, I have labeled each context. Note that  $C_0 = C_3$ . The set of winning transitions are indicated with bold lines; non-optimal transitions are indicated with thinner lines. As can be seen, the candidate in which A’s public beliefs are updated with  $q$  is also a winner, according to our (unranked) pragmatic constraints.



What this discussion shows is that our pragmatic constraints on CCPs give back a large number of winning transitions for the bare falling declarative in this context. One of these transitions is the trivial one. But there are a host of other possibilities, in which one of the other constraints is violated instead. The situation may look unwieldy, but this is probably as it should be. What we end up predicting is that, in any context where the trivial update is optimal, so are a bunch of other updates, in which the agent’s commitments are altered in some way or another. What this in turn indicates is that a “trivial update” may often be used to hint at some other pragmatic move, or to make some other commitment. In other words we have an indeterminate update, in which the speaker might be making a completely trivial move, or one in which he is suggesting some other change to the context instead.

But not every move is pragmatically compatible with the bare falling declarative, and this is where the predictive power of constraint-based reasoning comes in. Al-

though the set of potential winners is large, it is also restrictive. And crucially, update  $\langle C_0, C_2 \rangle$  is *not* in this set. Why? Simple: All the winners here violate *one* constraint each. The constraint particular violated by a given winner may differ, but only one is violated. Transition  $\langle C_0, C_2 \rangle$  violates *two* constraints. This is because we must first do a downgrade of  $\neg p$  (violating  $\text{MAX}_{\text{PB}}$ ) and also an update with  $p$  (violating  $\text{DEP}_{\text{PB}}$ ). We thus predict that the bare declarative *cannot* be used for such a move, in accordance with the intuitions reported by McCready.

Gunlogson notes that her semantics of falling declaratives only makes requirements of the speaker's commitments in the output context. Since she adopts a functional model of CCP meaning, output contexts in which the commitments of the addressee are updated as well are not compatible with the semantics of a falling declarative. This is, as Gunlogson notes, not quite right, since falling declaratives *can* be used for moves in which the speaker wants the addressee to update her commitments as well. In the relational approach advocated here, the output contexts compatible with a bare falling declarative include those in which the addressee's commitments remain unchanged, as well as those in which they are updated with the propositional content of the declarative. I have argued that pragmatic constraints block update of the addressee's public beliefs when such update requires elimination of a prior commitment in order to maintain logical consistency, since this corrective move violates both  $\text{MAX}_{\text{PB}}$  and  $\text{DEP}_{\text{PB}}$ , while the speaker-only update violates only  $\text{DEP}_{\text{PB}}$ .

In neutral contexts, however, the effects of  $\text{MAX}_{\text{PB}}$  are absent. Consider for example an utterance by A of  $[\text{DECL } p \downarrow]$  in a context where A and B have no prior commitments, so that  $\text{PB}_A^c = \text{PB}_B^c = \emptyset$ . In this context, B does not need to remove any prior commitments in order to update her public beliefs with  $p$ . The only constraint in play for the resulting transitions is thus  $\text{DEP}_{\text{PB}}$ . This constraint was defined so that it assigns a penalty for every *unique* proposition that is added to some agent's public beliefs in the output context. This means that, once  $\text{DEP}_{\text{PB}}$  has

been violated by the addition of  $p$  to A's public beliefs (required by the semantics of his utterance), it does *not* incur further violations when  $p$  is added to B's public commitments as well. What this in turn means is that in contexts that do not require non-monotonic revision, a bare falling declarative is pragmatically compatible with an update to *both* the speaker's and the addressee's public beliefs, as well as an update that targets only the speaker's public beliefs. This seems right; a bare falling declarative can normally be used to suggest an update to the common ground, rather than just the speaker's own commitments. It is only when an update to the common ground would require a non-monotonic revision to the addressee's commitments that a bare falling declarative is ruled out.

A *yo*-marked declarative overcomes this limitation of bare falling declaratives. As illustrated by the rightmost diagram in (52), the *yo*-marked declarative is *only* compatible with a non-monotonic update violating both  $\text{MAX}_{\text{PB}}$  and  $\text{DEP}_{\text{PB}}$ . Intuitively, this seems right. When *yo* is used in (49), the speaker cannot be understood as “just repeating himself”; he is understood as actively trying to change the addressee's commitments. We thus see a way in which the use of *yo* has produced an utterance that is more marked than the bare falling declarative. This models an important insight, due to Zeevat (2000):<sup>6</sup>

The particles seem to have the power to make otherwise infelicitous assertions into specialized non-standard assertions that have other goals than standard assertions, like correcting opinions expressed earlier on or reconfirming established opinions.

(Zeevat, 2000, p.75)

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<sup>6</sup>Zeevat is speaking specifically about modal particles in German/Dutch, but his point has broader applicability.

By using *yo* in this context, the speaker has offered a CCP all of whose transitions violate  $\text{MAX}_{\text{PB}}$  and  $\text{DEP}_{\text{PB}}$ . This means that winning transitions will violate at least two constraints, and thus have a harmony score of  $\mathcal{H} = -2$ , by contrast to the winning transitions for the bare falling declarative, which all had  $\mathcal{H} = -1$ . The theory captures Zeevat’s insight in terms of pragmatic markedness, since the *yo*-marked declarative gives us a CCP that, in this context, requires a more marked transition than we get with the bare falling declarative.

In the model developed here, pragmatic particles provide speakers with a means of fine-tuning the set of alternative transitions denoted by their utterance. In this way they (indirectly) guide pragmatic reasoning toward more marked transitions than an utterance without the particle, or with a different particle, would allow, since the particle succeeds in semantically eliminating what would have been pragmatically optimal transitions for the same sentence without the particle. We do not rely on cross-utterance competition, but still capture the fact that sentences with pragmatic particles give us more marked moves than those without particles.

#### 2.2.4 Comparison with McCready (2009)

Before closing this chapter, I consider a competing account of the contrast in (49) due to McCready (2009). This account differs from that presented here in that it relies on an explicitly non-monotonic dynamic meaning component in the denotation of *yo*. To account for examples like (49), McCready (2009) proposes the two-part semantics of *yo* in (55).

- (55)  $\llbracket yo(\varphi) \rrbracket =$
- a. Semantics:  $\sigma \parallel \text{S-ASSERT}(\varphi) \parallel \sigma'$
  - b. Presupposition:  $\mathcal{B}_S IV_H(Q, \varphi) > d_s$

This semantics contains a dynamic component (55a) in which *yo* contributes a specific kind of update semantics, and a presuppositional component (55b) that captures the

intuition that the use of *yo* indicates the relevance of the utterance for the hearer. The dynamic component of *yo*'s meaning involves a “strong assertion” of *yo*'s propositional complement  $\varphi$ , S-ASSERT( $\varphi$ ), defined in (56).

$$(56) \quad \sigma \parallel \text{S-ASSERT}(\varphi) \parallel \sigma' =$$

- a.  $\sigma \parallel \varphi \parallel \sigma'$  if  $\sigma \parallel \varphi \neq \emptyset$
- b.  $\sigma \parallel \downarrow \neg\varphi ; \varphi \parallel \sigma'$  otherwise.

S-ASSERT( $\varphi$ ) is an instruction to the interpreter to update its information state  $\sigma$  with  $\varphi$  if the post-update information state  $\sigma'$  is consistent. If the state resulting from an update to  $\sigma$  with  $\varphi$  would cause an inconsistent information state, then the interpreter is instructed to first *downdate* with the negation of  $\varphi$  (written  $\downarrow \neg\varphi$ ), then update with  $\varphi$ . In simple cases, the downdate corresponds to set subtraction, so that the post-downdate information state is  $\sigma - \{\neg\varphi\}$ . In cases where the removed proposition is entailed by other propositions in the information state, or is itself an important premise, more extensive and often non-deterministic revisions are required. McCready argues that the S-ASSERT component of *yo*'s meaning is responsible for the sense of strength or insistence that *yo* contributes to an utterance.

The presuppositional component of McCready's semantics for *yo* is intended to capture the intuition that *yo* marks assertions whose propositional content is taken by the speaker to be relevant to the hearer. The formula in (55b) says that it is a presupposition of *yo*( $\varphi$ ) that the speaker believes ( $\mathcal{B}_S$ ) that the information value for the hearer of  $\varphi$  with respect to some contextual question  $Q$ ,  $IV_H(Q, \varphi)$ , is above some contextual relevance threshold  $d_s$ . This formulation of relevance builds on proposals of van Rooy (2003a,b) in which the relevance of a proposition  $\varphi$  is associated with  $\varphi$ 's informativity for the interpreter with respect to a contextually specified question  $Q$ , which is understood as a partition on the set of worlds and can be identified with the *Question Under Discussion* (QUD, Roberts 1996, 2004). At an intuitive level, the

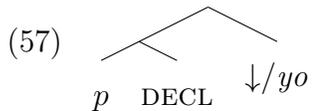
informativity metric in (55b) measures the extent to which the proposition  $\varphi$  helps to reduce the hearer’s uncertainty with respect to the question  $Q$ . More technically, the measure considers the entropy, an information theoretic measure of uncertainty, of the hearer’s information state with respect to  $Q$  before and after update with  $\varphi$ . This difference is the informativity value for the hearer of  $\varphi$  with respect to  $Q$ . The presupposition in (55b) requires that this value be above some contextual threshold.

I put the relevance-theoretic component of McCready’s analysis aside for the moment, since I take it to be associated with rising intonation, as discussed in §3.2. This leaves the “strong-assertion” component of the semantics. This component is intended to model dialogs like that in (49). The account works for examples like this because the addressee is contextually committed to the negation of the propositional content of the *yo*-marked utterance. Essentially, what the proposal predicts is that if a speaker wants to assert a proposition  $p$  when the addressee is committed to  $\neg p$ , then *yo* can “save” the update by first demanding that  $\neg p$  be subtracted from the addressee’s information state.

It is difficult to distinguish McCready’s account from the one presented here on empirical grounds, at least based on the data seen thus far. The present theory, however, accomplishes the distinction in (non-)monotonicity between bare falling declaratives and *yo*-marked declaratives without having to write a disjunctive condition into the semantics of *yo*, and is thus arguably a theoretically simpler account of the data. Moreover, McCready’s analysis is explicitly designed to handle *assertions*; there is an assertion operator written into the very semantics of *yo*. It is thus not clear how the account should be extended to non-assertive speech acts, or to non-declarative clause types. The present analysis of *yo*, however, is not in principle restricted to any particular clause type or speech act. In §4 the analysis will be extended to imperatives, and in §5 it will be extended to interrogatives. The present account thus offers broader empirical coverage than the account of McCready.

## 2.3 Summary

In this chapter, I have made the case for a treatment of *yo* according to which the particle (as distinct from its intonational associates) contributes a meaning that, like English sentence-final intonational morphemes according to Gunlogson, takes us from an “open” CCP meaning that is unspecified for whose commitments are to be updated to a “resolved” CCP meaning in which the commitments of *all* the discourse participants are updated. The semantics was built on a three-part calculation of CCP semantics; a propositional radical is combined with a declarative force head DECL, which is then combined with either a final fall  $\downarrow$  or with *yo*, as illustrated in (57).



I have shown that, when combined with some simple pragmatic constraints, the resulting semantics derives two pragmatic facts characterizing the use of declaratives with  $\downarrow$  and with *yo*:

1. The use of a bare falling declarative with propositional content  $p$  is not optimal as an attempt to get the addressee to accept  $p$  when the addressee has a prior commitment to  $\neg p$ .
2. The use of *yo*-marked declarative with propositional content  $p$  is pragmatically felicitous as an attempt to get the addressee to drop a commitment to  $\neg p$  and replace it with a commitment to  $p$ . It cannot be used to just repeat the speaker’s own commitment.

These two facts fell out naturally from the differing CCP semantics of the two types of declarative in conjunction with constraint-based pragmatic reasoning.

The discussion so far has led to a two-part calculation of the update associated with an utterance in a context. The utterance itself is taken to denote a CCP. This offers a conventional means for narrowing down the set of possible updates compatible

with the speaker's intended discourse move. We further narrow down the choice by making use of pragmatic input-output constraints on transitions. This allows us to find an optimal transition for a given CCP, or if not a unique optimal transition, then a set of such transitions. This two-part calculation of optimal transitions will form the core means by which CCP denotations are used to make predictions about pragmatics.

There are subtle differences between falling and rising *yo* on top of the contrast discussed in this chapter, and it seems correct that *yo* with a final fall is a more direct way of demanding a revision to the addressee's beliefs, a fact that can be attributed to the falling intonational morpheme  $\Downarrow$ , as argued in the next chapter. But since *yo* with *either* final intonational contour is more natural than a bare fall in such a context, we need an account that does not depend exclusively on falling intonation for the contrast. And since *yo* with a final rise can be used for moves that do *not* require a non-monotonic revision, it seems that we should not build non-monotonicity into the semantics of *yo* itself. In this chapter, I have shown how a minimal semantics of *yo* is able to achieve the effect of non-monotonic update, in contrast to the same sentence with a final fall  $\Downarrow$ . The effects of the intonational particles that combine with *yo* are taken up in the next chapter.

## CHAPTER 3

### CORRECTION, ACTION, AND INTONATION

In the previous chapter, I outlined a minimal theory of the semantics of *yo*, according to which it gives rise to an update targeting the commitments of both the speaker and addressee simultaneously. In this chapter, I consider the effects that the sentence-final intonational associates of *yo* have on the resulting CCP denotation. At the very least, one can identify distinct rising and falling intonational patterns with which *yo* can occur (Shirakawa, 1993; Koyama, 1997; Matsuoka, 2003). I adopt this binary distinction, and use  $yo\uparrow$  to designate *yo* with rising intonation, and  $yo\downarrow$  to designate *yo* with falling intonation.

#### 3.1 Overview

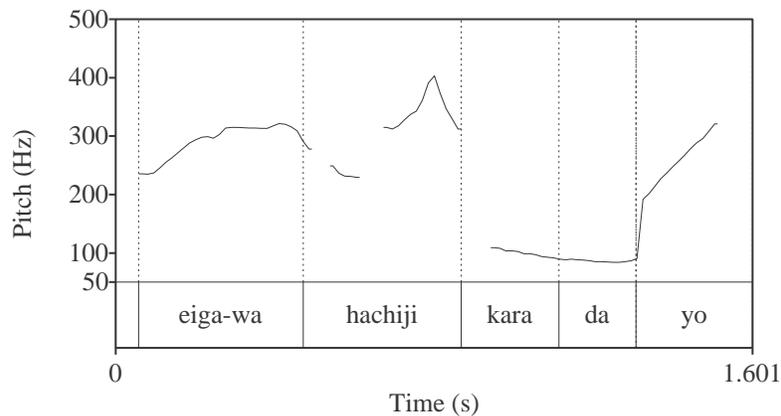
Koyama (1997) argues that the meaning of *yo* (and other sentence final particles in Japanese) should be distinguished from the meaning attributable to the intonational contour with which it occurs. I adopt this decompositional analysis, arguing that  $yo\uparrow$  and  $yo\downarrow$  are morphologically complex, consisting of the morpheme *yo* and one of two other morphemes represented as  $\uparrow$  and  $\downarrow$ , reflecting their phonological manifestation on the intonational tier. The semantic decomposition stems from that of Davis (2009), but the details of the analysis differ from that work. Both works argue that  $\downarrow$  contributes non-monotonicity to the resulting update. But whereas in Davis (2009) I assigned no semantic contribution to the final rise with *yo*, here I argue that it is responsible for the guide to action which, in that earlier work, was attributed to *yo* itself.

Koyama (1997) says (p.105) that rising *yo* exhibits the “most typical” of the meanings associated with *yo*, including “notification, information-transmission, and attention-calling”.<sup>1</sup> On the other hand, Koyama argues, falling *yo* gives to an utterance a sense that there is some kind of conflict or incompatibility in the speaker’s and addressee’s understanding.<sup>2</sup> I introduced this intonational distinction with the example in (9), repeated once more in (58) and (59).

(58) **Guide to Action Context**

A: eiga-o miru mae-ni gohan-o tabe-you ka  
 movie-ACC watch before food-ACC eat-HORT Q  
 “Shall we eat before watching the movie?”

B: mou shichi-ji sugi deshou? eiga-wa hachi-ji kara da #(yo↑)  
 already 7-o’clock past right movie-TOP 8-o’clock from be #(yo↑)  
 “It’s already past 7, right? The movie starts at 8 *yo*↑.”



The use in (58) is what I described earlier as a *guide to action*. The addressee A has indicated that he is trying to decide whether to eat dinner before going to the movies.

<sup>1</sup>The original Japanese is “*kono taipu ga yo no youhou no naka de mottomo tenkeiteki de aru to omoware, iwayuru kokuchi, jouchoudentatsu, yobikake nado ni bunrui sareru.*”

<sup>2</sup>The original Japanese is “*kouchou no intoneeshon o tomonau baai ni wa, hanashite to kikite no ninshiki no sa ga kyouchou sareru dake de naku, mushiro sore ga kuichigatteiru koto ga shimesareru.*”

The speaker B makes it clear that there is not enough time for dinner, and implies that they should just head straight to the movies. The associated pitch track shows a clear final rise in the *yo*-marked sentence in this context, which I attribute to the particle  $\uparrow$ . As indicated in the gloss, the bare falling declarative without *yo* is felt by informants to be infelicitous for this use.

The same sentence, when used in what I label the *corrective context* in (59), is now naturally used with a distinct final fall, as seen in the associated pitch track, produced by the same speaker as in the previous example. Here too the bare falling declarative is felt to be less felicitous than the declarative with *yo*↓, a fact that was derived in the last chapter.

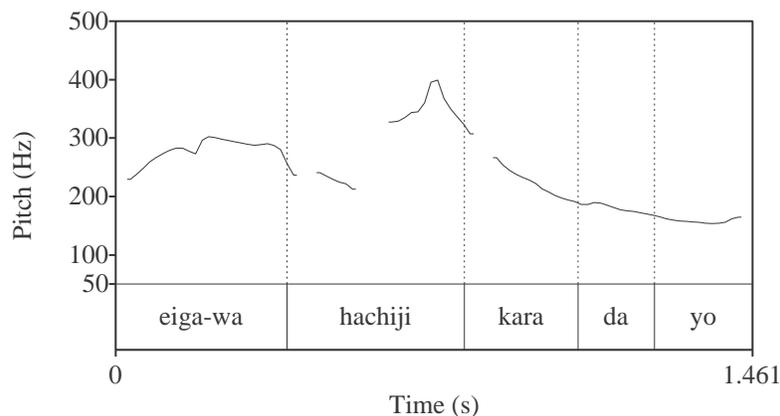
(59) **Corrective Context**

A: eiga-wa kuji kara dakara gohan-o taberu jikan-wa  
 movie-TOP 9.o'clock from because food-ACC eat time-TOP  
 juubunni aru ne  
 sufficiently be PRT

“Since the movie starts at 9, there’s plenty of time to eat.”

B: chigau *yo*↓. eiga-wa hachi-ji kara da #(*yo*↓)  
 wrong *yo*↓. movie-TOP 8-o'clock from be #(*yo*↓)

“That’s wrong *yo*↓. The movie starts at 8 *yo*↓.”



These contrasts form the basis for my claim that *yo* can be associated with one of two intonational morphemes,  $\Downarrow$  and  $\Uparrow$ . From this point on, I will represent uses of *yo* along with these morphemes, as I have done in both (58) and (59). On the basis of examples like these, I propose that there are two main uses to which *yo* is put in declaratives, and that these uses are correlated with intonation:

1. Used as a *guide to action* for the addressee, to *introduce an issue* and suggest an *optimal action* (correlates with rising intonation).
2. Used to *correct* the addressee, to get the addressee to *get rid of a prior commitment* (correlates with falling intonation).

The association between these classes and sentence-final intonation is, I will argue, a conventional one. Rising intonation in such examples is the phonological realization of an independent morpheme  $\Uparrow$  that combines with *yo* to give the guide-to-action interpretation in the first class of uses. The semantics of  $\Uparrow$  is discussed in §3.2, where I argue that it is used to indicate an “issue-settling” move, by which the speaker is advocating some action to the addressee. The semantics of  $\Downarrow$  is taken up in §3.3, where I argued that it contributes an explicit call for non-monotonic correction of an agent’s public commitments. Quantitative corpus evidence in favor of the resulting analyses of *yo* $\Uparrow$  and *yo* $\Downarrow$  is presented in §3.4.

### 3.2 $\Uparrow$ : A Guide to Action

My account of *yo* $\Uparrow$  builds on the analysis of *yo* itself proposed in Davis (2009, 2010). The basic idea is that an utterance marked with *yo* $\Uparrow$  indicates that, in the post-update context, a contextually salient issue is resolved for the addressee. I begin this section by looking at data showing that, in declaratives whose utterance is intended to help the addressee make some decision or take some action, there is a felicity contrast between bare falling declaratives and declaratives with *yo* $\Uparrow$ . I then

propose a denotation for  $\uparrow$  that captures these facts by employing the notion of a contextually salient *decision problem*.

### 3.2.1 Relevance Marking

Grice (1975) gives the following dialog, whose interpretation relies crucially on the Maxim of Relation (i.e. *Be Relevant!*):

(60) A is standing by an obviously immobilized car and is approached by B.

A: I am out of petrol.

B: There is a garage around the corner.

Grice notes that B's assertion gives rise to a number of implicatures, such as that the garage is (at least possibly) open, sells petrol, and so on. But he also notes that observation of the Maxim of Relation requires an unstated connection between A's and B's contributions:

In this example, . . . the unstated connection between B's remark and A's remark is so obvious that, even if one interprets the supermaxim of Manner, "Be perspicuous," as applying not only to the expression of what is said but to the connection of what is said to adjacent remarks, there seems to be no case for regarding that supermaxim as infringed in this example.

(Grice, 1975)

The obvious connection linking B's remark to A's remark (given the nonlinguistic context) is simply that B's assertion is made in order to help A get some gas into his car. While the connection is not direct, Grice argues that it is so obvious as to not constitute a violation of any of the maxims.

Replicating this dialog in Japanese brings the obviousness of the connection between B's assertion and A's problem into doubt. The sentence in (61) is made by B in response to A's situation:

- (61) kono miti-o zutto itta tokoro ni gasorinsutando-ga ari-masu #(yo↑)  
 this road-ACC straight went place at gas.station-NOM be-HON #(yo↑)  
 “There’s a gas station straight down the road yo↑.”

The plain falling declarative without *yo↑* in this context is felt by informants to be rather less natural than the version with *yo↑*. Native speakers report that if B uses the bare declarative without *yo↑*, it sounds as if B is simply stating a fact, with no connection to A’s problem, and with no implication that this information will help A to resolve his problem (by getting gas at the station). The infelicity disappears if B’s utterance ends with *yo↑*.

This pattern is quite robust, and can be seen in the following examples as well. These examples form the core of Davis’s (2009) analysis of *yo*. But each example in fact seems to require *yo↑* for felicity, suggesting that we are seeing the effects of *yo* in conjunction with the intonational morpheme ↑. In each case, the context is such that the hearer faces some kind of dilemma, and B’s assertion is meant to provide information that will guide A in making a decision. I recorded a male native speaker consultant reading these examples with the contexts provided. The pitch tracks from these recordings are provided along with the examples. These pitch tracks show a clear final rise associated with *yo*. In each case, B’s assertion is infelicitous as a bare falling declarative, but becomes completely natural with the addition of *yo↑*. Subsequent discussion with this informant and others confirmed the intuition that the examples are degraded without the final rise on *yo*, suggesting that it is *yo↑*, not *yo* or *yo↓*, that makes these sentences felicitously used as a guide to action.

In (62), A has indicated that he is trying to decide whether he should eat before going to the movies, or whether he should just go straight to the movies. B responds by saying that it is already seven, and that the movie starts at eight. The implication here is that there is not enough time to eat before going to the movies, and that A should therefore go straight to the movies without eating.

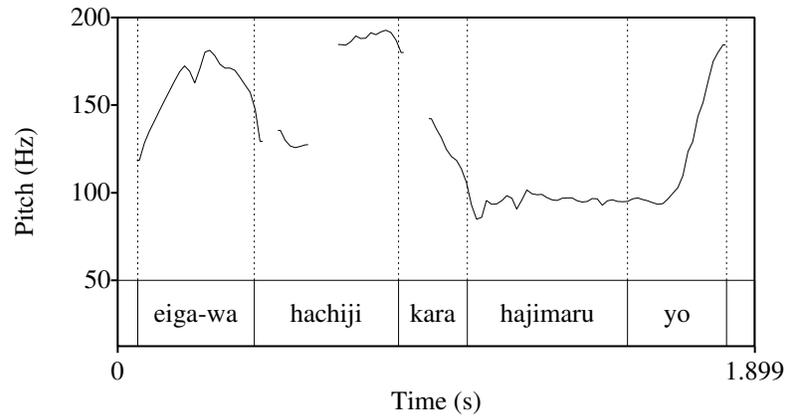
(62) A: *tabe-tekara eiga-o mi ni ik-ou ka na*  
 eat-after movie-ACC see to go-HORT Q PRT  
 “I wonder if I should eat before going to the movie?”

B: *mou shichi-ji sugi deshou? eiga-wa hachi-ji kara hajimaru*  
 already 7-o'clock past right movie-TOP 8-o'clock from start

#(*yo*↑)

#(*yo*↑)

“It’s already 7, right? The movie starts at 8 *yo*↑.”



By using *yo*↑ with the second sentence, the speaker indicates that this fact, in conjunction with the previous one, is sufficient to rule out the possibility that the speaker goes to eat before going to the movie. The sentence is infelicitous with either a bare final fall ↓ or with *yo*↓.

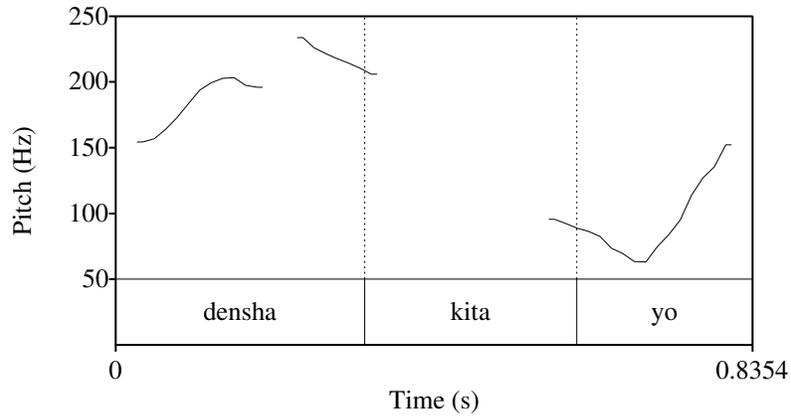
A similar generalization is found with declaratives that are used to suggest a course of action in contexts where the addressee is unaware of any issue. The following examples all require *yo*↑ for felicity:

- (63) Context: The addressee is waiting for a train, and wants to get on, but doesn't notice that it has arrived. The speaker knows this, and says:

densha kita #(*yo*↑)

train came #(*yo*↑)

“The train is here *yo*↑.”

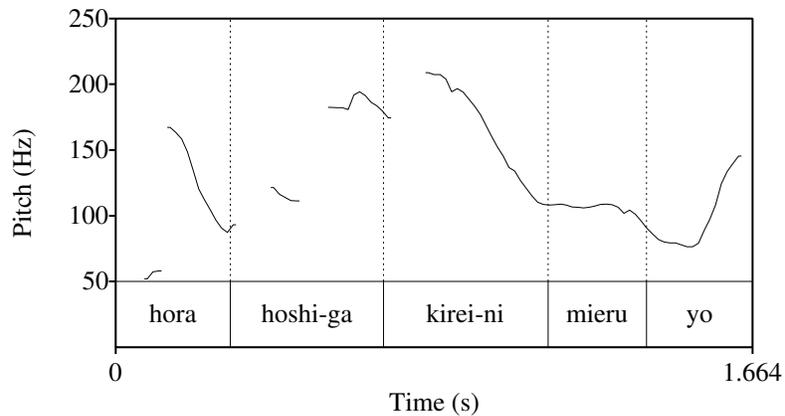


- (64) Context: The stars are especially pretty this night, and the speaker wants the addressee to look at them.

B: hora hosi-ga kireini mi-eru #(*yo*↑)

look star-NOM clearly see-can #(*yo*↑)

“Look, you can really see the stars tonight *yo*↑.”

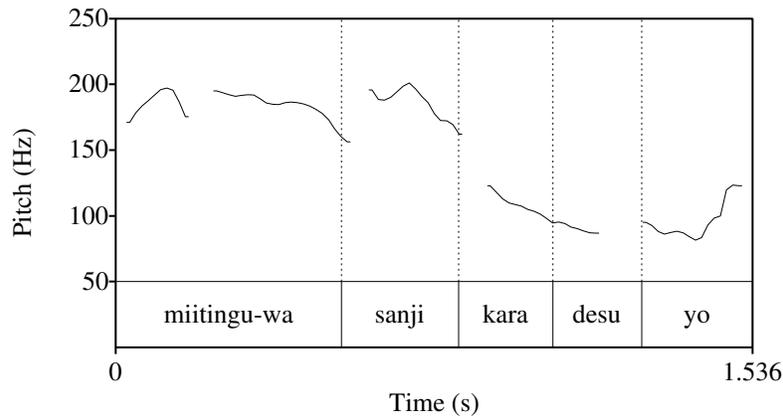


- (65) Context: The speaker knows that the addressee must attend a meeting, but even though the meeting time is fast approaching, the addressee is not getting ready to go. The speaker says:

miitingu-wa san-ji kara desu #(yo↑)

meeting-TOP 3-o'clock from be.HON #(yo↑)

“The meeting starts at 3 yo↑.”

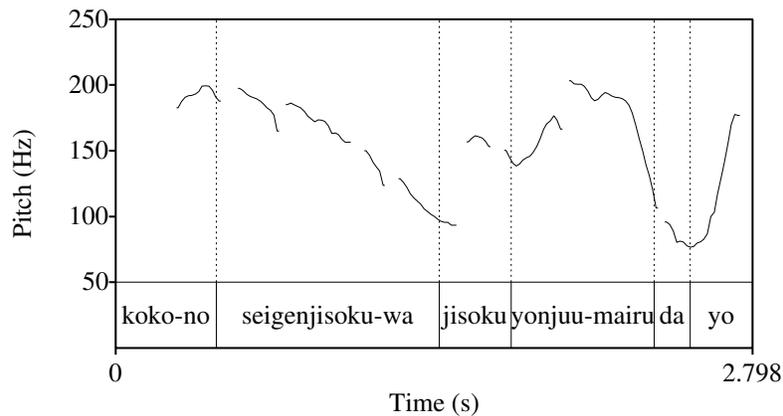


In each of these examples, the assertion is not made primarily in order to transmit the information encoded by the declarative radical to the hearer. Rather, the purpose is to guide the hearer’s action. In (63), the speaker knows that the hearer wants to get on the train when it comes, and expects that the information that the train has arrived will be sufficient to cause the addressee to stop what she is doing and get on the train. Similarly, in (64), the speaker wants the addressee to look at the stars, and assumes that the addressee will want to look at them if she knows that they can be seen clearly. Finally, in (65) the speaker knows that the addressee plans to go to the meeting, and that the information that the meeting is starting soon will be sufficient to cause the hearer to stop what she is doing and go. Unlike (62), the addressee in these examples is not aware of any issue at the time when the speaker makes his utterances. By making the utterance, the speaker is simultaneously *introducing* a previously unacknowledged issue, and *suggesting* a particular resolution of the issue.

The examples in (63) and (64) are ones in which the addressee’s expected reaction to the information conveyed was based on the speaker’s assumptions regarding the addressee’s desires. But the example in (65) shows that this expectation can also be based on the speaker’s assumptions regarding the addressee’s obligations, in this case her obligation to attend the meeting. The example in (66) shows *yo*↑ used in a situation where the speaker is guiding the hearer’s action on the basis of the law.

- (66) Context: The addressee is driving at a speed of 55 miles per hour. The speaker says the following with the intention of getting the hearer to lower her speed.

koko-no seigenjisoku-wa jisoku yonjuu-mairu da #(*yo*↑)  
 here-GEN speed.limit-TOP speed 40-mile be #(*yo*↑)  
 “The speed limit here is 40 miles per hour *yo*↑.”



The above examples show that bare falling declaratives are not generally felicitous in cases where the utterance is intended to guide the addressee’s action. The utterances are made felicitous by the addition of *yo*↑, which seems to make the relevance relation between the information asserted and the consequences for the addressee’s optimal action more explicit. The examples are not improved with the use of *yo*↓, suggesting that it is ↑ that is responsible for marking these declaratives as a guide to action.

Examples like these, in which a declarative marked with *yo*↑ serves to suggest some particular course of action to the addressee, exemplify the first of three classes

into which Izuhara (2003) sorts the use of *yo*. She characterizes the first of these classes as in (67), followed by some of the examples she provides as exemplifying the class. Each *yo*-marked declarative in the set of examples is accompanied by a parenthetical comment which Izuhara provides to give a flavor for the sort of action the sentence is used to urge the addressee toward (examples from the original, gloss and translation are mine; emphasis added).

(67) [Used with sentences that] strongly appeal to the listener’s awareness, and urge them toward some course of action.<sup>3</sup>

- a. nanika ochimashita *yo*. (hirotte kudasai.)  
something fell *yo* (pick.up please)  
“Something fell *yo*. (You should pick it up)”
- b. gohan desu *yo*. (hayaku ki-nasai)  
rice be *yo* (quickly come-IMP)  
“Dinner’s ready *yo*. (Come eat)”
- c. mou ku-ji desu *yo*. (hayaku iki-nasai / ne-nasai)  
already 9-o’clock be *yo* (quickly go-IMP / sleep-IMP)  
“It’s already nine *yo*. (Get going already / Go to sleep)”
- d. denwa desu *yo*. (isoide)  
phone be *yo* (hurry)  
“You’ve got a phone call. (Hurry up and answer it)”

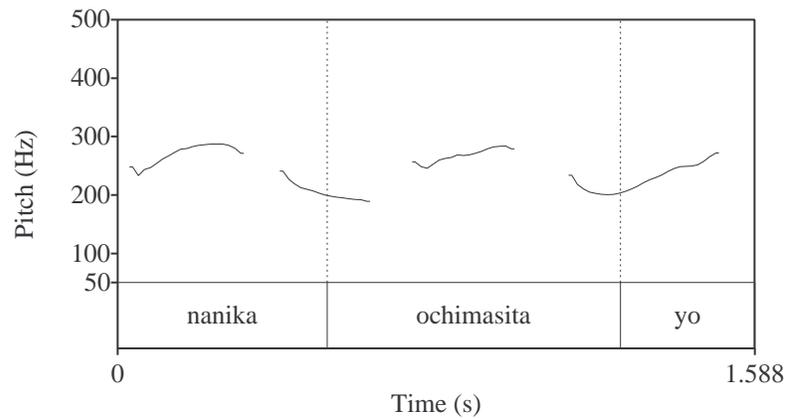
Each of the (constructed) examples in (67) provide a piece of information for the addressee. The intuition tapped by Izuhara is that by using *yo* in these sentences, the speaker is indicating that there is some action that the addressee should take in response to this information. These sentences thus illustrate the use of *yo* as a *guide*

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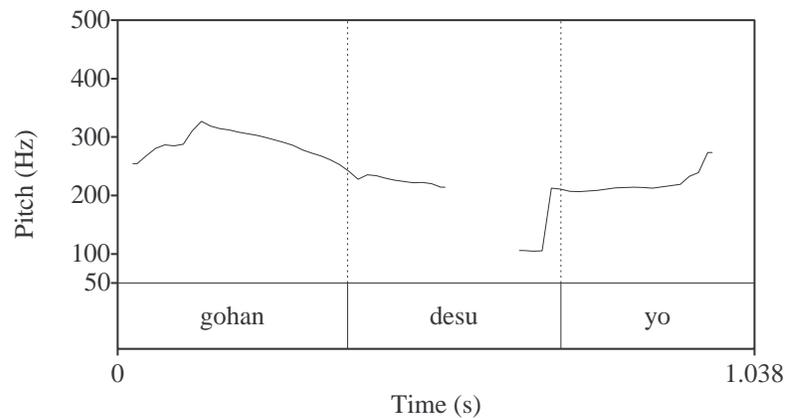
<sup>3</sup>The original Japanese is: *kikite no ninsiki ni tuyoku hatarakikake, nanraka no koudou wo unagasu mono.*

*to action*. For all the examples above, native speaker intuitions suggest that a rising intonation with *yo* is most natural, at least when the parenthesized inferences are present. To check this intuition, I asked a female native speaker (the same informant who provided the productions in (58) and (59)) to produce these sentences in the contexts provided by Izuhara. The pitch tracks in (68) show a noticeable final rise.

(68) a. “Something fell *yo*. (You should pick it up)” (67a)



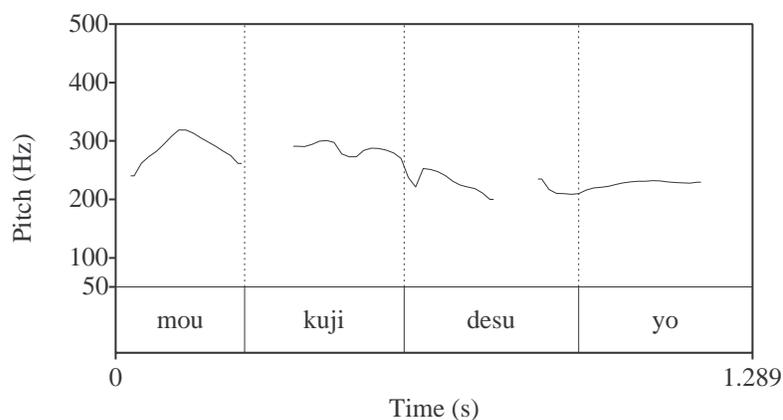
b. “Dinner’s ready *yo*. (Come eat)” (67b)



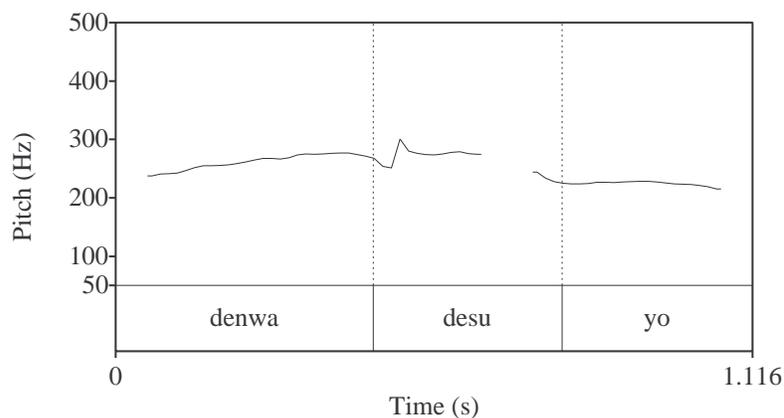
These productions exhibit a slight but noticeable final rise, but it is less dramatic than we saw in (58). These recordings were from the same speaker, and were made in the same session. I have kept the pitch range the same in all diagrams, so that the differences in the contours are easily seen. The effect of  $\uparrow$  is less evident in

the  $f_0$  contours of this speaker’s production of the other two examples in (67). The sentence-final intonation for these is fairly flat; we might say that they exhibit not a final rise, but a lack of a distinct final fall. Despite the lack of a distinct  $f_0$  rise, native speaker intuitions, including those of the informant who produced these sentences, still suggest that these examples are classed perceptually with other cases of final “rise”, despite the flat phonetic profiles.

(69) a. “It’s already nine *yo*. (Get going already / Go to sleep)” (67c)



b. “You’ve got a phone call. (Hurry up and answer it)” (67d)



My informants report an intuition that among those contours that I have labeled “rising” and associated with  $yo\uparrow$ , there may be two subclasses. Examples like (58), (63), (64), (65), and (66) exhibit a distinct fall-rise pattern, whereas the examples in

(67) have a much flatter profile. This difference may reflect the distinction made by Koyama (1997), who claims that final rises with *yo* can be divided into a simple rise or a distinct falling-rising contour intonation. Both rising profiles are distinguished from the one in (59), in which there is over a 200Hz decline from lexically accented peak on *hachiji* “eight o’clock” to the end of *yo*. Given their semantic and perceptual opposition to clear cases of falling *yo*, I group the two kinds of final rise together under *yo*↑. I will return to possible differences in the final rise in §3.3.4). Whatever other differences they may exhibit, these sentences all illustrate the use of *yo*↑ as a *guide to action*, helping the addressee resolve some contextual *issue*.

### 3.2.2 Contextual Issues

On the basis of examples like those adduced above, I propose that ↑ indicates the *optimality* for the addressee of some contextually salient action in the post-update context, thus resolving some contextually salient *issue* for the addressee. The idea that dialog is driven by issues is nothing new. There are interesting questions, however, concerning the proper formalization of this notion. Probably the most familiar construct in use by formal semanticists for modeling this aspect of dialog is the *Question Under Discussion* (QUD), a notion developed independently by Roberts (1996, 2004) and Ginzburg (1996). The QUD is responsible for shaping the flow of discourse, providing a (set of) background issue(s) whose resolution is the entire purpose of the dialog. The QUD thus serves as a discourse-regulator, and is the formal counterpart of the discourse issue(s) which each utterance is assumed to address.

The QUD gives us a way to partition the set of worlds consistent with the common ground (or alternatively, the public beliefs of an individual agent) on the basis of some salient issue. This partition can then be used to guide the interpretation of utterances made in the discourse. This model reflects a view of discourse as fundamentally a game of raising and settling questions about how the world is. But surely this is

only part of the story. Many, if not most, discourses are fundamentally about *what to do*, rather than *what is true*. And in many cases, questions as to what is true are motivated by a background concern about what to do. A discussion about the existence or otherwise of weapons of mass destruction in the hands of a belligerent regime is motivated not by philosophical curiosity but by a need to decide a course of action. Insofar as this information is important in determining action, it becomes a question worth discussing.

The same holds for discussions with more mundane consequences. If I ask, for example, whether or not the local Chinese restaurant serves beer, I might be understood as raising a sub-question intended to answer a larger question, namely, which restaurants serve beer. But in most contexts of utterance, I am not interested solely in the answer to these questions. Rather, I am likely to be interested in deciding where to go out and eat. If beer-drinking is a significant constraint on my decision (Chinese food really requires beer for its full enjoyment), then the above question is naturally understood as an attempt to get information to answer a factual question which, in turn, helps me to decide what to do.

The primacy of decisions in motivating information questions is put forth in the first sentences of van Rooy (2003b):

Why do we ask questions? Because we want to have some information.  
But why this particular kind of information? Because only information of this particular kind is helpful to resolve the *decision problem* that the agent faces.

On the basis of such considerations, van Rooy argues for a decision-theoretic model in which a background *decision problem* is the crucial object driving question interpretation. The essential object that a decision problem relies on is a set of relevant actions from which the agent must choose. This set of actions will vary from context to context. In standard decision theory, these actions are taken as primitives of

the model, so that a decision problem makes reference both to possible states of the world, and to possible actions that may be taken in the world. Which action is best in a given world? This is determined by the use of a *utility function*, which serves to order world–action pairs for an agent. This ordering is interpreted as encoding the agent’s preferences. A rational agent can use these objects (beliefs about the world, set of possible actions, and ranking of world–action pairs) to calculate a choice from among the alternative actions that maximizes his utility.

I do not adopt all of the decision-theoretic apparatus (world-action pairs, utility functions, etc.) used by van Rooy, just the notion that a context  $C$  has a salient set of possible actions for each agent  $x$ , an agent-relativized *Action Set*  $\mathcal{A}_x^C$ , from which that agent must choose. The action set is like an agent-related version of the QUD. Both questions under discussion and action sets are ways of representing contextual *issues*. The QUD is used to model discourses guided by the issue “what is the world like?”. The action set is used to model discourses guided by the question “what should I/you/we do?”.

The data considered earlier will be accounted for in terms of the resulting contextual model by requiring that output contexts in the CCP denoted by a  $yo\uparrow$ -marked sentence make one of the alternative actions in the addressee’s action set optimal. The calculation of optimality will depend on a context-sensitive ordering of worlds. This ordering might encode the addressee’s own preferences, and hence mirror the utility function of decision theory. But the examples we saw earlier have already provided evidence that the relevant notion of optimality is more flexible than this, and in a given context can be relativized to legal obligations, the speaker’s interests, or any other contextually salient ordering. This fact will be reflected in the semantics of  $\uparrow$ , to which I now turn.

### 3.2.3 Semantics of $\uparrow$

I have shown that the use of  $yo\uparrow$  in an utterance points to the existence and potential resolution of some decision problem for the addressee in the post-utterance context. I will spell this out in terms of the agent-specific sets of alternative actions discussed above. Formally, this means that I will introduce a new agent-specific contextual object into our model of contexts. This object is a repository of the contextually salient actions from which our agent must make a choice. This is represented as  $\mathcal{A}_x^c = \{a_1, \dots, a_n\}$ . I model each  $a_i \in \mathcal{A}_x^c$  as a *property* representing one of the alternative actions under consideration by  $x$  in  $C$ .

With the minimal addition of agent-specific alternative actions to the model of discourse contexts, I am now in a position to model the contribution of  $\uparrow$  formally. The notion of *optimality* will be captured by the derivative notion of an *optimal set*. Intuitively, this is a set of worlds that combines an agent’s public beliefs, which provides us with a set of possible worlds compatible with what is believed, with an ordering over that set, which provides us with a representation of which worlds are optimal. The resulting set models the optimal worlds for an agent among those compatible with his beliefs.

The calculation of optimality, I argue, is made relative to the contextual *ordering source* (Kratzer, 1981, 1991), understood to be a set of propositions, such as the set of laws (deontic ordering source), desires (bouletic ordering source), or the like. This set of propositions imposes a partial order on the set of worlds compatible with the common ground or, in my own model, with a given agent’s public beliefs. I adopt the ordering relation in (70), slightly modified from Portner (2007a):<sup>4</sup>

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<sup>4</sup>This ordering is in Portner’s paper relativized to the properties in an agent’s To-Do List. Note that according to (70),  $w_i <_x^c w_j$  means that  $w_i$  is more optimal than  $w_j$  according to  $x$ ’s preferences. In Portner’s original definition, the inequality works the other way. I should note that the partial ordering defined in (70) handles the cases of inconsistent premise sets discussed by Kratzer (1977), and can thus plausibly be used as a general way of ordering the modal base with respect to an ordering source for the purposes of modal interpretation.

(70) **Partial Ordering of Worlds** (modified from Portner 2007a):

For all worlds  $w_i, w_j \in \cap \text{PB}_x^c$ ,  $w_i <_x^c w_j$  iff

$\exists p \in \text{OS}(c) [p(w_i) \ \& \ \neg p(w_j) \ \& \ \forall q \in \text{OS}(c) [q(w_j) \rightarrow q(w_i)]]$

where  $\text{OS}(c)$  is the *ordering source* in  $c$  (Kratzer, 1981).

The ordering  $<_x^c$  defined in (70) ranks all worlds compatible with  $x$ 's public beliefs in accordance with the set of propositions returned by the ordering source for context  $c$ . The ordering source is a notion that has been used to model the contextual dependency of the interpretation of modals, among other things.<sup>5</sup> The basic idea is that, in a given context, we might be concerned with different sorts of requirements: those arising from the law, those arising from a moral code, those arising from an individual's preferences, etc. Portner argues, on the basis of data revolving around deontic modals and imperatives, for a tight contextual connection between the contextual ordering source (relevant to the interpretation of such modals) and an agent's contextual to-do list (analogous to the public intentions to be introduced in §4). Portner posits a general "rationality" metric, according to which an agent is rational to the extent he attempts to realize worlds that are optimal, according to his own to-do list. This requirement can be stated as in (71).<sup>6</sup>

(71) **Agent Commitment** (modified slightly from Portner 2007a):

For any participant  $x$  in a context  $c$ , the participants in the conversation mutually agree to deem  $x$ 's actions rational and cooperative to the extent that those actions in any world  $w_i \in \cap \text{PB}_x^c$  tend to make it more likely that there is no  $w_j \in \cap \text{PB}_x^c$  such that  $w_j <_x^c w_i$ , where  $\text{OS}(c) =$  the to-do list of  $x$  in  $c$ .

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<sup>5</sup>See Chapter 5 of Kai von Stechow and Irene Heim's lecture notes on Intensional Semantics (von Stechow and Heim, 2010) for a gentle introduction to the key ideas and uses of ordering sources in formal semantics.

<sup>6</sup>This statement differs from that in Portner in that the set of worlds is restricted by the agent's own commitments, rather than by the common ground.

The formulation in (71), based on the one given by Portner, is intended to capture a fundamental constraint on rational and cooperative behavior. Basically, agents are expected to try and make the actual world among those most highly ranked by their public intentions (or by the contextual ordering source), modulo their public beliefs (i.e. no-one is expected to strive for a world that they think is impossible).

Another way to get at the relevant notion of rationality/cooperativity is by relying on what I will call an agent's *optimal set*. This set is constructed by taking the maximal set of worlds returned by the ordering in (70), as in (72).

(72) The **Optimal Set** of an agent  $x$  in a context  $C$  is defined as:

$$\text{OPT}_x^C = \{w_i \in \cap \text{PB}_x^C \mid \neg \exists w_j \in \cap \text{PB}_x^C : w_j <_x^C w_i\}$$

The optimal set for an agent  $x$  in context  $C$  is the set of worlds compatible with  $\text{PB}_x^C$  which are not outranked by any other worlds compatible with  $\text{PB}_x^C$ . That is, it is the set of maximal worlds according to the contextual ordering source compatible with that agent's public beliefs. We can then restate the rationality/cooperativity criterion in (71) as follows:

(73) **Agent Commitment:**

For any participant  $x$  in a context  $C$ , the participants in the conversation mutually agree to deem  $x$ 's actions rational and cooperative to the extent that those actions tend to make actual world among those in  $\text{OPT}_x^C$ . That is,  $x$ 's actions are rational and cooperative insofar as they tend to make it so that  $w^* \in \text{OPT}_x^C$ , where  $w^*$  is the actual world.

With the notion of optimal set in place, I am now in a position to propose a denotation for  $\uparrow$ . The basic idea is that  $\uparrow$  indicates a resolution of the addressee's decision problem in terms of the optimal set introduced above.

$$(74) \quad \llbracket \uparrow \rrbracket = \lambda L_{\langle c, ct \rangle} \cdot \left\{ \langle C, C' \rangle \in L \mid \exists a \in \mathcal{A}_{Ac}^{C'} : \begin{array}{l} \text{OPT}_{Ac}^C \not\subseteq a(A_C) \wedge \\ \text{OPT}_{Ac}^{C'} \subseteq a(A_C) \end{array} \right\}$$

The denotation in (74) takes a relational CCP as an argument, and returns a relational CCP that is like its input, but with a further restriction. First, it requires that there exists a non-trivial decision problem for the addressee in the output context, represented as  $\mathcal{A}_{A_C}^{c'}$ . There must be some action  $a$  in this set<sup>7</sup> that is *not* optimal for the addressee in the input context,  $\text{OPT}_{A_C}^c \not\subseteq a(A_C)$ . But this same action *is* optimal in the *output* context,  $\text{OPT}_{A_C}^{c'} \subseteq a(A_C)$ .

The particle  $\uparrow$  attaches to a sentence marked with  $yo$ ; for a declarative, this gives us the structure and root denotation in (75).

$$(75) \left\{ \langle c, c' \rangle \left| \begin{array}{l} \forall x \in \text{DP}^c : \llbracket p \rrbracket \in \text{PB}_x^{c'} \wedge \\ \exists a \in \mathcal{A}_{A_C}^{c'} : \text{OPT}_{A_C}^c \not\subseteq a(A_C) \wedge \text{OPT}_{A_C}^{c'} \subseteq a(A_C) \end{array} \right. \right\}$$

```

graph TD
    Root(( )) --- p[p]
    Root --- DECL[DECL]
    Root --- yo[yo]
    yo --- up[↑]

```

It will be helpful to unpack the denotation in (75) by pointing out some of its key features. The combination of  $yo$  with the declarative requires that the propositional radical be added to the output public beliefs of all discourse participants. The use of  $\uparrow$  makes additional demands of the addressee. The addressee is chosen on the basis of the input context. The set of actions for the addressee, however, is chosen on the basis of the *output* context. This means the use of  $\uparrow$  does *not* require a contextually salient set of actions for the addressee in the *input* context, but it *does* require one in the *output* context. This asymmetry is motivated by uses of  $yo\uparrow$  that seem to both introduce and resolve an issue that the addressee is unaware of, as was seen in examples (63), (64), and (65). The action is constrained to be optimal in the *output* context, but *non-optimal* in the *input* context. I will provide motivation for this piece of the denotation shortly, but the basic fact motivating this formulation is that once a

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<sup>7</sup>It is this existential quantification over actions in the output decision problem that is responsible for the requirement that the output decision problem be non-trivial.

$yo\uparrow$ -marked sentence is used to motivate a particular action, it seems that we cannot then use another  $yo\uparrow$ -marked sentence to motivate the same action.

These pieces of the denotation combine to make the following contributions:

- (76) A sentence with  $yo\uparrow$  can be used to:
- a. *introduce* decision problems *for the addressee* in previously neutral contexts.
  - b. indicate that the post-update context is sufficient to *resolve* the decision problem thus introduced, by saying that there is an alternative action *a* that is optimal.
  - c. indicate that this action is *not* optimal in the *input* context. The utterance thus serves to *change* the context in such a way that the action *becomes* optimal.

These features of the denotation are given justification in the rest of the section.

### 3.2.4 Evidence for Optimality

#### 3.2.4.1 Addressee Orientation of $yo\uparrow$

The denotation given for  $\uparrow$  makes it fundamentally addressee-oriented. The decision problem is specified relative to the addressee, and optimality is calculated relative to the addressee's own commitments. The prediction is clear: the use of  $yo\uparrow$  requires an addressee, and indicates optimal actions *for the addressee*. In all of the examples presented earlier, this prediction is borne out. The examples motivating the semantics of  $yo\uparrow$  are all dialogs, and the urge to action is always directed at the contextual addressee, rather than, say, as a way for the speaker to indicate that he has resolved his own contextual decision problem. Consider again the dialog in (63), repeated in (77). The use of  $yo\uparrow$  is felicitous here (and the bare declarative is not) precisely because the semantics of  $\uparrow$  serves to indicate the existence of a decision problem for the addressee (to board or not to board), and also indicates that one of the alternative

actions is optimal (the addressee is committed to an intention to board the train once it arrives).

- (77) Context: The addressee is waiting for a train, and wants to get on, but doesn't notice that it has arrived. The speaker knows this, and says:

densha kita  $\#(yo\uparrow)$   
train came  $\#(yo\uparrow)$   
“The train is here  $yo\uparrow$ .”

Now, if we modify the context so that it is the *speaker*, rather than the addressee, who wants to board the train, the sentence becomes infelicitous. This is illustrated by the example in (78).

- (78) Context: The speaker is waiting for a train, and wants to get on, but doesn't notice that it has arrived. He looks up and sees that the train has unexpectedly arrived, and says:

a, densha kita ( $\#yo\uparrow$ )  
oh, train came ( $\#yo\uparrow$ )  
“Oh, the train is here ( $\#yo\uparrow$ ).”

The use of  $yo\uparrow$  in (78) is felt by informants to be far less natural than in (77). If  $yo\uparrow$  is used here, it seems to involve the addressee in some subtle way, by suggesting for example that the addressee himself should also board the train, or that the addressee should stop talking and let the speaker board the train. This contrast shows that  $yo\uparrow$  is used in utterances that are strongly addressee-oriented, as a way of directing the addressee toward some optimal action, as predicted by the denotation of  $\uparrow$  in (74).

### 3.2.4.2 Non-Repeatability

The following example illustrates the fact that, in general, the repetition of  $yo\uparrow$  is not allowed across sentences, at least when those sentences are (in a sense to be made more explicit shortly) “about the same thing”.<sup>8</sup>

(79) Context: A sushi chef is making recommendations to a customer. He makes the following two utterances, (implicitly) suggesting that the customer purchase the sea urchin.

- a. kyou-wa uni-ga oishii desu  $yo\uparrow$   
today-TOP sea.urchin-NOM delicious be  $yo\uparrow$   
“We have good sea urchin today  $yo\uparrow$ .”
- b. kesa Hokkaido-de toreta mono desu ( $\#yo\uparrow$ )  
this.morning Hokkaido-at caught thing be ( $\#yo\uparrow$ )  
“It was caught in Hokkaido this morning ( $\#yo\uparrow$ ).”

The example illustrates the following principle: When  $yo\uparrow$  is used with an utterance to suggest to the addressee some action, it cannot in general be used again with a subsequent utterance that is used to suggest the same action. For the example above, the action suggested to the customer by both sentences is ordering the sea urchin. It is fine to mark the first sentence with  $yo\uparrow$ , but then the second one cannot also be so marked.

The denotation of  $\uparrow$  given in this chapter can explain the restriction seen in (79). The explanation goes like this: By using  $yo\uparrow$  with the first sentence, the speaker is suggesting that there is some salient action that is optimal for the hearer in the *post*-update context that was not optimal in the *pre*-update context. The salient action is naturally interpreted as ordering sea urchin. The second utterance is made in the context generated, in part, by the first utterance. Using  $yo\uparrow$  in the second

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<sup>8</sup>I thank an anonymous PACLIC 24 reviewer for bringing this example to my attention.

utterance commits the speaker to the existence of some action that is salient and optimal in the new post-update context, but not optimal in the input context. But since the second utterance is about sea urchin, the most natural interpretation is that the utterance is still suggesting that the hearer buy sea urchin. But this was already an optimal action in the input context, due to the use of  $yo\uparrow$  in the prior utterance. So the input context is not in the domain of the CCP denoted by the second utterance with  $yo\uparrow$ . In effect, the acceptance of the  $yo\uparrow$ -marked utterance in (79a) generates a requirement on subsequent input contexts that is not satisfied for the context of utterance in (79b), and the result is infelicity.

### 3.2.4.3 When Relevance Must be Marked

The semantics of  $\uparrow$  has given us a way to understand the sense in which utterances with  $yo\uparrow$  indicate “relevance”. They do so by targeting (or introducing) a contextual decision problem (an issue) for the addressee, and indicating that this decision problem is settled in the post-update context. This gives us a way to understand part of the data introduced at the beginning of the chapter, but recall that there was another side to the story as well. Not only were  $yo\uparrow$  declaratives felicitous in utterances intended to guide the addressee’s action, but bare falling declaratives were *infelicitous* in such contexts. In this section, I suggest how this infelicity can be understood. First, though, I want to give a fuller sketch of just when bare declaratives are infelicitous.

The basic picture is this: Bare falling declaratives seem to become infelicitous in Japanese to the extent that the preceding linguistic context fails to explicitly indicate the question or decision problem that the declarative addresses. The generalization can be seen by comparing B’s response in (80) to each of the two preceding utterances of A. If A asks the question in (80a), then B’s reply is of a form that directly picks out one of the propositions that constitutes a resolving answer to the question. In

this case, native speakers report that B's answer without *yo*↑ is not so bad, although there seems to be a preference for the response with *yo*↑.

- (80) A: a. Nihon-no sinbun doko de ka-eru?  
Japan-GEN newspaper where at buy-can  
“Where do they sell Japanese newspapers?”
- b. Nihon-no sinbun yomi-tai na  
Japan-GEN newspaper read-want PRT  
“I really want to read a Japanese newspaper.”
- B: eki de ka-eru (↓/*yo*↑)  
station at buy-can (↓/*yo*↑)  
“You can buy one at the station (↓/*yo*↑).”

At a more subtle level, speakers report an intuition that if B's answer does not have *yo*↑, then it is just answering the question asked by A, while using *yo*↑ seems to indicate more directly that the speaker expects the addressee to go to the station as a result of learning the information asserted.

If A makes a statement like that in (80b), then native speakers consistently report that B's response is infelicitous without *yo*↑. By using *yo*↑, B's assertion becomes felicitous in this context, and moreover conveys the fact that B expects this information to help A get a Japanese newspaper. We thus see that the felicity of bare falling declaratives in Japanese degrades rapidly insofar as the assertion is meant to resolve a decision problem that is implicit in the context, but which has not been directly encoded in a preceding question by the addressee.

And in contexts where there is *no* pre-existing decision problem, overt or covert, the contrast seems to be even stronger. In such examples, it is the very utterance of the declarative that suggests the existence of a decision problem for the addressee in the first place. And in such uses, the bare declarative seems to be highly unnatural, by comparison with the *yo*↑-marked declarative. This pattern is seen in examples

like (66), repeated in (81), in which the addressee is driving along blissfully unaware of, or at least unconcerned by, the regulations regarding vehicular velocity.

(81) Context: The addressee is driving at a speed of 55 miles per hour. The speaker says the following with the intention of getting the hearer to lower her speed.

koko-no seigensokudo-wa jisoku 40-mairu da #(yo↑)  
 here-GEN speed.limit-top per.hour 40-mile be #(yo↑)  
 “The speed limit here is 40 miles per hour yo↑.”

The explanation of this contrast follows the same logic that was used in the last chapter to explain the infelicity of bare falling declaratives in corrective contexts. The data above illustrate a pattern in which bare falling declaratives are infelicitous to the extent that the decision problem relevant for interpretation of the utterance is *not* explicit in the input context. The situation can be formalized like this. Assume a maximally neutral partial input context, in which the public beliefs of A and B are represented, along with the action set for A. The maximally neutral context (ignoring public intentions) C will be such that  $PB_A^C = \emptyset$ ,  $PB_B^C = \emptyset$ ,  $\mathcal{A}_A^C = \emptyset$ , and  $\mathcal{A}_B^C = \emptyset$ .

I have already argued for the constraints  $MAX_{PB}$  and  $DEP_{PB}$  that serve to militate against changes to the public beliefs of the contextual agents. It is reasonable to extend the pressure for “contextual inertia” to action sets as well. The relevant constraint for this discussion is stated in (82).

(82)  $DEP_A$

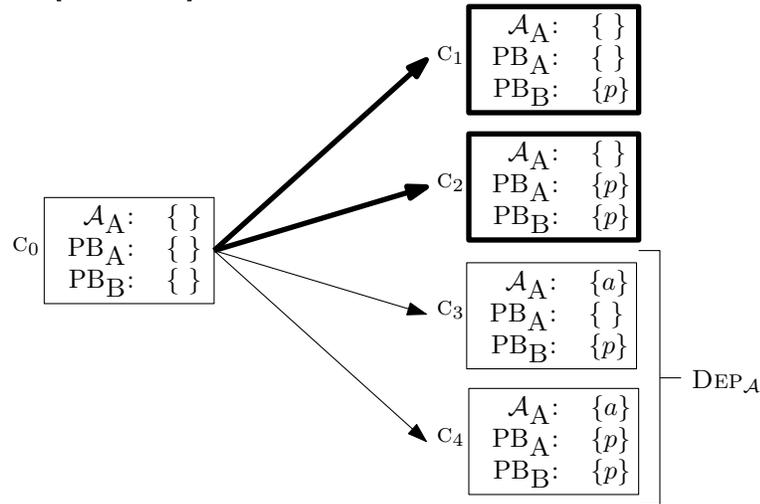
For any transition  $\langle C, C' \rangle$  and agent x, assign a penalty for every  $a$  in  $\mathcal{A}_x^{C'}$  that is not in  $\mathcal{A}_x^C$ .

$DEP_A$  serves to penalize any update that introduces alternative actions into an agent’s action set that were not there in the input context. For an input context in which an agent’s action set is empty, and in which there is therefore no public decision problem

facing the agent, this constraint will militate against the introduction of any new decision problems.

The consequences for a bare falling declarative are obvious. The constraint will penalize all transitions in which actions are added to the addressee’s (or any other agent’s) action set. This is illustrated by the diagram in (83), in which transitions for an utterance of  $[p \text{ DECL } \downarrow]$  by agent B are given.

(83) B:  $[p \text{ DECL } \downarrow]$



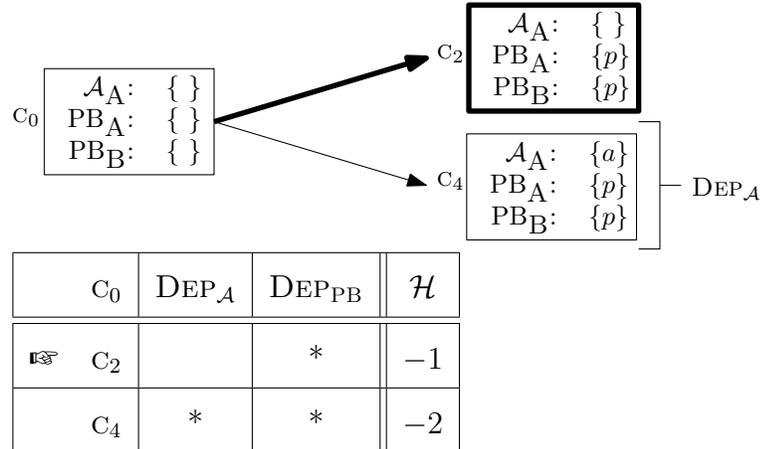
	$C_0$	$\text{DEP}_A$	$\text{DEP}_{\text{PB}}$	$\mathcal{H}$
$\rightarrow$	$C_1$		*	-1
$\rightarrow$	$C_2$		*	-1
	$C_3$	*	*	-2
	$C_4$	*	*	-2

The third and fourth output contexts in (83) are ones in which an action  $a$  has been added to the action set of agent A, a move that is penalized by  $\text{DEP}_A$ . Since there are no other pressures *favoring* this move,  $\text{DEP}_A$  is sufficient to knock these transitions out of the competition.

There is further evidence for  $\text{DEP}_A$ , using the contrast between a sentence marked with  $yo\downarrow$  and one marked with  $yo\uparrow$ . The semantics of  $\downarrow$  has not yet been introduced, but for present purposes it is only necessary to assume that  $\downarrow$ , unlike  $\uparrow$ , does not re-

quire a non-trivial action set in the output context. This leaves us with the transition in (84).<sup>9</sup>

(84) B: [*p* DECL *yo*↓]



The semantics of *yo* requires that the propositional content of the declarative be added to the public beliefs of all the discourse participants, so that  $\text{DEP}_{\text{PB}}$  is not in play in the resulting competition.  $\text{DEP}_A$  militates against the addition of actions to the addressee’s action set, so that we predict, just as with the bare declaratives, that *yo*↓-marked sentences will not work in contexts where the utterance is intended to introduce (and then resolve) a previously unrecognized decision problem for the addressee. And the prediction seems correct: the use of *yo* without rising intonation does not improve the felicity of examples like those in (80) in the same way that *yo*↑ does. This suggests that the introduction of previously unrecognized decision problems really does depend on the semantics of ↑.

### 3.2.5 Minimal Decision Problems

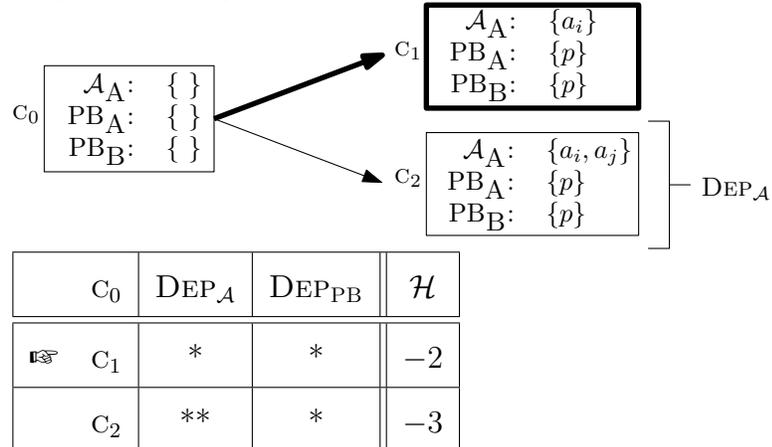
A final note before closing the section. The diagrams in (83) and (84) have only a single action introduced into the action set of the output context. And looking at

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<sup>9</sup>We will soon see that ↓ requires the elimination of some prior commitment, but this does not change the present argument, since it will still be suboptimal to introduce any new actions to the addressee’s action set.

a declarative with  $yo\uparrow$ ,  $DEP_{\mathcal{A}}$  will actually militate against the introduction of more actions than is required by the semantics of the utterance. This is illustrated in (85).

(85) B: [ $p$  DECL  $yo\uparrow$ ]



The existential quantification over actions in the denotation of  $\uparrow$  requires that we have at least one action in the addressee’s action set in the output context. But no more than this. And in fact,  $DEP_{\mathcal{A}}$  will militate against the addition of more actions than is strictly required by the semantics, which means that we will only have one when we move from a neutral context in which the addressee’s action set is empty.

From the perspective of standard decision theory, this situation is not good, since it is a fundamental requirement of alternative actions that they cover all possible choices. If interpreted through the lens of standard decision theory, the contexts resulting from the pragmatic calculation above are defective, since the decision problem is trivial. Only one action in the set means only one choice, which in turn means there is no real choice. I suggest a straightforward remedy to this apparent problem.

The contents of an agent  $x$ ’s action set will induce a partition as defined in (86). This gives us an equivalence relation defining a partition, each of whose cells agree for each action in the agent’s contextual action set as to whether the agent chooses that action or not.

(86) Definition of an **Action Partition**

For an agent  $x$  in context  $C$ , the worlds compatible with the public beliefs of  $x$  are partitioned by the equivalence relation  $=_{\mathcal{A}_x^c}$  as follows:

$$\forall w_i, w_j \in \cap \text{PB}_x^C : w_i =_{\mathcal{A}_x^c} w_j \text{ iff } \forall a \in \mathcal{A}_x^C : a(x)(w_i) = a(x)(w_j)$$

The partition thus defined is similar in spirit to various partition-based semantic approaches to the semantics of questions (Groenendijk and Stokhof 1982, 1989). The only difference is that whereas a question-based partition represents an issue of *fact* (which cell of the partition should the agent believe the world is in), the action-based partition represents an issue of *choice* (which cell of the partition should the agent strive to make the actual world belong to). The definition of the action partition has one very nice property, which is that it can give us *non-trivial* partitions from *singleton* action sets. For example, if we have a context  $C$  in which our agent  $x$ 's action set contains the single action  $a$ , then the resulting partition sorts worlds compatible with  $x$ 's public beliefs into two cells. One cell contains worlds where  $a(x)$  is true (in which  $x$  chooses/performs/etc action  $a$ ), and one cell in which  $a(x)$  is false (those in which the agent does *not* choose  $a$ ).

We can now understand the context resulting from the optimal update in (85) in a sensible way. What we have is an output context in which the addressee  $A$ 's public beliefs contain  $p$  (the propositional complement of the  $yo\uparrow$  marked declarative), and in which the action set for  $A$  contains some action  $a$ . The interpretation of the agent's post-update action set is as described above: the addressee faces the decision of whether to  $a$  or not to  $a$ . And the semantics of  $\uparrow$  requires that  $a$  be optimal in the output context (since  $a$  is the only action in the output action set, it is the action that must be understood as satisfying the existential quantification in the denotation of  $\uparrow$ ).

But how do we resolve which action  $a$  to add to the addressee's action set? In principle, any way we like. Our pragmatic constraints will consider *any* resolution as

equally optimal, since the constraints are not sensitive to the content of the issue facing the addressee. The determination of *which* action  $a$  gets added to the addressee’s action set is an issue that goes beyond the bounds of the pragmatic constraints detailed here, and will likely involve more general, non-linguistic pressures, such as plausibility, non-linguistic salience, and the like. There also seems to be a connection to something like *relevance* between the propositional content of the sentence and the resolution of the indicated action.

Back now to how issues of action are resolved. Recall that an agent’s optimal set is calculated on the basis of that agent’s public beliefs, and a *contextually specified ordering* over the worlds consistent with those beliefs. The optimal set is the set of maximal worlds according to this ordering. Now, if we resolve the contextual ordering source to the agent’s preferences, then we get a result in which the issue is resolved in terms of the those preferences. But we can also relativize the issue to other orderings. The question of whether an issue of action is settled is thus doubly relativized, in just the way that our optimality metric was. We can thus define a measure of resolvedness on the basis of optimality, as in (87).

(87) **Resolution of Action**

A context  $C$  is *resolved* toward some action  $a \in \mathcal{A}_x^c$  just in case  $\text{OPT}_x^c \subseteq a(x)$ .

With this definition in place, we can say that the use of  $yo\uparrow$  indicates that the output context is *resolved* toward some action in the output action set of the addressee, an action toward which the input context was *not* resolved.

### 3.3 $\Downarrow$ : A Call for Correction

In this section, I propose an analysis of the corrective flavor of  $yo\Downarrow$ -marked declaratives, in contrast to bare falling declaratives and  $yo\uparrow$ -marked declaratives.

### 3.3.1 Basic Data

I begin with the contrast seen at the beginning of the chapter, repeated once again in (88).

(88) a. **Guide to Action Context**

A: eiga-o miru mae-ni gohan-o tabe-you ka  
movie-ACC watch before food-ACC eat-HORT Q  
“Shall we eat before watching the movie?”

B: mou shichi-ji sugi deshou? eiga-wa hachi-ji kara da *yo*  
already 7-o'clock past right movie-TOP 8-o'clock from be *yo*  
“It’s already past 7, right? The movie starts at 8 *yo*.”

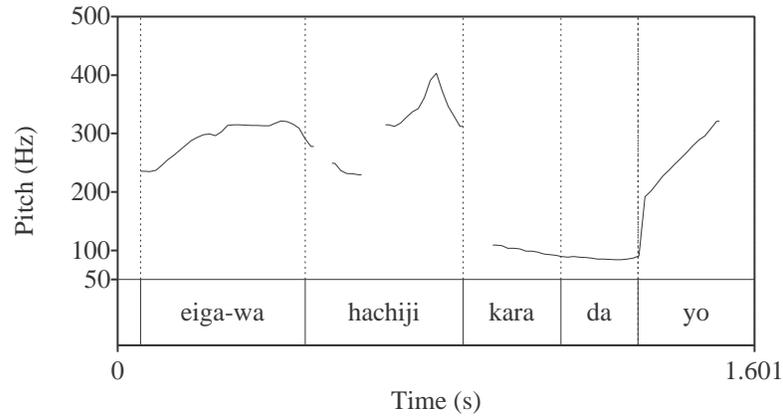
b. **Corrective Context**

A: eiga-wa ku-ji kara dakara gohan-o taberu jikan-wa  
movie-TOP 9-o'clock from because food-ACC eat time-TOP  
juubunni aru ne  
sufficiently be PRT  
“Since the movie starts at 9, there’s plenty of time to eat.”

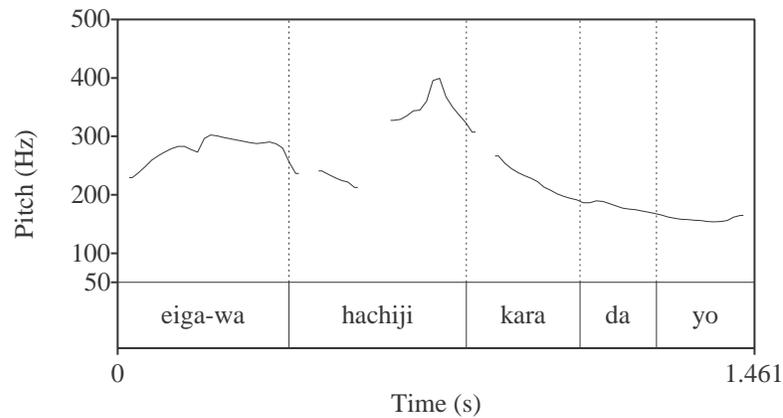
B: chigau *yo*. eiga-wa hachi-ji kara da *yo*  
different *yo*. movie-TOP 8-o'clock from be *yo*  
“That’s wrong *yo*. The movie starts at 8 *yo*.”

As I discussed earlier, the intonational possibilities for *yo* in the sentence translated as “the movie starts at eight” differ as a function of the contexts in (88), as illustrated by the pitch tracks in (10), repeated in (89).

(89) a. **Guide to Action Context** (88a)



b. **Corrective Context** (88b)



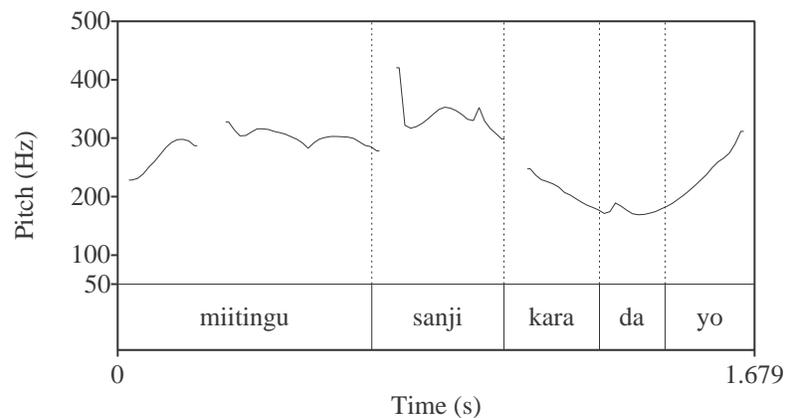
The informant who produced these sentences in context was instructed that the use in context (88b) was explicitly corrective. And in such a corrective context, the sentence is naturally produced with a final fall.

To further support this generalization, I examine dialogs in which a given *yo*-marked sentence is first used with the “guide to action” sense discussed in the last section, followed by the corrective use considered in this section. I also provide pitch tracks from a native speaker consultant who produced these dialog-embedded sentences. These pitch tracks show that the corrective use has a final fall, in contrast to the guide-to-action use that precedes it.

The first dialog begins with the sentence in (90). In line with what we saw in the last section, the *yo*-marked declarative has a distinct rise in this context, reflecting the “guide to action” semantics of  $\uparrow$ .

- (90) Context: The speaker B knows that the addressee A must attend a meeting, but even though the meeting time is fast approaching, A is not getting ready to go. B says:

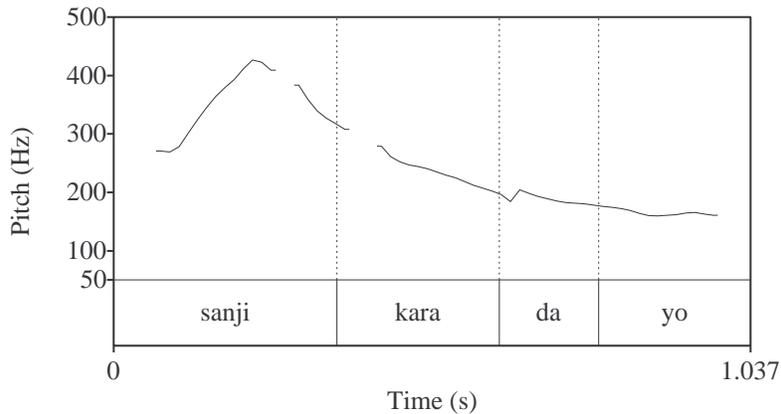
B: miitingu-wa san-ji kara desu  $\#(yo\uparrow)$ . ika-nai no?  
 meeting-TOP 3-o'clock from be.HON  $\#(yo\uparrow)$ . go-not PRT ?  
 “The meeting starts at 3 *yo* $\uparrow$ . Aren't you going?”



The dialog continues in (91). Here, A says that she thought the meeting was not at three, but at four. B then corrects A’s mistaken assumption with the same *yo*-marked sentence we saw in (90). Here, however, the sentence is produced with a final fall. Note that there are actually two *yo* $\downarrow$ -marked declaratives here; I only show the pitch track for the repeated sentence from (90), although both were produced with a final fall.

(91) A: a, yo-ji da to omotteta  
 oh 4-o'clock be COMP thought  
 “Oh, I thought it was at four.”

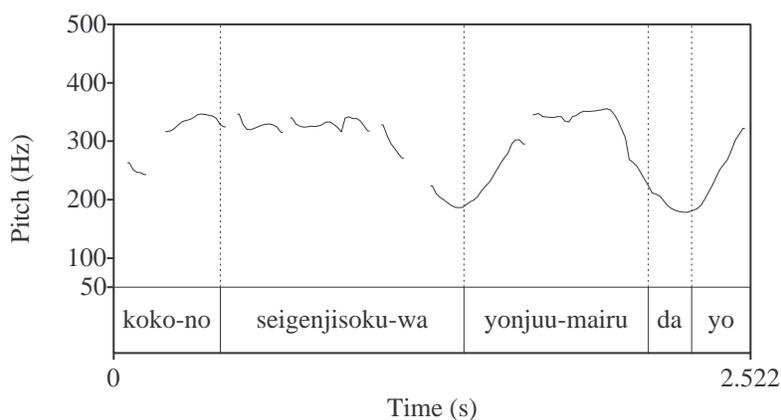
B: chigau yo↓. san-ji-kara da yo↓  
 different yo↓. 3-o'clock-from be yo↓  
 “No yo↓, it’s at three yo↓.”



Another dialog illustrates the same contrast. This one begins with the sentence in (92), similar to the one in (66). Again, the pitch track (from a different speaker than that in (66)) shows a distinct rise, confirming the generalization that it is *yo*↑ that indicates a guide to action in such examples.

(92) Context: The addressee A is driving at a speed of 55 miles per hour. The speaker B says the following with the intention of getting A to lower her speed.

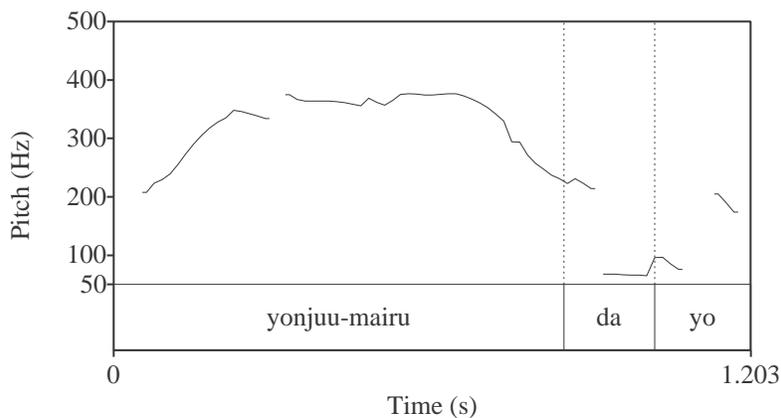
B: koko-no seigenjisoku-wa yonjuu-mairu da #(yo↑)  
 here-GEN speed.limit-TOP 40-mile be #(yo↑)  
 “The speed limit here is 40 miles per hour *yo*↑.”



The dialog continues with A saying that she thought the speed limit was higher. This leads B to repeat her claim, correcting A’s mistake. This corrective use is produced with a final fall.

(93) A: a, gojuugo-mairu da to omotteta  
 oh, 55-miles be COMP thought  
 “Oh, I thought it was fifty-five mph.”

B: chigau yo↓. yonjuu-mairu da yo↓  
 different yo↓. 40-miles be yo↓  
 “No yo↓, it’s 40 mph yo↓.”



The pitch track for this example is degraded because *yo*↓ here was accompanied by creaky voice. This is in fact another likely phonetic dimension along which *yo*↓ and

$yo\uparrow$  are distinguished, although more systematic investigation is needed to confirm this suspicion.

As discussed in the previous chapter, the use of bare falling declaratives is felt to be infelicitous in these kind of corrective examples. The use of  $yo\downarrow$  makes the sentences felicitous, and also makes them in some way explicitly corrective. The correlation with non-monotonic correction and falling intonation leads Davis (2009) to argue that  $\downarrow$  contributes an explicitly non-monotonic semantics. This explains the association between corrective use of  $yo$  and falling intonation. But Davis (2009) goes further, claiming that such corrective uses are *only* possible when  $yo$  is used with a final fall. The empirical claim is bidirectional: When  $yo\downarrow$  is used, the effect is non-monotonic update, and when non-monotonic update is required,  $yo\downarrow$  (in contrast to  $yo\uparrow$ ) must be used.

But the empirical situation does not, upon further investigation, seem to support such a strong statement. The corrective uses illustrated above are indeed natural with falling intonation, as confirmed by both speaker intuition and the pitch tracks from actual productions. And when  $yo$  is used with falling intonation, it seems to make a very clear demand on the addressee to give up some mistaken commitment, and is for that reason felt by informants to be rather forceful and, depending on the context, even rude. But rising intonation does not, contra Davis (2009), seem to be impossible here. Native speaker informants, including the one who produced the sentences above, report that the final rising intonation typically associated with the “guide to action” interpretation are also felicitous in these corrective contexts.

The intuitions reported here seem to hold for the naturalistic examples that motivate what Izuhara (2003) refers to as class 2 uses of the particle. Izuhara’s characterization of the second class of  $yo$  sentences is given in (94) (my translation, emphasis added).

(94) [Used with sentences that] urge the listener to *revise their understanding*.<sup>10</sup>

Izuhara's characterization of class 2 uses of *yo* matches the corrective use I have identified here. Such uses of *yo* are natural with a final fall, but also possible with a final rise. On this basis, we expect to find a mix of both *yo*↓ and *yo*↑ for Izuhara's class 2. And looking at the examples she provides, this is what we seem to find.

Izuhara provides a number of naturalistic examples from an interview between the television personality Kuranagi Tetsuko [T] and the singer Koshiji Fubuki [K] as exemplifying class 2 uses of *yo*. I do not have access to the original recordings from which these dialogs are taken, and intonational data is not provided by Izuhara. On the basis of native-speaker intuitions, however, we find examples of both intonational patterns in this class, although there are complications introduced by the fact that some examples Izuhara puts in this class are in fact being used to urge a particular course of action. I provide the examples cited by Izuhara, along with intuitions as to which intonation is most natural and some commentary. The relevant use of *yo* in each example is underlined.

(95) K: atashi, terebi tte agachau ndesu *yo*.

I television TOP get.nervous PRT *yo*

“I get nervous appearing on TV.”

T: uwaa, go-joudan deshou?

whoah, HON-joke probably

“What, you're joking, right?”

K: honto, honto, honto . . .

true true true

“No, really, really.”

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<sup>10</sup>The original Japanese is “*kikite no ninsiki no teisei wo unagasu mono*”.

T: uso yo  
 lie *yo*  
 “No way yo.”

In this example, Koshiji is telling Tetsuko that she gets nervous on TV (Koshiji’s use of *yo* in this sentence is discussed later on, in the context of example (104)). Tetsuko indicates her disbelief at this claim, since Koshiji is a famous singer who one presumes is comfortable in such circumstances. Koshiji reiterates her prior claim, to which Tetsuko again registers her disbelief, this time using *yo*. Intuition suggests that *yo* here is most natural with falling intonation. Intuitively, what Tetsuko is doing is (at least rhetorically) urging Koshiji to admit that what she is saying is not true (literally, she says “that’s a lie *yo*”). The sentence is encouraging the addressee to revise her “understanding”, in Izuhara’s words.

We see the same pattern in the following example as well:

- (96) T: ... (go-shujin-wa) ima-demo mote-teirassharu?  
 (HON-husband-TOP) now-even cool-PROG  
 “Is your husband still popular with the ladies?”
- K: rashii desu ne  
 apparently be PRT  
 “Yeah, apparently.”
- T: yasashii kara  
 gentle because  
 “Because he’s so nice.”
- K: uchi-de-wa sou-demo nai desu yo, uchi-e kaette-kimasu  
 home-at-TOP that.way-even not be *yo*, home-to return-come  
 to  
 when  
 “Oh, not at home he’s not yo, not when he comes home.”

In this example, Koshiji is refuting (part of) Tetsuko’s assertion that her husband is kind. This example has a right-dislocated constituent appearing after *yo*, which makes it difficult to tell what the sentence-final contour associated with *yo* is here. Native speakers report that is natural for *yo* to have either rising or falling intonation in this example, but the choice may depend in part on how “connected” the right-dislocated constituent is to the rest of the sentence. We seen then that *yo*↓ is natural with the above two examples, although *yo*↑ may be possible as well. In contrast, *yo*↓ is odd with all of Izuhara’s class 1 examples in (67).

The next example, which Izuhara puts into class 2, would apparently be most natural with rising intonation, according to the intuitions of native speaker informants:

- (97) T: mou nan-nen desu ka, takarazuka fukumete  
 already what-year be Q, Takarazuka join  
 “How many years has it been since you joined the Takarazuka theater?”
- K: mata suuji-o. itta desho, suuji-wa dame  
 again numerals-ACC. said probably, numerals-TOP no.good  
 da-tte. are, suuji janai ... kazu?  
 be-QUOT. wait, numerals not.be numbers?  
 “Numerals again? I told you, I’m no good with numerals. Wait, not numerals, ... numbers?”
- T: ie, suuji-de ii ndesu yo  
 no, numerals-with good PRT *yo*  
 “No, I think you’re fine saying ‘numerals’ yo.”

While Izuhara puts this in class 2, it is obvious that Tetsuko is urging the addressee towards a particular word-choice with her utterance. She is saying that use of the word *suuji* (numerals), as opposed to *kazu* (numbers) is fine, in response to Koshiji’s concern about which of the two words she should use. The fact that *yo* in this example would be used naturally with rising intonation can thus be seen as falling out from

the fact that this constitutes a *guide to action*, per Izuhara’s characterization of class 1 uses of *yo*.

Putting the above data together, I argue that corrective uses of *yo* are *natural* with ↓, but also *possible* with ↑. That is, corrective use of *yo* does not *require* falling intonation. The situation is what we expect, given the discussion from §2, where we saw that *yo* itself was sufficient to derive non-monotonic update to the addressee’s public beliefs, in contrast to bare falling declaratives. This generalization holds just for examples in which the propositional content of the *yo*-marked declarative is inconsistent with some pre-existing commitment of the addressee. It is only in these situations where the use of *yo* itself leads to non-monotonic correction, in accordance with the meta-constraint that blocks inconsistent sets of public beliefs in the output context.

There is, however, still a sense that *yo*↓ is more explicitly corrective, and hence more explicitly non-monotonic, than *yo*↑. This is made clear by the contrast between *yo*↑ and *yo*↓ in examples like (98).

- (98) A: gohan mou tabeta?  
           dinner already ate?  
           ‘Did you eat already?’
- B: tabeta (*yo*↑/*yo*↓)  
       ate (*yo*↑/*yo*↓)  
       “(Yeah,) I ate.”

By asking an unbiased information seeking yes/no question, A indicates that he is uncommitted regarding whether B has eaten. If B uses *yo*↓, she conveys an objection to something about A’s question. Informants report that B’s use of *yo*↓ in this context implies that there is something A is taking for granted that B thinks should not be taken for granted (for example, the possibility that B has not yet eaten, or that it is appropriate to be asking this question of B). In this particular context, B’s response

is likely to convey something like “Of course I ate, why are you asking me all these questions?!”<sup>11</sup> For this reason, in neutral, non-confrontational contexts, the use of  $yo\Downarrow$  is often perceived as infelicitous. The use of  $yo\Uparrow$  has no such implications.

Examples like (98) show that the use of  $yo\Downarrow$  is linked with non-monotonicity, since the use of  $yo\Downarrow$  in such a “neutral” context makes it seem as if the speaker is objecting to some commitment of the addressee. The same sentence with  $yo\Uparrow$  generates no such implication, suggesting that  $yo\Uparrow$  does not demand non-monotonic update, which in turn suggests that non-monotonicity is *conventionally* linked to  $\Downarrow$ , not with  $yo$  or with  $yo\Uparrow$ . What we seem to have is an asymmetry, in which  $yo\Downarrow$  *forces* a corrective interpretation, while  $yo\Uparrow$  is *compatible* with a corrective use, but does not conventionally *require* it. In contrast, a bare falling declarative is not a pragmatically natural way of making a corrective move. We have already seen how  $yo$ -marking makes non-monotonic update *possible*. This section shows how the addition of  $\Downarrow$  makes it *mandatory*. This explains the contrast in (98), where the corrective flavor of the utterance depends on  $\Downarrow$ . The propositional content of the  $yo$ -marked declarative is not inconsistent with any pre-existing commitments of the addressee in this example, so the update semantics returned by  $yo$ , and in turn by  $yo\Uparrow$ , will not trigger any non-monotonic revisions. If  $yo\Downarrow$  is used, we *force* a non-monotonic interpretation. I now give a formal account of this contribution of  $\Downarrow$ .

### 3.3.2 Semantics of $\Downarrow$

The association between  $\Downarrow$  and non-monotonic update leads Davis (2009) to hard-wire non-monotonic update into the semantics of  $\Downarrow$ . Ignoring the compositional details, the dynamics of a declarative with  $yo\Downarrow$  under this account is roughly equivalent

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<sup>11</sup>I thank Eric McCready for pointing out to me that the use of  $yo\Downarrow$  is not simply infelicitous in such cases.

to (99), where  $q$  is a free propositional variable that must be contextually resolved, and  $-$  is set subtraction.

$$(99) \quad \llbracket \text{DECL } p \text{ } yo \Downarrow \rrbracket = \lambda C. C' \text{ such that } PB_{A_c}^{C'} = (PB_{A_c}^C - q) \cup \{\llbracket p \rrbracket\}$$

This denotation encodes a function from contexts to contexts that demands that the public beliefs of the addressee in the input context be modified in *two* ways. First, we must subtract (downdate) some proposition  $q$ . This proposition must be contextually determined. Then, we must add the propositional content of the declarative to the addressee's public beliefs.

Given the model of contexts developed so far, the contribution of  $\Downarrow$  can be recast by the denotation in (100).

$$(100) \quad \llbracket \Downarrow \rrbracket = \lambda L. \left\{ \langle C, C' \rangle \in L \mid \exists x \in DP^C, \exists q : q \in PB_x^C \wedge q \notin PB_x^{C'} \right\}$$

The intonational particle  $\Downarrow$  attaches above  $yo$ , to give the structure and corresponding denotation in (101).

$$(101) \quad \left\{ \langle C, C' \rangle \left| \begin{array}{l} \forall x \in DP^C : \llbracket p \rrbracket \in PB_x^{C'} \wedge \\ \exists y \in DP^C, \exists q : q \in PB_y^C \wedge q \notin PB_y^{C'} \end{array} \right. \right\}$$

```

graph TD
    Root[ ] --- p[p]
    Root --- DECL[DECL]
    Root --- yo[yo]
    yo --- D[Downarrow]
  
```

What this denotation demands is that the proposition denoted by the declarative radical be contained in the public beliefs of *all* discourse participants in the output context. This is what we get from  $yo$  itself. The use of  $\Downarrow$  makes an additional requirement: There must be some additional proposition  $q$  that is a public belief of some discourse participant  $y$  in the input context, but is eliminated from  $y$ 's public beliefs in the output context. Note that the discourse agent whose public beliefs are targeted for revision is left open. Motivation for this indeterminacy will be given later in the dissertation; for the examples discussed in this chapter, this agent is resolved to the addressee.

There are two obvious ways in which a  $yo\Downarrow$ -marked declarative can now be used, corresponding to how the downdated proposition  $q$  is resolved. In some cases, this proposition will correspond to the negation of the proposition denoted by the declarative radical. That is, for a  $yo\Downarrow$ -marked declarative [DECL  $p\ yo\Downarrow$ ], the downdated proposition might be set to  $\neg p$ . This is illustrated in (102), where S is the speaker and A is an addressee already committed to  $\neg p$ .

$$(102) \quad c_0 \begin{array}{|c|c|} \hline A & \{\neg p\} \\ \hline S & \{\} \\ \hline \end{array} \longrightarrow c_1 \begin{array}{|c|c|} \hline A & \{p\} \\ \hline S & \{p\} \\ \hline \end{array}$$

In cases like this, the use of  $\Downarrow$  is in some sense “redundant”. I argued in §2 that the semantics of a  $yo$ -marked declarative was itself sufficient to give us non-monotonic revision to an addressee’s public beliefs. This required what I termed a “meta-constraint” ruling out contexts with inconsistent sets of public beliefs. If such a meta-constraint against inconsistency can rule out inconsistent sets of public beliefs, then why use  $\Downarrow$  to explicitly indicate the removal of a proposition that logical consistency would demand be removed anyway? Antoniou (1997) provides a telling story:

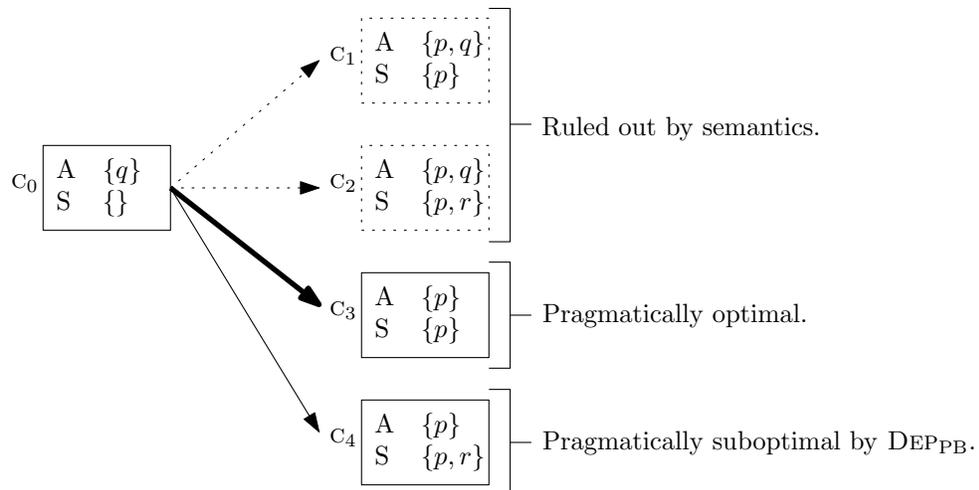
Inconsistency is a grave, sometimes life-threatening, problem. It is well-known, though perhaps not so well appreciated, that one can deduce *anything* from a set of inconsistent premises. For the sake of emphasis, let me tell you a story. On April 26, 1994 a Taiwanese commercial jet crashed during a landing attempt at Nagoya Airport in Japan killing 261 people on board. After analyzing the in-flight recorder, the engineers discovered that as the jet approached the runway the pilot informed the aircraft that *the jet was to land*. However, due to poor weather conditions the co-pilot indicated that *the jet was not to land*, instead it was to make another approach. As a consequence of this inconsistency the engines exploded. (Antoniou, 1997, p.184)

While the failure to detect inconsistency in one’s public commitments is unlikely to make anything explode, it can have bad consequences for the state of a dialog. Discourse is modeled here as a coordination game, and the participant needs to keep a constantly updated model of the commitments of all the participants, and also make sure that their respective models of the contextual commitments are kept more or less the same. Signaling revision and avoiding inconsistency seems to be a design feature of language, with good motivation, since it helps interlocutors make the intended changes to the context more explicit.

So despite the redundancy in this case, it might still be reasonable to mark the non-monotonicity explicitly anyway, to insure that the meta-constraint on consistency is not inadvertently violated in the output context. By making explicit that a non-monotonic update is required, we can avoid an unintentional transition to a defective context. It will not always be the case that inconsistency derives from the negation of the propositional radical. In such cases, an overt signal of the need for revision is especially useful.

When the propositional content of the  $yo\Downarrow$ -marked declarative leads to no inconsistency, the semantics of  $\Downarrow$  still requires that some proposition be deleted from the addressee’s public beliefs. This is illustrated in (103).

(103) [DECL  $p$   $yo\Downarrow$ ]



The semantics of  $\Downarrow$  has succeeded in reducing our candidate transitions to those in which the propositional content of the declarative is added to the public beliefs of each discourse participant, *and* in which a logically unrelated prior commitment has been eliminated. This is a first-pass formal characterization of the kind of use seen in (98).

At this point, there is an artificial limitation built into this analysis, in that only public beliefs can be targeted for revision. As will be seen in the next chapter, imperatives with  $yo\Downarrow$  regularly target an addressee's public *intentions* instead. And in fact the use of  $yo\Downarrow$  in examples like (98) might best be characterized as an attempt to get the addressee to change their intentions or behavior (in this case, by demanding that they stop asking annoying questions). This limitation will be addressed in the next chapter, when the model of discourse contexts is expanded to handle the CCP semantics of imperative clauses.

In §3.3.3, I look at some data suggesting that the denotation in (100) might be stated too strongly, and suggest a possible revision. Before doing so, I want to briefly discuss the use of  $yo\Uparrow$  in examples like (98). The addressee in this context has asked an information-seeking question. I have argued for a semantics of  $\Uparrow$  that is action-oriented. When the speaker answers with  $yo\Uparrow$ , he points to a contextually salient set of alternative actions, and says that the post-update context makes one of these optimal. What are the alternative actions in (98)?

One possibility is that in this case, the alternative actions are ones involving *belief*. This gives a very tight connection between the action set in this context and the QUD. For any set of propositions (a question)  $\{p_1, \dots, p_n\}$ , we can construct a set of actions  $\{b_{p_1}, \dots, b_{p_n}\}$ , where  $b_{p_i}$  is the property (action) of believing proposition  $p_i$ . So we can model contexts where the issue of action corresponds to an issue of fact. This means that, in such contexts, we expect the use of  $yo\Uparrow$  to be quite natural, and this is what we find. The use of  $yo\Downarrow$ , on the other hand, indicates some kind of non-monotonic

correction, and is not a natural or unmarked way to just “give an answer” in such contexts.

### 3.3.3 Further Issue in Modeling Non-Monotonicity

The semantics in (100) predicts that a *yo*↓-marked utterance requires the deletion of some proposition which is an explicit public belief of the addressee. This statement might be too strong. To look at this issue, I consider a third class of *yo* sentences that Izuhara proposes in addition to the two classes introduced early. I examine the examples she gives for this class, along with native speaker informants’ intuitions for their most natural intonation.

- (104) T: doushite terebi-ni o-de-ninara-nai no ka tte  
 why TV-DAT HON-appear-HON-NEG PRT Q QUOT  
 gimonni omotterassharu kata-mo aru to omou nda kedo,  
 wonderingly thinking person-also be COMP think PRT but  
 sokontoko, chotto o-kik-ase-itadake-nai?  
 that.thing a.little HON-hear-cause-receive-NEG  
 “I think there are people wondering why you don’t appear on TV, so I  
 was wondering if I could ask you about that.”
- K: atashi, terebi tte agacchau ndesu yo.  
 I television TOP get.nervous PRT *yo*  
 “I get nervous appearing on TV yo.”
- T: uwaa, go-joudan deshou?  
 whoah, HON-joke probably  
 “What, you’re joking, right?”

The use of *yo* in this example is natural with falling intonation. This example leads into example (95), in which Tetsuko goes on to express her disbelief in Koshiji’s assertion that going on TV makes her nervous. This gives us a hint at understanding

the naturalness of *yo*↓ here: Koshiji is indicating that, *despite what Tetsuko may have thought*, she is in fact nervous about going on TV. Her assertion runs counter to Tetsuko’s expectations, a fact that she indicates with the use of *yo*, which intuition suggests would probably be realized as *yo*↓.

The following example has a similar flavor to it:

- (105) K: konoaida nyuuin shi-tara, atashi tairyoku aru n desu.  
 recently enter.hospital do-when I stamina have PRT be  
 hanashi-wa tobu kedo ...  
 talk-TOP fly but  
 “When I was admitted to the hospital recently, ... I have some stamina.  
 This is a digression, but ...”
- T: a, nyuuin shita no?  
 oh, enter.hospital did Q  
 “Oh, you were in the hospital?”
- K: sou sou. kounetsu shite ne, nyuuin shita ndesu yo  
 yeah yeah fever do PRT enter.hospital did PRT yo  
 “Yeah, I had a fever, and went to the hospital yo.”

Here, Koshiji has said, or presupposed, that she was in the hospital recently. Tetsuko registers her surprise at this information with a polar question. This polar question is not neutral, and seems to indicate a prior bias on Tetsuko’s part that Koshiji was not in the hospital, and hence to indicate surprise at this state of affairs. Koshiji responds by backing up and filling in some more information, and then asserts that she went to the hospital, using *yo* this time. Again, the use of *yo* in this example seems most natural with falling intonation, meaning that we are probably seeing *yo*↓ here as well.

According to Izuhara’s own characterization, these sentences are used in response to an addressee who has indicated, by means of a question, that they are surprised

about, or unconvinced by, some piece of information. Izuhara suggests that the speaker uses *yo* in such circumstances to signal an intention to alter or revise this sense of dissatisfaction or surprise. From a more formal perspective, what seems to be happening is that the addressee asks a biased polar question, which serves to register her pre-existing bias against the truth of some proposition. The use of *yo* in the response serves to urge the listener that, despite what they may have thought, the piece of information (e.g., that the speaker gets nervous on television or has recently been in the hospital) should be accepted as true.

When we add these kind of examples to the mix, we end up with roughly three kinds of revision triggered by  $yo\Downarrow$ . In some cases, this revision amounts to a situation where the addressee has publicly committed to some proposition  $p$ , and the speaker is asserting the negation of that proposition  $\neg p$ . In other contexts, like that in (98), the revision is indirect but still quite strong; the addressee is being told to give up some previous assumption, or to stop behaving in a certain way. And in other contexts, like those just above that exemplify Izuhara's third class of *yo*-sentences, the sense of revision is more subtle, and indicates perhaps only that the addressee was unduly biased against the truth of the proposition asserted, or finds it surprising.

While these examples don't appear as obviously non-monotonic or corrective as some of the previous examples with  $yo\Downarrow$ , we can still understand the contribution of  $yo\Downarrow$  as pointing to a revision. The question is whether the semantics in (100) can handle this third class of corrective uses. That denotation required that some proposition in the public beliefs of the addressee be given up. It is not clear, however, whether the addressee in the above examples is really taken to have a public *belief* in the proposition being targeted. Instead, it seems that the speaker is targeting something like an *expectation* or *bias* that the addressee has expressed, or can be assumed to hold based on what they are in fact publicly committed to.

This looser form of commitment to a proposition, which we might call a default belief or expectation, is in fact one of the core issues driving the development of various kinds of non-monotonic logics. The move to non-monotonic logic and non-monotonic inference gives rise to a large set of formal questions which lie well beyond the scope of this dissertation. The interested reader is pointed to Antoniou (1997), who gives a textbook-level introduction with many references. For present purposes, it suffices to note the following. First, given that an agent’s public beliefs consist of a set of propositions, we can derive a set of possible worlds from this set in the “classical” way by taking the intersection of the set. This is the commitment set, as defined by Gunlogson (2003) and discussed briefly in §2.1. The definition is given in (106).

$$(106) \quad cs_x^c =_{\text{def}} \cap PB_x^c$$

In addition to this classical definition of commitments, we can use a non-monotonic logic to define a non-monotonic commitment set as well. For example, we might use a default logic (Reiter, 1980) to derive, non-monotonically, a more restrictive commitment set  $\Delta cs_x^c$  (read “default commitment set”). As I said, the details of such a non-monotonic logic are beyond the scope of the dissertation, but the idea is that in addition to the formulae that are assumed “true for sure” (as in classical logic), we can have a set of “default rules” which are taken to hold, “all else being equal”. In the model of contexts developed so far, the contents of an agent’s public beliefs have been taken to be formulae interpreted classically. If we move to a non-monotonic logic, like default logic, then we can use default rules to derive default commitment sets.

For the example in (104), we see from T’s response that she is surprised that her famous interviewee, a veteran of the stage, gets nervous on TV. This is a fact that the interlocutor seems to have anticipated with her use of  $yo\Downarrow$ . If we adopt the denotation of  $\Downarrow$  in (100), then we would interpret her utterance as, in effect,

presupposing that T had a public belief that she did not get nervous on TV. But this seems a bit strong. Instead, it seems like K is merely indicating that T would have expected, all else being equal, that she does not get nervous on TV. Perhaps there is a default rule to the effect that famous singers do not get nervous on TV, a default which is overridden by K’s assertion. In (105), T has indicated surprise about K’s going to the hospital. Again, perhaps this falls out from a default rule, some kind of “closed world” assumption to the effect that if you have no information suggesting that someone has been to the hospital recently, then you should assume they haven’t.

Assuming some sort of default logic that encodes these default expectations, we can now rule out worlds in which K gets nervous on TV or in which she has recently been in the hospital from T’s default commitment set. Setting  $p =$  “K gets nervous on TV” and  $q =$  “K was in the hospital recently”, we then have:

$$(107) \quad \text{a. } \Delta\text{cs}_T^c \subseteq (\neg p \wedge \neg q)$$

In words: All the worlds in T’s default commitment set are ones in which K does not get nervous on TV ( $\neg p$ ) and in which K was not in the hospital recently ( $\neg q$ ). Since we are using a default logic, we do not require  $\neg p$  or  $\neg q$  to be in the public beliefs of T, or even classically entailed by these beliefs. Instead, they just follow as defaults, all else being equal.

If we use such default commitment sets, then we can rewrite our semantics for  $\Downarrow$  as in (108).

$$(108) \quad \llbracket \Downarrow \rrbracket = \lambda L. \left\{ \langle c, c' \rangle \in L \mid \exists x \in \text{DP}^c, \exists q : q \subseteq \Delta\text{cs}_x^c \wedge q \not\subseteq \Delta\text{cs}_x^{c'} \right\}$$

The new denotation can be used to capture examples like (104) and (105), at the cost of requiring some as-yet-to-be specified theory of default logic. The cost might seem high. But the facts suggest this move is empirically necessary, and in any case the idea that natural language update can be modeled entirely within the confines

of a monotonic logic is not tenable, given that we do in fact make non-monotonic revisions to our public commitments in the course of dialog.

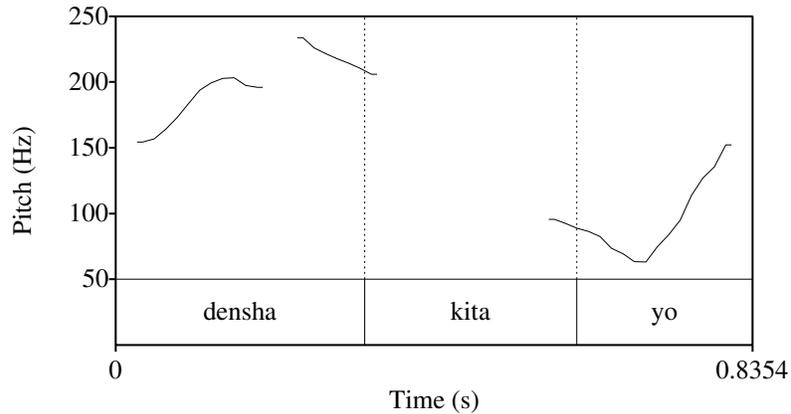
The denotation in (108) can in any case be “downgraded” to one in which default logic plays no part, with a result similar though not identical to the earlier denotation in (100).  $\Delta cs_x^C$  will in general be a subset of  $cs_x^C$ , since the former is constrained by both the entailments of  $PB_x^C$  and by whatever default inferences are applicable. If there are no default inference rules, then the two sets are equal. If we have a classical logic, with an empty set of default rules, then  $\Delta cs_x^C$  will reduce to  $cs_x^C$ . The use of  $\Downarrow$  would then require that some proposition supported by the addressee’s public beliefs in the input context not be supported in the output context. This in turn requires non-monotonic revision to the addressee’s public beliefs, which in turn means deletion of one or more propositions, as in (100).

### 3.3.4 Combining Intonational Morphemes

In §3.2, I argued that a final rise with *yo* was associated with a “guide to action” interpretation, which I attributed to the semantics of the intonational particle  $\Uparrow$ . Many of these examples had a corrective flavor to them as well. This can be seen in (63), repeated in (109).

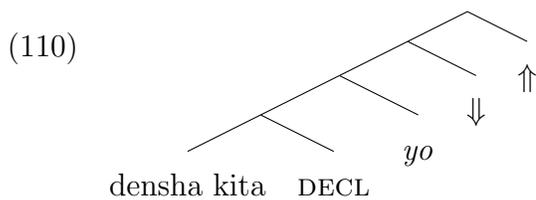
(109) Context: The addressee is waiting for a train, and wants to get on, but doesn’t notice that it has arrived. The speaker knows this, and says:

densha kita  $\#(yo\Uparrow)$   
 train came  $\#(yo\Uparrow)$   
 “The train is here *yo* $\Uparrow$ .”



Given the situation described in the context, the speaker is in some sense correcting the addressee's default expectation (that the train has not yet arrived), or perhaps correcting her behavior (suggesting that she needs to stop whatever she is doing and get onto the train). The intonational profile for this sentence shows a clear fall-rise, with a low target on *yo* followed by a subsequent rise.

Looking at the semantics of  $\Downarrow$  and  $\Uparrow$ , we see that they can in principle be combined together in the same sentence, since they are in effect adverbial modifiers of the root CCP denotation. The fall-rise contour in examples like (109) might then reflect the contribution of both  $\Downarrow$  and  $\Uparrow$  together, with a structure like that in (110).



Phonologically,  $\Downarrow$  provides a low target, and  $\Uparrow$  provides a subsequent high target, and the  $f_0$  contour reflects this by falling first to the sentence-final low target and then rising to the sentence-final high target.

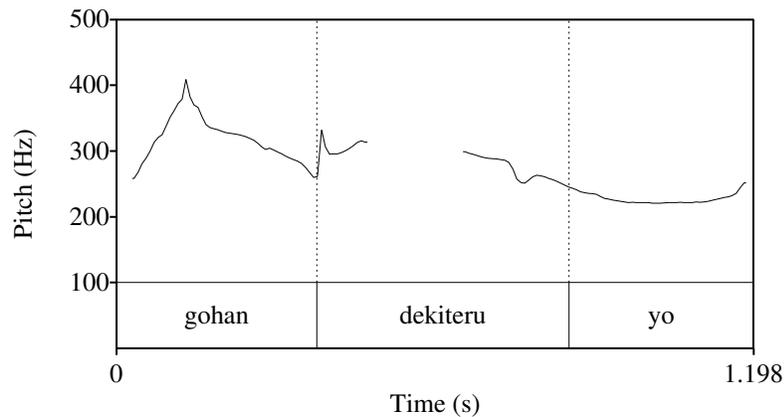
This fall-rise pattern would then contrast with rise-only and fall-only patterns, in which  $\Uparrow$  or  $\Downarrow$  occur in isolation. This would lead to a three-way intonational distinction of *yo*-marked sentences. Although it requires further verification, consultation

with native speakers suggests that this three-way distinction is real, and corresponds to pragmatic differences that follow from the semantics of  $\Downarrow$  and  $\Uparrow$ . Consider for example the sentence in (111).

- (111) gohan dekiteru *yo*  
 dinner is.ready *yo*  
 “Dinner is ready *yo*.”

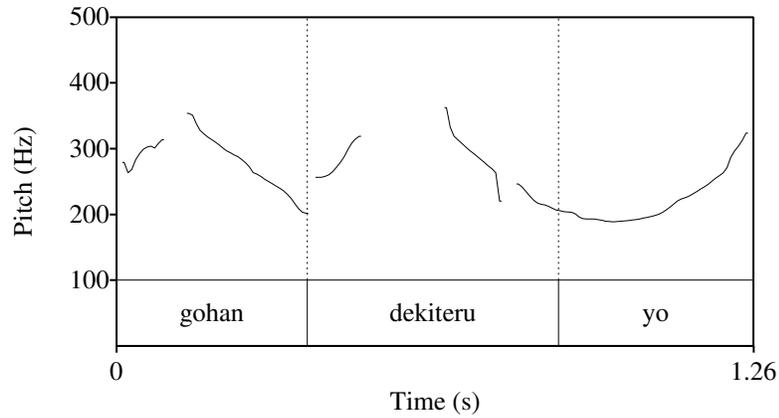
To test for the possibility of a three-way contrast, I asked a native speaker consultant to produce this sentence in three contrasting contexts. The first context and associated pitch track are given in (112).

- (112) Context: Mom has finished preparing dinner, and is calling the family to come eat.



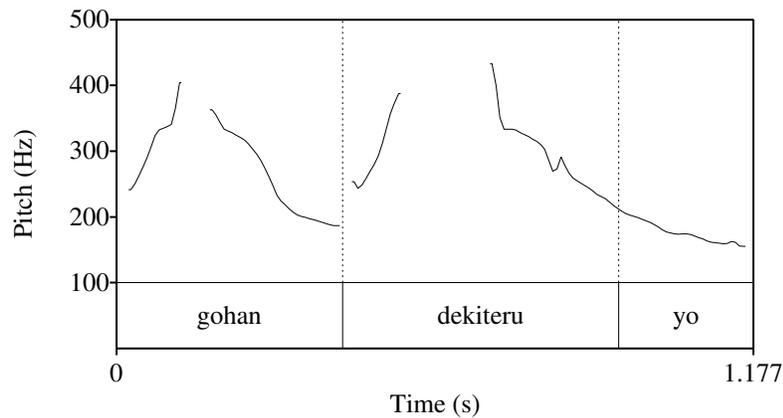
The context in (112) is one in which the speaker is providing a guide to action (come eat!), but is not in any obvious sense “correcting” the people she is talking to. The pitch track here is “flat”, like those seen earlier in (69). This contrasts with the contour associated with the context in (113), which is intuitively both a correction (“stop playing games!”) and a guide to action (“come eat!”).

- (113) Context: Although it is past the time that dinner always starts, the speaker’s son is absorbed in a video game, oblivious to the fact that dinner is ready.



Comparing the two pitch tracks, it is clear that the one in (113) has a pronounced fall-rise contour by comparison to the flat contour in (112). Semantically, we can account for this distinction by positing that both sentences contain  $\uparrow$ , since they both constitute a guide to action (“come eat!”). The sentence in (113) has  $\downarrow$  as well, reflecting its corrective content. Both of these productions contrast with the one in (114), whose context suggests an emphatic correction, without the guide to action component of the other two.

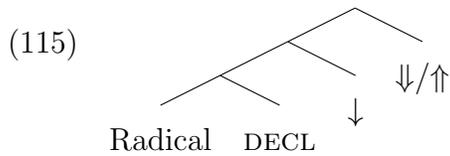
- (114) Context: Although dinner has been ready for some time, the speaker’s son asks “Isn’t dinner ready?” in an ill-humored tone.



The context in (114) gives rise to a corrective utterance (“of course dinner’s ready, what are you thinking?”), without the guide to action (“come eat!”) of the other two. Semantically, this can be attributed to the presence of  $\Downarrow$  and the absence of  $\Uparrow$ , giving rise to a purely corrective utterance.

While suggestive, the data need further substantiation through systematic production studies. If the three-way contrast is real, we also need to know why the combination of  $\Downarrow$  and  $\Uparrow$  gives rise to a fall-rise contour, rather than to a rise-fall. Semantically, the two particles should be possible in either order, meaning that we need a phonological explanation for the observed order.

I have also left unexplained the fact that the intonational particle  $\Downarrow$  does not seem to combine with either  $\Downarrow$  or with  $\Uparrow$ . We need to rule out the structures in (115).



Semantically, there is nothing wrong with (115), meaning that some other constraint in the grammar must rule it out. I leave the explanation for this gap to future research.

### 3.4 The Profile of *yo* in a Large Sentiment Corpus

In this section, I present quantitative corpus data supporting the analyses of  $yo\Uparrow$  and  $yo\Downarrow$  presented in this chapter. The text and results presented here derive largely from Davis (2010), although the details have been altered to fit with the relational CCP approach adopted in this dissertation, as well as the distinctions between  $yo\Uparrow$  and  $yo\Downarrow$ . The data come from a recently expanded version of the publicly available UMass Amherst Sentiment Corpora (Constant et al. 2008, Potts and Schwarz 2008). The Japanese corpus contains approximately 33 million words of text culled from reviews of various products (books, dvds, electronics, and games) appearing on the

Japanese Amazon website, Amazon.co.jp. All reviews on the site are associated with a product rating given by the reviewer, ranging from 1 to 5 stars.

Sentiment corpora provide an objective scale along which the author’s *sentiment* or *evaluation* of the target product can be estimated, a technique pioneered by researchers in the burgeoning field of *sentiment analysis* (Pang et al. 2002, Pang and Lee 2005). Using the sentiment corpus, we can look at the distribution of *yo* across different rating categories, and get a sense for how it correlates with speaker sentiment. Unfortunately, we have the problem that intonation is not marked in the corpus. Thus, a given token of *yo* might reflect the use of *yo*↑ or of *yo*↓. There is corpus evidence, however, that *yo*↑ is more common than *yo*↓. I briefly discuss this evidence before moving on to discuss the distribution of *yo* in the sentiment corpus.

### 3.4.1 The Relative Frequency of *yo*↑ and *yo*↓

The rising and falling tunes associated with ↑ and ↓ can be identified phonologically with two of the five *boundary phrase markers* (BPMs) discussed by Venditti et al. (2008) within the framework of X-JToBI (extended Japanese ToBI, an extension/revision of the J-ToBI schema (Venditti, 2005), which in turn is based on the theory of Japanese intonational structure of Pierrehumbert and Beckman (1988)). BPMs are a robustly attested phenomenon in spoken Japanese, and are generally considered to be ‘pragmatic morphemes’ (see Venditti et al. 2008, p.13 for discussion and extensive references). Under the analysis implicit in the X-JToBI labeling schema, BPMs are associated with the right edge of an accentual phrase and can thus occur both sentence-medially and sentence-finally.

The dialogs from the “core” portion of the Corpus of Spoken Japanese (Kokuritsu Kokugo Kenkyuujo [National Institute for Japanese Language], 2006) contain 45 utterance-final occurrences of *yo* with associated X-JToBI intonational labeling, 33 of which are associated with the rising BPM tunes L%H% or H%, and 12 with

the falling BPM tune L%. Based on these data, I assume that the morpheme I represent as  $\uparrow$  is realized phonologically by a tune on the intonational tier which in the X-JToBI system is represented as the tune (L%)H%. With this correspondence in place, we can see that  $yo\uparrow$  is almost three times more common than  $yo\downarrow$  in the CSJ (33 occurrences of  $yo\uparrow$ , 12 occurrences of  $yo\downarrow$ ). A  $\chi^2$  test confirms the significance of this different frequency of occurrence,  $\chi^2(1, N=45) = 9.8$ ,  $p = 0.001745$ . This distributional difference suggests that  $yo\uparrow$  is in some sense the more canonical use of  $yo$ . At a practical level, this bias for  $yo\uparrow$  should be borne in mind when analyzing corpus data for which intonational information is not provided. The characteristics of such data are at least as likely to be due to the influence of  $yo\uparrow$  than  $yo\downarrow$ , at least if the distribution in the CSJ is at all typical.

### 3.4.2 A Tendency towards Extreme Sentiment

To analyze the association between specific lexical items and associated rating scores in the sentiment corpus, the *relative frequency* of an item across the five rating categories is calculated.<sup>12</sup> As a first approximation, we can say that 1 and 5 star reviews are extremely negative and positive, respectively, while 2 and 4 star reviews are associated with more moderate negative and positive evaluations. 3 star reviews are associated with a high degree of ambivalence or lack of a strong evaluative stance with respect to the target product.

With this understanding of the rating scales, we can think of the middle value (3 stars) as a kind of “baseline”, with other values defined as either positive (4 and 5 stars) or negative (1 and 2 stars) by comparison. I spell out this intuitive interpretation of the ratings by transforming the rating categories to a *sentiment index* such that sentiment index = star rating – 3. This centers the sentiment index values on 3 stars, so that a star rating of 3 maps to a centered sentiment index of 0 on the

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<sup>12</sup>Relative frequencies are used because there is a bias toward more positive reviews in the corpus.

$x$ -axis of the graphs to be presented. In this way, negative numbers reflect negative evaluations (1 and 2 star reviews correspond to sentiment indices of  $-2$  and  $-1$ ), and positive numbers reflect positive evaluations (4 and 5 star reviews correspond to sentiment indices of 1 and 2). Moreover, the absolute value of the sentiment index is an approximate measure of how *extreme* the review is, and how extreme the reviewer's sentiments about the product are. A 1-star review gets a sentiment index of  $-2$ , and a 5-star review gets a sentiment index of  $+2$ . Taking the absolute value of the sentiment index, we see that both kinds of review are more extreme than the other rating categories.

In looking at the distribution of items in this corpus, I will use graphs in which the  $y$ -axis plots the *log odds* of the item in the corpora. The motivation for using log odds with this kind of data is laid out in Potts and Schwarz (2008). Briefly, the use of log odds allows us to fit logistic regression models to the data, in order to test for the statistical significance of certain trends in the distribution of an item across rating categories. Log odds are derived from the more intuitive *relative frequency* measure. The relative frequency of a lexical item in a given rating category is calculated by dividing the number of tokens of the item in that category by the total number of tokens of all lexical items in that rating category. For example, if there were 1000 words of review text in a given rating category  $R$ , and there were 10 tokens of lexical item  $i$ , then the relative frequency of  $i$  in  $R$  would equal  $10/1000 = .01$ . This gives us the probability that any given item in a text from  $R$  will be  $i$ ; for this example,  $P(i, R) = .01$ .

To get log odds, we first go from probabilities to odds. Unless you are a gambler, the use of odds may not be intuitive, but they are related to the more familiar notion of probability by the equation in (116)

$$(116) \quad \text{odds}_{i,R} = \frac{P(i, R)}{1 - P(i, R)}$$

We get log-odds by taking the natural log of the odds:

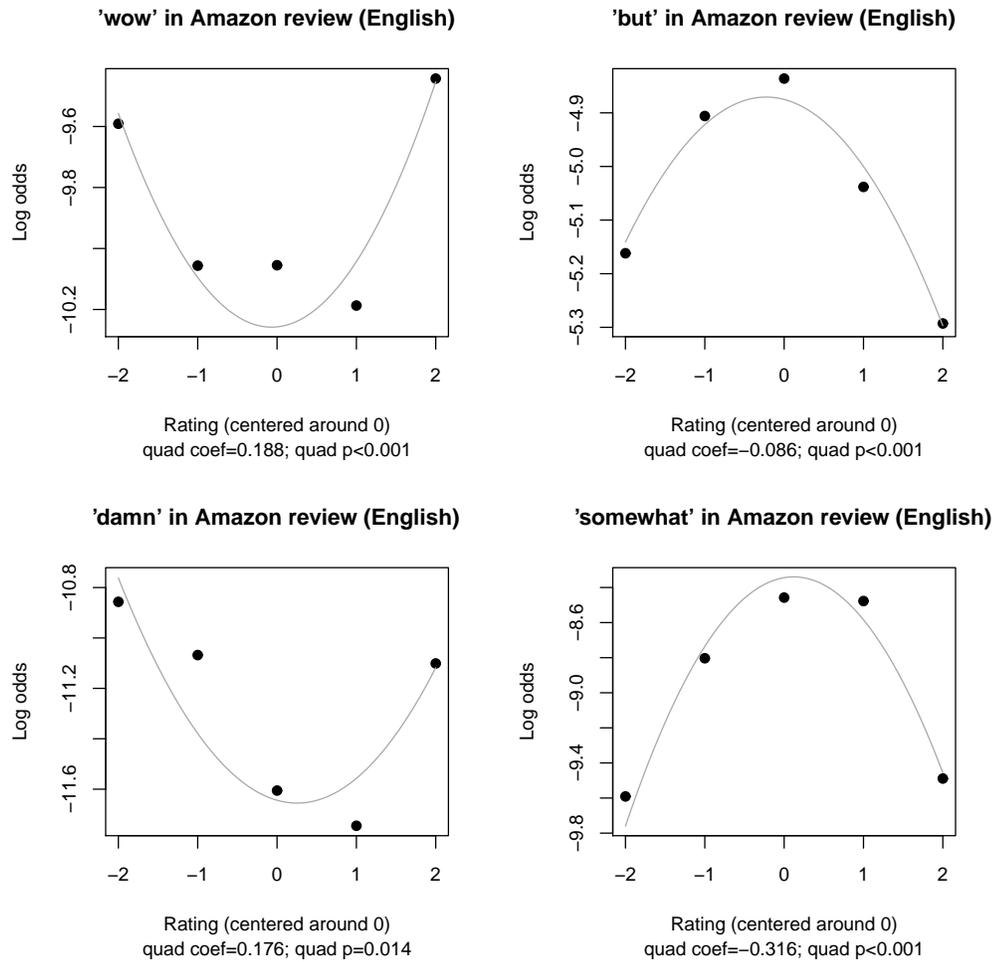
$$(117) \quad \text{log-odds}_{i,R} = \ln(\text{odds}_{i,R})$$

The move from odds to log-odds is motivated by two things. First, it allows us to compare differences in odds across categories for items with very different base frequencies. Second, it is required for doing statistics using *logistic regression*. Logistic regression is the appropriate way to test for certain statistical patterns in categorical data, as discussed by Jaeger (2008) in the context of (psycho)linguistic research. I will use logistic regression models to test for U-shaped distributions of items in the corpus, as discussed just below.

To see how the corpus can be used to detect patterns of usage, I begin with some familiar lexical items from English. The left side of Figure 3.1 shows the distribution of the English expressives *wow* and *damn* in the review texts of the English Amazon corpus across the five centered ratings categories. Both *damn* and *wow* have a clear U-shaped distribution across the rating categories. This impression is confirmed statistically by fitting the data to a *quadratic* logistic regression model. This models the distribution of a dependent variable  $y$  (here, the log odds of a lexical item) as a function of an independent variable  $x$  (here, the sentiment index of the review), using the equation in (118). This equation describes a *curve*, and logistic regression fits the best curve possible from (118) to the data.

$$(118) \quad y = \beta_0 + \beta_1x + \beta_2x^2$$

The coefficient of interest here is  $\beta_2$ , the *quadratic coefficient*. This coefficient tells how quickly the slope of the curve changes as a function of  $x$ . We can use the value of this coefficient to test for *direction* and *magnitude* of the curvature of a distribution. A positive value means that we have a U-shaped curve, while a negative value means that we have an inverse-U. The absolute value of this coefficient corresponds to the severity of the curve, with higher values giving us more extreme distributions. The graphs in Figure 3.1 give the quadratic coefficient from the associated regression



**Figure 3.1.** Distribution of *wow*, *damn*, *but*, and *somewhat* in the review text of the English Amazon corpus.

model, along with the  $p$ -value, which tells us how statistically significant the U or inverse-U tendency in the data is.

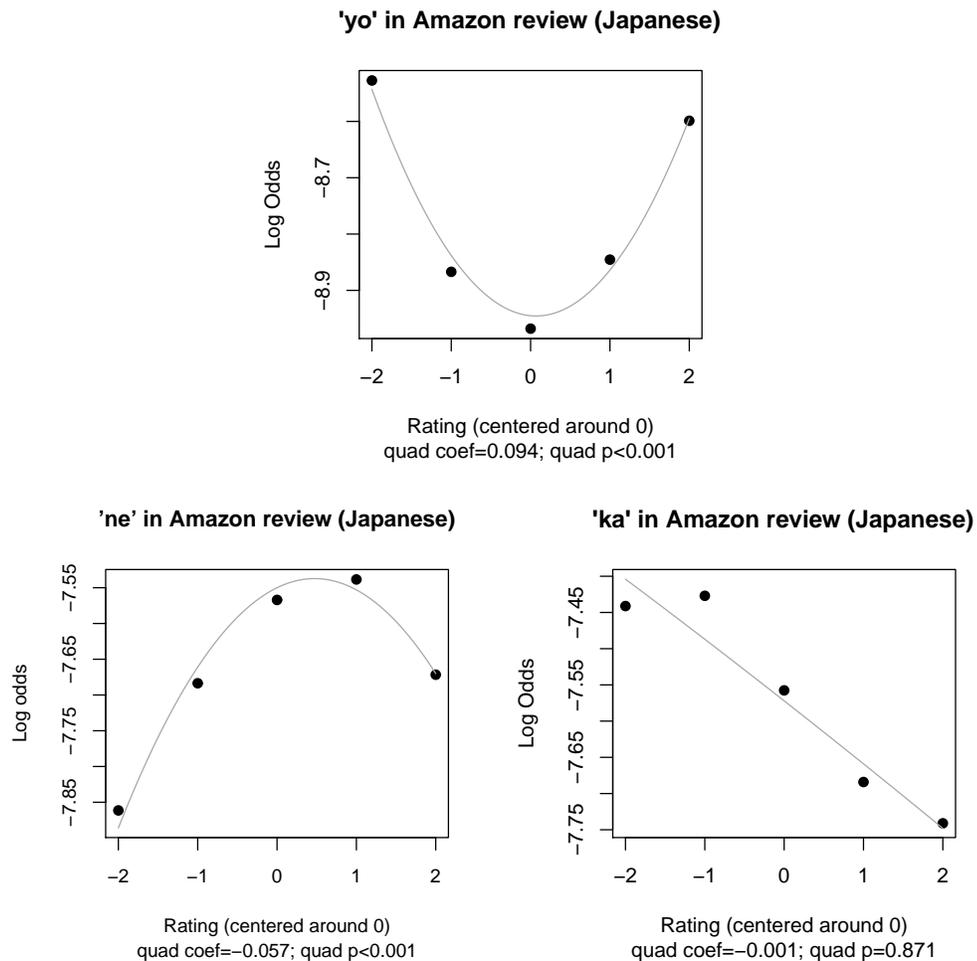
The significant U-shaped distributions of *wow* and *damn* in Figure 3.1 indicates a tendency for these items to be used in reviews whose author has a relatively extreme opinion toward the item being reviewed, with a correspondingly strong recommendation, whether positive or negative. This tendency is statistically significant, as demonstrated by the low  $p$ -values of the associated quadratic coefficients. The right side of Figure 3.1 shows items with the opposite distributional pattern, an inverse-U

shape in which use is more frequent in the non-extreme rating categories. In English, the conjunctive particle *but* and the adverb *somewhat* exhibit this profile. The inverse-U shape for these items is also statistically significant based on the  $p$ -value for the quadratic coefficient.

It is conceivable that expressives like *wow* or *damn* directly index speaker emotionality, in which case their distribution in the corpus might be a direct reflection of their meaning, insofar as review category serves as a proxy for emotional state. This interpretation of the sentiment data relies on a (potentially indirect and fuzzy) mapping from emotional state to sentiment index, and vice-versa. Their distribution across sentiment indices thus supports the analysis of these items as expressing heightened speaker emotionality, and at the same time provides a means for empirically estimating the degree of heightened emotion expressed by a given item in comparison with other expressive items. This perspective has been adopted for the analysis of expressive items exhibiting a U-shaped distribution in these corpora by Potts and Schwarz (2008), Constant et al. (2008), and Davis and Potts (2010).

Looking to the inverse-U distribution associated with English *but* and *somewhat*, an expressive analysis is perhaps less appealing. Intuitively, we can understand the inverse-U associated with this item as a kind of epiphenomenon arising from this item's (non-expressive) semantics/pragmatics. Roughly, *but* is used to indicate some kind of contrast. In the context of product reviews, a likely dimension along which to register contrast is that of positive or negative attributes of an item, or the positive or negative reactions to the item. In a highly positive or highly negative review, the reviewer is more likely to be uniformly positive or negative toward the various features of the item, and hence less likely to use a contrastive particle like *but* to register contrast along the dimension(s) reflected in the review score itself. An ambivalent reviewer, on the other hand, would have more cause to use the particle, since (s)he presumably likes some aspects of the product, but not others.

Turning to Japanese, Figure 3.2 shows the distribution of *yo*, along with the sentence final particles *ne* and *ka*. The particles *ne* and *ka* are chosen for comparison because they have a similar syntactic distribution to *yo*, appearing only in matrix sentence-final position. The particles *yo* and *ne* exhibit opposite patterns, with *yo* showing the U-shaped distribution typical of expressives, and *ne* showing an inverse-U. The quadratic terms in the associated logistic regression models are significant, suggesting that the pattern is a real one. The sentence-final question particle *ka* does not have a significant quadratic component in the regression model of its distribution at all.



**Figure 3.2.** Distribution of *yo*, *ne*, and *ka* in the review text of the Japanese Amazon corpus.

As just discussed, there are a number of different ways that these data can be understood. An expressive approach to the distribution would claim that the profiles of these particles are a more or less direct reflection of their meaning. For *yo*, the U-shape would result from the fact that *yo* directly indexes heightened speaker emotionality, while *ne* presumably indexes the opposite. The other approach, mirroring that sketched for English *but*, would derive these distributional differences in the corpus as a (potentially highly indirect) reflex of a basically non-expressive meaning, or at least a meaning that is not in any direct way tied to speaker emotionality.

The semantics of  $yo\uparrow$  hints at an explanation of the second kind. The analysis of  $\uparrow$  in terms of decision-problems encourages a new perspective on the sentiment indices in our corpora. In addition to correlating with author *emotionality*, these indices reflect the degree to which the author endorses the product, and hence the degree to which (s)he thinks that any given reader should purchase the product. The structure of our sentiment corpus can be mapped readily onto the formal model of decision problems and discourse contexts adopted in the analysis of  $\uparrow$ . The background problem addressed by a review for item  $i$ , we can assume, is the question “Should one purchase item  $i$ ?” Formally, this is represented by a contextual action set  $\mathcal{A}_x^c = \{\lambda x.\text{buy}(i)(x), \lambda x.\neg\text{buy}(i)(x)\}$ , where  $x$  is resolved to whoever is reading the review.

With the 0-centered five star rating system, we can give an approximate estimate of how strongly the reviewer is recommending the product, or recommending against it. As a first approximation, we can assume that reviewers who give a negative ( $-2$  or  $-1$ ) rating are recommending that the reader not buy the product, while those who give a positive (1 or 2) rating are recommending that the reader buy the product. Reviewers who give a neutral (0) rating can be taken as more ambivalent, not making a firm recommendation either way. These need not be hard-and-fast associations,

just tendencies. The rating categories thus give us a rough measure of *which action* the reviewer is recommending (to buy or not to buy).

Within the positive and negative review categories, we can further distinguish moderate (1, -1) and extreme (2, -2) reviews. In the context of our decision problem, we can assume that an extremely positive review will in general be one in which the author is more strongly recommending that the reader buy the product than a more moderate positive review. Similarly, extremely negative reviews will tend to associate with more extreme negative recommendations than more moderate negative reviews. The rating categories thus give us a rough measure of *how strongly* the reviewer is making their recommendation (whether positive or negative).

We can now link the structure of the reviews in our sentiment corpus to the semantics of  $yo\uparrow$ . The review is written in a context with a highly salient decision problem: whether or not to buy the product being reviewed. Reviewers in the more extreme categories have more extreme views on this issue, and are correspondingly more likely to make a strong suggestion that the reader either purchase or not purchase the product. This fact is reflected in the relative frequency with which  $yo$  is used in these reviews. Informally, we can understand the U-shaped distribution of  $yo$  as resulting from the fact that more extreme reviews make stronger recommendations than moderate reviews, and that  $yo\uparrow$  (and therefore  $yo$ ) tends to occur in contexts where the speaker is making a strong recommendation.

This analysis pins the U-shape on the effects of  $\uparrow$ , but we can also see how the corrective semantics of  $yo\downarrow$  might have a similar effect. Roughly, we might expect that corrective moves are associated with more strongly opinionated reviewers, and hence correlate with more extreme review categories. The U-shaped distribution of  $yo$  in the sentiment corpus thus provides indirect evidence in favor of the analyses of  $yo\uparrow$  and  $yo\downarrow$  in this chapter. There are of course many other reasons why a lexical item might exhibit a U-shaped distribution, as I mentioned in the discussion of English

expressives, but the analysis of  $yo\uparrow$  and  $yo\downarrow$  give us a plausible explanation for this tendency in the case of  $yo$ . I now turn to another distributional characteristic of  $yo$  in this corpus, which suggests that  $yo$  is used to make *issue-settling* moves, in line with the discussion of  $yo\uparrow$ .

### 3.4.3 Sentence Final, Discourse Final

The particle  $yo$  is syntactically restricted to matrix clause-final position. Examination of the position of  $yo$  in the review texts of the sentiment corpus shows a tendency for  $yo$  to appear text-finally as well. In this subsection, I present statistical evidence from the sentiment corpus supporting this generalization. I then discuss the way in which this empirical generalization fits into the theory of  $yo\uparrow$  outlined above.

To explore the textual position of  $yo$ , I extracted from the Japanese Amazon corpus every review containing one or more instances of a matrix, sentence-final use of  $yo$ . This excludes uses of  $yo$  in quotative contexts, as well as cases where  $yo$  is followed by another particle; such cases do not fall within the analysis presented in this dissertation.<sup>13</sup> A total of 4,486 reviews were found containing such tokens of  $yo$ , containing a total of 5,283 tokens.<sup>14</sup> The textual position of each token of  $yo$  was then calculated by counting the number of characters that preceded  $yo$  in the text. For a given review text, we can then get the textual position of  $yo$  by dividing the textual position of  $yo$  by the total number of characters in the text, to get a value between 0 and 1.<sup>15</sup>

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<sup>13</sup>In particular, the particle sequence  $yo\ ne$  is excluded from consideration.

<sup>14</sup>This means that some reviews contained more than one token of  $yo$ . Because of the way the data were extracted, such multi-token reviews might allow some non-matrix-final tokens of  $yo$ , but this is merely a source of noise, through which the patterns exhibited by matrix tokens of  $yo$  can still be seen.

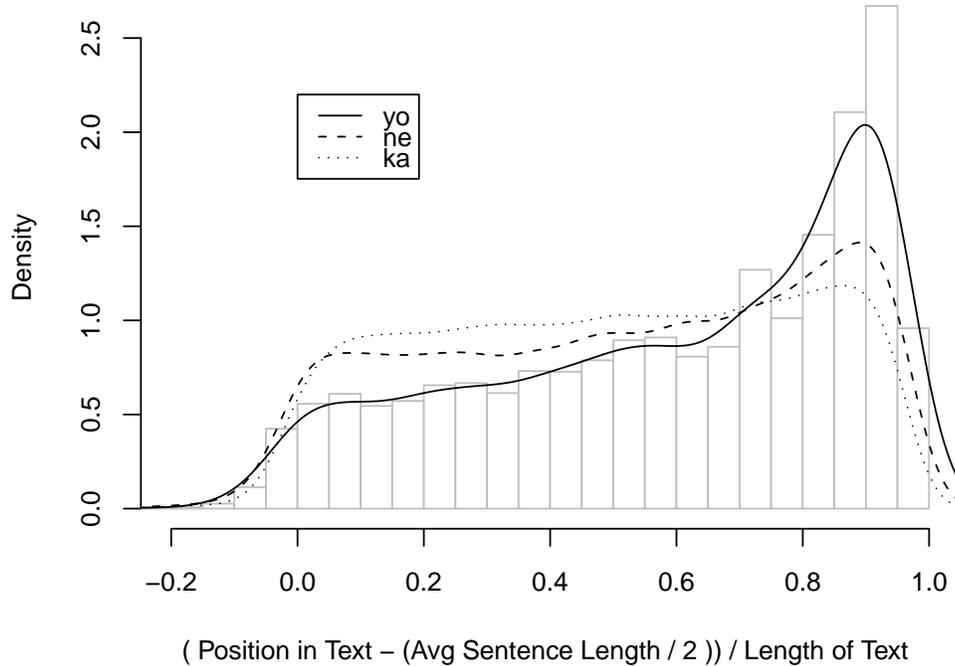
<sup>15</sup>For technical reasons involving text processing unicode characters, the values were actually calculated in terms of bytes rather than characters. This difference does not introduce any significant differences from the idealization of the calculation given in text.

The sentence-finality of *yo* introduces a confound in the calculation of textual position described above. To illustrate, consider a subset of reviews consisting of just two sentences of roughly equal length. Syntactically, *yo* can only occur at the end of the first sentence, or at the end of the second sentence. If it occurs at the end of the first sentence, its textual position will be approximately 0.5, or halfway through the text. If it occurs after the second sentence, its textual position will be 1. If *yo* occurs equally often on the first or second sentence in such reviews, then the average textual position will come out to 0.75. The sentence-finality of *yo* has introduced a bias towards occurring later in the text, which has nothing to do with discourse or text-level constraints on the use of *yo*.

To eliminate this confound, I calculated a corrected textual position for each occurrence of *yo* using the following procedure: I calculated the average sentence length in a review, then subtracted half of the average sentence length from the character position of each occurrence of *yo* in that review. In the example outlined above, this would give corrected textual positions of 0.25 for a token of *yo* occurring after the first sentence, and a value of 0.75 for a token occurring after the final sentence. The corrected average textual position for a set of two-sentence reviews with an equal likelihood of *yo* after either sentence would tend toward a mean corrected position value of 0.5.

The graph in Figure 3.3 shows a histogram and estimated density plot of the corrected textual position of *yo* in the corpus. The mean value of the corrected textual position is 0.6, with a median of 0.67. Even with the corrected positional values, it is clear that there is bias toward later positions in the text, with a highly skewed distribution of values. This distribution can be compared with that of the question particle *ka* and the discourse particle *ne*, both of whose syntactic distributions are

### Corrected Textual Position of *yo*, Compared to *ne* and *ka*



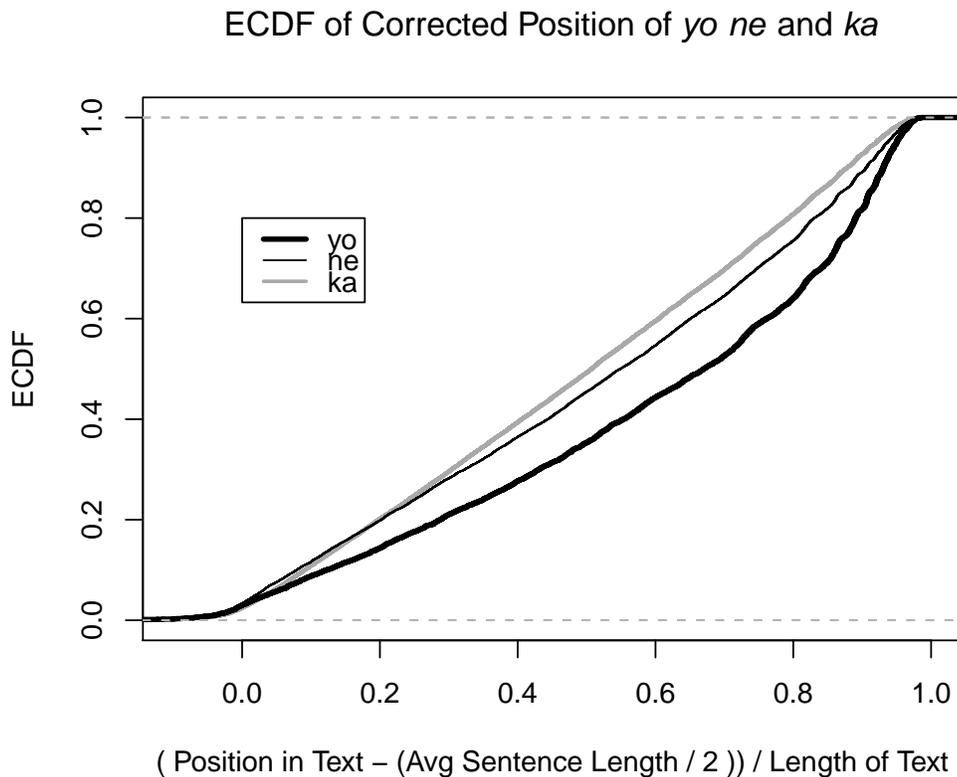
**Figure 3.3.** Histogram and density plot showing the density of the corrected position of *yo* at different points in the review text. Density estimates for two other sentence final particles are provided for comparison.

similar to that of *yo*, in that they must appear sentence-finally.<sup>16</sup> The estimated densities for these particles across textual positions were calculated using the same procedure as described for *yo*. The mean corrected textual position of *ka* is 0.49, with a median value of 0.51. The mean value for *ne* is 0.52, with a median value of 0.55. As can be seen from the graph in Figure 3.3, neither particle is as biased toward text-finality as *yo*, although *ne* seems to exhibit a slight bias in the same direction, for reasons I do not understand.

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<sup>16</sup>Like *yo*, *ne* is restricted to matrix clause-final position, while *ka* can appear in embedded clauses. In making my calculations, I considered only those instances of *ka* that appeared matrix clause-finally.

The difference between these empirical distributions can be tested statistically using a two-sample Kolomogorov-Smirnov (KS) test. This test works by looking at the *empirical (cumulative) distribution function* (ECDF) of two distributions, and checks the likelihood that the two empirical distributions were drawn from the same underlying distribution. The ECDFs of the three particles are shown in Figure 3.4. The  $x$ -axis represents the corrected position of the particle in the review text, as in Figure 3.3. The ECDF gives for each value of  $x$  the proportion of occurrences of the particle occurring at or before position  $x$ .



**Figure 3.4.** Empirical cumulative distributions of *yo*, *ne*, and *ka*.

If the particle is equally likely at any position, the ECDF should approximate a straight line. This is what we see for *ka*, which reflects the fact that it does not seem biased toward occurring at any particular point in a review text. The ECDF of *yo*

shows a clear concave curvature compared to the flat distribution of *ka*, reflecting the fact that the distribution of *yo* is uneven, with more occurrences near the end of a review text. The ECDF of *ne* also exhibits a slight concave curvature, but not as extreme as that of *yo*. The concavity of the ECDF thus serves as an empirical estimate of how biased a particle is toward occurring near the end of the review text. To test the difference between the ECDF of *yo* and that of the other particles, I applied a two-sample KS test. This returns a test statistic,  $D$ , equal to the largest distance between the two ECDFs being compared. The difference between *yo* and *ne* was highly significant ( $D = 0.1216$ ,  $p < 2.2 \times 10^{-16}$ ), as was the difference between *yo* and *ka* ( $D = 0.174$ ,  $p < 2.2 \times 10^{-16}$ ).

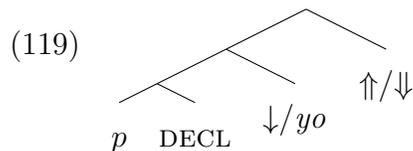
The empirical tendency for text-finality of *yo* follows from the semantics of  $\uparrow$  when we make a few idealizations about the structure of the review texts and the rhetorical strategies adopted by authors. In the case of extremely favorable or extremely negative reviews, we can assume that most or all of the sentences in the review will be positive or negative, respectively. In the case of a 5-star review, for example, we expect a text whose sentences are uniformly positive with respect to the product. Each sentence provides a fact or sentiment that supports the conclusion that one should buy the product. The first sentence in the review is made in a null context, and adds a single fact or sentiment relevant to the question of whether to buy the product. This adds a piece of information relevant to this decision, intended to sway the reader toward buying the product. The next sentence is made in the (positive) context created by the previous sentence. If this sentence is also positive, we now have a context with *two* pieces of information supporting the conclusion advocated by the author. And so on. When the author uses  $yo\uparrow$ , they indicate that the issue has now been settled. Rhetorically, it makes sense to save this sort of move for last.

As with the corpus data discussed earlier, the ambiguity of *yo* (compatible with either  $yo\uparrow$  and  $yo\downarrow$ ) introduces a confound. The semantics of  $\uparrow$ , however, provides a

plausible explanation for the trend for text finality. As an author builds a case for a position, the common ground becomes more supportive of that position. Since  $yo\uparrow$  requires that the common ground be sufficient to make a particular action optimal, it tends to occur later in a text, when the context has been enriched with enough information to favor one action over another. Looking at things from the other direction, once an author has used  $yo\uparrow$ , he has rhetorically indicated that he takes the issue to be settled. Such an issue-settling move, I suggest, tends to be made text-finally.

### 3.5 Summary

In this chapter, I have argued for a semantic decomposition of  $yo\uparrow$  and  $yo\downarrow$ , providing evidence for intonational particles  $\uparrow$  and  $\downarrow$  that combine with  $yo$  itself. These particles constrain the CCP semantics of the entire sentence, which in turn influences the pragmatic interpretation of the resulting utterance. The resulting inventory of particles and their structural position in a declarative clause is diagrammed in (119).



In the next chapter, I extend this picture to imperatives. I show that  $\downarrow$  and  $yo$  attach to imperatives, producing pragmatic contrasts parallel to those seen with declaratives. We also find intonational distinctions in  $yo$ -marked imperatives that parallel those seen in this chapter. These facts will be analyzed by building a semantics for the imperative clause that parallels that of declaratives.

## CHAPTER 4

### IMPERATIVES WITH *YO*

In this chapter, I extend the semantics of  $\downarrow$ , *yo*,  $\uparrow$ , and  $\Downarrow$  to imperatives. In §4.1, I extend the model of contexts to include an agent's *public intentions*. I then propose a CCP semantics of imperative clauses in §4.2 that targets these intentions, parallel to how declaratives target public beliefs. I show that *yo* and  $\downarrow$  combine with imperatives in a way that parallels their contribution to declarative clauses. The contribution of intonation in *yo*-marked imperatives also parallels that in declaratives, as I show in §4.3. This provides further support for the semantics of  $\uparrow$  and  $\Downarrow$  laid out in the last chapter.

#### 4.1 Public Intentions and Imperative Update

I use the label *imperative* to describe a *clause type*, rather than a kind of speech act. Imperatives are, like declaratives, characterized by certain syntactic and/or morphological characteristics, depending on the language we are looking at. Like declaratives, we can give an update semantics to imperative clauses, according to which they give rise to relations between contexts. There are two main issues in giving a dynamic semantics to imperatives. First, we must decide what feature(s) of the context these sentences conventionally update. Then, we must decide how this update is achieved.

##### 4.1.1 Public Intentions

In answer to the first question, a number of researchers (Han 1998b, 1999, Potts 2003, Roberts 2004, Portner 2004, a.o.) have proposed that the formal model of

discourse context be enriched with an agent-specific set of commitments whose update is the target of imperatives. Han (1999), for example, proposes a model in which each agent is associated with a *plan set*, modeled as a set of (irrealis) propositions to whose realization the agent is taken as being committed. Portner (2004) argues for a similar model, in which each discourse participant is assigned a *To-Do List*, which is a set of properties that the agent is committed to making true of himself.

While the formal details differ, both plan sets and to-do lists are a means of formally specifying an agent’s *public intentions* in a way that is analogous to the model of public beliefs laid out by Gunlogson (2003) and developed in the previous chapters. Whereas public *beliefs* are a way to model the propositions to whose *truth* an agent is committed, public *intentions* are a way to model the propositions to whose *realization* the agent is committed, and which the agent thus *intends* to make true of the actual world. In order to keep the parallel between public beliefs and intentions maximally clear, I will extend the model of contexts developed so far to include, for each discourse participant, a set of propositions representing their public intentions.

Like their public beliefs, an agent’s public intentions are modeled as a set of propositions. This set is understood as providing information as to how the agent intends the world to become, rather than information about how the agent thinks the world actually is. For example, if the proposition  $p = \text{“Bill goes to the store”}$  is an element of  $x$ ’s public intentions in  $C$ , then  $x$  is understood as intending that Bill go to the store in  $C$ . Formally, an agent’s public intentions are represented as in (120).

(120) For any context  $C$  and agent  $x \in DP^C$ :

$$PI_x^C =_{\text{def}} \left\{ p \mid p \text{ is a public intention of } x \text{ in } C \right\}$$

For a dialogue with two agents  $A$  and  $B$ , we have the expanded model of discourse contexts  $C = \langle \{A, B\}, PB_A^C, PB_B^C, PI_A^C, PI_B^C \rangle$ .

An agent  $x$ ’s public intentions in a context  $C$ ,  $PI_x^C$ , is a set of propositions which constitute the agent’s public goals in  $C$ . If some proposition  $p$  is an element of

$PI_x^C$ , then  $x$  is understood as being committed to behaving in such a way that the proposition  $p$  holds of the real world. For example, if the proposition “John comes in the office” is entailed by  $PI_x^C$ , then discourse agent  $x$  is committed to an intention that the actual world be one in which John comes into the office.

Intention is a big topic, with many unresolved issues both philosophical and empirical. Then again, so is belief. I will adopt a “common-sense” view of intentionality, according to which a public intention to a proposition  $p$  is a commitment to behaving in such a way that  $p$  is realized. As will be seen, this may be a bit too strong for the interpretation of all imperatives. We might instead take what I am calling public intentions to be mere public *preferences*. But the stronger formulation will do for now.

#### 4.1.2 Semantics of Imperatives

The public intentions introduced above will be the target of imperative update. But how does this happen? There are a number of competing proposals in the literature. On one extreme is Portner (2004), who argues that there is no context-change encoded in the semantics of imperatives (or any clause type). Rather, imperatives denote a special kind of property (one which is only defined for the contextual addressee), and an utterance of an imperative is interpreted pragmatically as an instruction to the addressee to update his or her own to-do list with the content of the imperative. Han (1999) gives a fundamentally different view of imperative semantics:

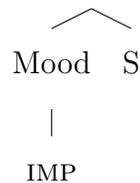
Our main proposal is that the directive illocutionary force of imperatives is not the result of Gricean reasoning or inference, but is directly encoded in their logical form, and that Gricean reasoning plays a role in the variability of directive force. We define directive force as a function that takes a certain type of proposition and turns it into a DIRECTIVE ACTION, which we in turn define as an instruction to the hearer to update his or her PLAN

SET. A plan set is a set of propositions that specify the state of affairs that the hearer intends to bring about.

(Han, 1999, p.97)

In Han's account, an imperative is *semantically* an instruction to the addressee to update his or her plan set. This is achieved by a two-part logical form of imperative sentences, in which a sentential radical S expresses an irrealis proposition, and imperative morphology contributes *directive force*.

(121) Sentence



This analysis rests on an assumption that the logical form of imperatives is divided into a sentential radical and a force-indicating device, in line with the two-level Fregean/Lewisian model outlined in §1.1.

While the accounts of Han and Portner differ in how an agent's public intentions are modeled (as properties or irrealis propositions) and in how update is achieved (by pragmatic reasoning about non-dynamic denotations, or by denotations which encode instructions), there is one important respect in which the two accounts are the same: They both assume that imperative update is fundamentally *addressee-oriented*. This addressee-orientation has two components. First, in a theory like Portner's, the imperative denotes a property that is only defined for the addressee. Intuitively, what this means is that we resolve the empty subject position of an imperative to the contextual addressee. Second, the update associated with the imperative is also addressee-oriented in these accounts. In Portner's account, the utterance of an imperative is interpreted pragmatically as an instruction or request to the addressee to add the property denoted by the imperative to her own to-do list. In Han's account,

the imperative denotes such an instruction, so that the semantics of the imperative is an instruction to the addressee to update her plan set with the propositional radical of the imperative clause.

Condoravdi and Lauer (2010) (henceforth C&L) characterize such addressee-oriented accounts of imperatives as in (122):

(122) **The ‘addressee commitment only’ view**

Utterance of an imperative *p!* commits the addressee to act as though he preferred *p*.

This characterization would seem to require that the very *utterance* of an imperative be enough to impose commitments on the addressee, an aspect which C&L express reservations about. But this is not necessary. Han’s view, for example, is that an imperative encodes an *instruction* to the addressee to have (or behave as if he had) certain preferences, goals, intentions, or the like.

C&L note that the addressee-only view handles command and request uses of imperatives straightforwardly. They argue, however, that an adequate theory of imperatives should be able to handle the full range of uses in (123).

- |       |   |                       |
|-------|---|-----------------------|
| (123) | a. (Mother to child) Clean up your room!            | COMMAND               |
|       | b. Step aside, please.                              | REQUEST               |
|       | c. Please, lend me the money!                       | PLEA                  |
|       | d. Okay, go out and play.                           | PERMISSION/CONCESSION |
|       | e. Have a cookie(, if you like).                    | INVITATION            |
|       | f. Get well soon!                                   | WELL-WISH             |
|       | g. Drop dead!                                       | ILL-WISH/CURSE        |
|       | h. (Doctor to patient) Take these pills for a week. | ADVICE                |
|       | i. Please, don’t have another broken vase!          | WISH                  |

j. Come on, take the ball from me (if you dare)!

DARE

In contrast to the addressee-oriented update semantics/pragmatics of imperatives in accounts like those described above, C&L argue for the speaker-oriented view in (124):

(124) **The ‘speaker commitment only’ view**

Utterance of an imperative *p*! commits the speaker to act as though he preferred *p*.

This view, which is also endorsed by Davis (2009) and Condoravdi and Lauer (2009), makes the contribution of an imperative fundamentally speaker-oriented, in that it conventionally commits the speaker (but not the addressee) to the content of the imperative.

Han herself notes that her account of imperative force predicts that the canonical use of imperatives will be to express orders, commands, requests, and the like, as illustrated by the following examples from Han.

(125) Order, command

- a. Stand at ease! (a commander in the army to his soldiers)
- b. Take down this poem. (a teacher to her class)
- c. Clean that mess up at once. (a mother to her child)

(126) Request

- a. Please bring me some water.
- b. Open the window, would you please?

Han notes, however, that imperatives can be used for apparently non-directive purposes. Han gives as an example a permission-granting use of the imperative; when someone knocks on your door and you reply with the imperative *Come in*, you are not usually understood as making a *demand* on the addressee, but rather giving him permission to do something that he has already expressed a desire to do. Since the

canonical force of imperatives in Han's account cannot directly handle such uses, she proposes that these non-directive uses be understood as a kind of *indirect speech act*, on par with questions used to (pragmatically) request action rather than information:

(127) Can you open the window?

- a. Canonical (i.e. semantic) force: Request for information.
- b. Indirect (i.e. pragmatic) force: Request for action (please open the window).

In contrast, the speaker-commitment view handles these uses in a relatively direct way. The logic is described by C&L for the example in (128).

(128) Daughter: Can I go out and play?

Mother: Okay, go out and play.

C&L's account of the pragmatics:

- Assume a speaker who utters an imperative  $p!$  has the authority to permit and prohibit  $p$ .
- Assume further that it is commonly known that the addressee wants  $p$  to be true.
- Then, by committing herself to act as though she preferred  $p$ , the speaker, in effect, gives permission to  $p$ .

In terms of an agent's public intentions, this explanation amounts to the following. The daughter in (128) is taken to be committed to a public intention to go out and play (henceforth  $p$ ). Thus, the public intentions of the daughter  $D$  in the utterance context  $C$  of the mother  $M$ 's response are such that  $p \in \text{PI}_D^C$ . Moreover, the mother is as yet uncommitted to either  $p$  or  $\neg p$ , so that  $p \notin \text{PI}_M^C$ . Then, the speaker-commitment view of imperative update means that the mother's response creates a post-update

context  $C'$  such that  $p \in \text{PI}_M^C$ , i.e. in which the mother has a public intention that the daughter go out and play. Since the mother has the authority to permit and prohibit  $p$ , the new context, in which the mother has committed herself to act as though she preferred that her daughter go out and play, is sufficient to grant permission to her daughter to do so. There is thus some pragmatic reasoning involved, but it is more straightforward than that required by the addressee-commitment view articulated by Han, who is forced to say that such uses are a kind of indirect speech act, since they in no way register an update to the speaker's own commitments (at least not conventionally).

There thus seems to be some support for the speaker-commitment view of imperatives. C&L do, however, mention a third alternative, the *underspecification view* in (129).

(129) **The underspecification view**

Utterance of an imperative  $p!$  commits an agent  $a$  to act as though he preferred  $p$ , where  $a$  is either the speaker or the hearer.

C&L construe the underspecification view as granting speakers with the ability to commit addressees by the mere utterance of an imperative, the same criticism they lodge against the addressee-commitment view. But here too, the problem disappears when we take the resulting denotation to be a CCP, whose output context is one in which the addressee has certain public intentions. The utterance of a sentence with such a CCP denotation in no way commits the addressee; we get a natural interpretation in which the speaker is *requesting* (or suggesting, demanding, etc.) that the addressee update their commitments in a way consistent with the output of the CCP.

With this apparent problem out of the way, C&L suggest that the underspecification view is not really an improvement on the speaker-commitment only view, since

command uses of the imperative are not problematic for the latter view, which C&L give the following analysis:

- Command-uses will be felicitous only if the speaker has the requisite authority.
- But having this authority just amounts to a socio-cultural circumstance in which the hearer is obliged to defer to the preferences of the speaker.

Since it is mainly command-uses of the imperative that motivate the addressee-commitment view in the first place, C&L argue that it is unnecessary to posit underspecification.

In the next section, I propose a relational CCP semantics of imperative clauses in Japanese. The semantics of the imperative force head IMP builds directly on that of the DECL operator introduced in §2. Since imperatives can combine with both falling intonation (giving rise to “bare” imperatives) and with *yo*, the analysis makes a clear demand: A sentence headed by IMP should denote a CCP with an open agent argument whose resolution depends on whether the sentence ends with ↓ or with *yo*. We are thus led to something like the underspecification view of the semantics of imperatives that C&L argue is unnecessary. After presenting the technical details of the account, I turn to empirical evidence that motivates the idea that an IMP-headed clause is unspecified for the agent whose commitments are to be updated. The evidence depends on pragmatic contrasts between imperatives with and without *yo*, and relies on CCP-based pragmatic reasoning like that introduced in the last chapter.

## 4.2 An Open-Agent CCP Semantics of Imperatives

### 4.2.1 Imperatives in Japanese

Turning to the semantics of imperatives in Japanese, it is necessary first to specify which construction or constructions I will consider. As I have already discussed, I

mean by *imperative* a certain clause type or set of clause types, which can be associated with particular morpho-syntactic features as well as a canonical interpretation. There are several kinds of imperative sentence in Japanese. The first of these is what I take to be the “canonical” imperative. This is formed by attaching a particular suffix to the verbal root. This morpheme is realized as *-e* if the verbal root ends with a consonant, and *-ro* if it ends in a vowel. Examples of both realizations are given in (130). As with English, we have a null subject that is resolved to the contextual addressee.

- (130) a. sake-o            nom-e  
           alcohol-ACC drink-IMP  
           “Drink some alcohol!”
- b. sakana-o tabe-ro  
           fish-ACC eat-IMP  
           “Eat some fish!”

There are at least two other constructions that spell out (some kind of) imperative in Japanese. These are given in (131), along with with the *-e/ro* imperative construction:

- (131) a. ***-e/ro* imperative**  
           sakana-o tabe-ro  
           fish-ACC eat-IMP  
           “Eat some fish!”
- b. ***-nasai* imperative**  
           sakana-o tabe-nasai  
           fish-ACC eat-IMP  
           “Eat some fish!”

c. *-te(kure/kudasai)* imperative

sakana-o tabe-te(-kure/kudasai)

fish-ACC eat-TE(-KURE/KUDASAI)

“Eat some fish!”

The *-nasai* imperative is a lot like the *-e/ro* imperative. The difference seems primarily to be one of politeness or honorific status. The *-nasai* imperative is commonly used by mothers to their children or teachers to their students. It has the feeling of a “firm” imperative, but in some sense more polite than the *-e/ro* imperative. In fact, the *-e/ro* imperative is often felt to be rather abrupt or rude.

The *-te(kure/kudasai)* imperative is even more polite, which probably follows from the fact that it is in some way less direct than the other two imperatives. The suffix *-te* is something like an infinitive in Japanese, and is used to link clauses and certain verbal elements together. The use of the *-te* form of the verb by itself can function as a kind of weak imperative. This is probably a reduced form of *-te(-kure/kudasai)*. The suffixes *-kure/kudasai*, which literally mean something like “give down to”, can be translated as something like “please”. The result is a complex verbal construction that spells out a certain kind of polite imperative. In most social contexts, this would be the preferred way to request that an addressee do something, at least from among these three options.

I will treat all these constructions as encoding the imperative clause type, by which I mean that they contain in their LFs an abstract imperative morpheme IMP. I suggest that the *e/ro* imperative gives us the most “raw” imperative of the three, with the *e/ro* morphology mapping directly onto the IMP force head. The other two constructions will incorporate other meaning elements, in particular ones related to honorification and politeness. I put aside these differences, treating the three constructions uniformly. Potts and Kawahara (2004) have in fact argued that honorific meaning is expressive, in the technical sense of Potts (2005). Expressive meaning

contributes to a separate dimension of meaning, and has no effect on the “regular” semantic dimension. Since the main meaning difference between the three imperative constructions outlined above seems to involve honorification or politeness, their uniform treatment in the regular semantic dimension can be justified under the assumption that any semantic differences will be spelled out in the expressive dimension. Further exploration of these differences, however, will have to await further research.

#### 4.2.2 A Relational CCP Semantics of Imperatives

With this background in place, I proceed to a discussion of the semantics of imperative clauses in Japanese. The semantics of declarative clauses developed in the previous chapters suggests an approach to the semantics of imperatives as well. As noted above, these imperatives have a null subject that ends up associated with the contextual addressee, as in English imperatives. Moreover, we have verbal morphology that seems to spell out imperative force. Like declaratives, I will assume that imperatives are headed by an imperative force head IMP. This morpheme takes a complement of type  $\langle e, st \rangle$  (a property of entities)<sup>1</sup> and returns an “open” CCP with an unspecified set of agents as the open argument.

$$(132) \quad \llbracket \text{IMP } P_{\langle e, st \rangle} \rrbracket = \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket (A_C) \in \text{PI}_{\mathbb{A}}^{C'} \right\}$$

Like declaratives, imperatives denote a function from sets of agents  $\mathbb{A}$  to CCPs in which the commitments of those agents are constrained in the output contexts. Unlike declaratives, the resulting CCP will constrain the agents’ *public intentions*, rather than their *public beliefs*. Which set of agents? As with declarative clauses, this is left open. If we apply the semantics of the particles  $\downarrow$  and *yo* developed in §2 to an imperative with the semantics in (132), we get clear predictions as to how this

---

<sup>1</sup>The exact semantic type of the complement of the imperative is not crucial. Since imperatives systematically lack syntactic subjects, and are interpreted in such a way that the contextual addressee is assigned to the open argument position of the verb, I adopt a property-based analysis.

is resolved, depending on whether we have a bare imperative with a final fall or an imperative with *yo*.

$$(133) \quad \begin{aligned} \llbracket \text{IMP } P \downarrow \rrbracket &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in \text{PI}_{\{s_C\}}^{C'} \right\} \\ \llbracket \text{IMP } P \text{ yo} \rrbracket &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in \text{PI}_{\text{DP}^C}^{C'} \right\} \end{aligned}$$

With a final fall  $\downarrow$ , we get a CCP that makes a requirement of  $\text{PB}_{\{s_C\}}^{C'}$  (the singleton set containing just the speaker) in the output context  $C'$ . With *yo*, we get a requirement on the entire set of discourse participants,  $\text{DP}^C$ . We need only introduce the equivalence in (134), analogous to the equivalence for public beliefs in (44), to derive the interpretations in (135).

$$(134) \quad \text{PI}_{\{x_1, \dots, x_n\}}^C = \bigcap_{i=1}^n \text{PI}_{x_i}^C = \text{PI}_{x_1}^C \cap \dots \cap \text{PI}_{x_n}^C$$

$$(135) \quad \begin{aligned} \llbracket \text{IMP } P \downarrow \rrbracket &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in \text{PI}_{s_C}^{C'} \right\} \\ \llbracket \text{IMP } P \text{ yo} \rrbracket &= \left\{ \langle C, C' \rangle \mid \forall x \in \text{DP}^C : \llbracket P \rrbracket(A_C) \in \text{PI}_x^{C'} \right\} \end{aligned}$$

If we assume an input context  $C$  consisting of just two discourse participants, the speaker  $s_C$  and addressee  $A_C$ , we get the CCP in (136) for an imperative with *yo*.

$$(136) \quad \llbracket \text{IMP } P \text{ yo} \rrbracket = \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in \text{PI}_{s_C}^{C'} \wedge \llbracket P \rrbracket(A_C) \in \text{PI}_{A_C}^{C'} \right\}$$

What we predict then is that a bare imperative with a final fall  $\downarrow$  commits the *speaker* to a public intention that the property  $P$  denoted by the complement of IMP (come to) hold of the addressee. Nothing is said about the commitments of the addressee (although, as with declaratives, we might derive such commitments pragmatically). With *yo*, by contrast, we get a CCP that commits both the speaker and the addressee to a public intention that  $P$  hold of the addressee.

In the rest of this section, I consider data that supports the semantic distinctions in (133), and favors these denotations over both the uniformly addressee-oriented update semantics of Han's account and the uniformly speaker-oriented update semantics of C&L's account. The evidence comes from a pragmatic contrast between

imperatives with and without *yo* in permission-granting contexts. The contrast can be straightforwardly accounted for with the semantics developed above.

### 4.2.3 Imperatives in Permission-Granting Contexts

The open-agent semantics of imperatives is motivated by the use of permission-granting imperatives, like the one in (137).

(137) Context: A has knocked on B's door. B says the following:

“Come in!”

In Han's account, the directive force of imperatives is inherently addressee-oriented. For the example described above, in which the addressee has already expressed an intention to perform the action encoded by the imperative, Han sketches the following sort of pragmatic reasoning:

In a context in which a person A has expressed the desire and intention to perform  $p$ , the implication is that A already has  $p$  in her plan set. For instance, if A knocks on your door, then A is expressing her desire and intention to come in. That is, by knocking on your door, A is implying that her plan is to come in. By uttering *Come in!* in this context, you are acknowledging A's plan, rather than instructing A to update her plan set. It may be that if an imperative  $directive(irrealis(p))$  is uttered in a context in which it is already known that the hearer has  $p$  in the plan set, then it performs the speech act of permission as an indirect speech act.

(Han 1999:102)

While the sort of pragmatic reasoning sketched above may be plausible, it is not embedded in a formal or predictive theory of indirect speech acts. The use of imperatives in such permission-granting contexts is thus an area where the addressee-directed semantics of IMP proposed by Han does not adequately handle the facts. This leads C&L to argue that imperatives target speaker commitments exclusively.

Turning to Japanese, imperatives in such contexts exhibit a contrast in felicity depending on whether they end with a final fall  $\downarrow$  or with *yo*:

(138) Context: A has knocked on B’s door. B says the following:

hair-e      ( $\downarrow/\#yo$ )  
 enter-IMP  
 “Come in ( $\downarrow/\#yo$ ).”

The context of B’s utterance is identical to the one described by Han in her permission-granting examples. B’s utterance is a canonical imperative clause, with overt imperative morphology on the verb. The bare imperative with falling intonation is felicitous in this context. The same imperative with *yo*, however, is felt to be infelicitous or highly marked, regardless of the intonation with which *yo* is used.

The explanation for the contrast proceeds as follows. First, A has indicated via the non-linguistic convention of knocking a *public intention* to enter B’s office. We can also assume that B is not publicly committed to either A’s entering or not entering. The context *C* of B’s utterance in (138) is thus one in which  $P(A)$  is in A’s public intentions  $PI_A^C$ , but neither  $P(A)$  nor  $\neg P(A)$  are in B’s public intentions  $PI_B^C$ , where  $P$  is the property of entering B’s office.

The bare imperative with falling intonation and the imperative with *yo* have the denotations in (135), repeated in (139).

$$\begin{aligned}
 (139) \quad \text{a. } \llbracket \text{IMP } P \downarrow \rrbracket &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in PI_{S_C}^{C'} \right\} \\
 &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A) \in PI_B^{C'} \right\} \\
 \text{b. } \llbracket \text{IMP } P \text{ yo} \rrbracket &= \left\{ \langle C, C' \rangle \mid \forall x \in DP^C(C) : \llbracket P \rrbracket(A_C) \in PI_x^{C'} \right\} \\
 &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in PI_{S_C}^{C'} \wedge \llbracket P \rrbracket(A_C) \in PI_{A_C}^{C'} \right\} \\
 &= \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A) \in PI_B^{C'} \wedge \llbracket P \rrbracket(A) \in PI_A^{C'} \right\}
 \end{aligned}$$

The bare imperative in (139a) explicitly commits the speaker (B) to an intention that the addressee (A) enter his office. Nothing is said about the commitments of

the addressee. And as we just saw, the input context for (139a) is one in which A already has a public commitment to coming into B’s office. The use of (139a) is thus a way of moving the context into one in which B shares this commitment. Since A already has the commitment, there is no need to require that A have it in the output context. In fact, an analog of the  $\text{MAX}_{\text{PB}}$  constraint introduced in the discussion of declaratives above will serve to make sure that the resulting transition is one in which the public intentions of both A and B support the proposition that A enters B office. To see this, I first define the constraints  $\text{MAX}_{\text{PI}}$  and  $\text{DEP}_{\text{PI}}$  by analogy with  $\text{MAX}_{\text{PB}}$  and  $\text{DEP}_{\text{PB}}$ .

(140)  $\text{MAX}_{\text{PI}}$

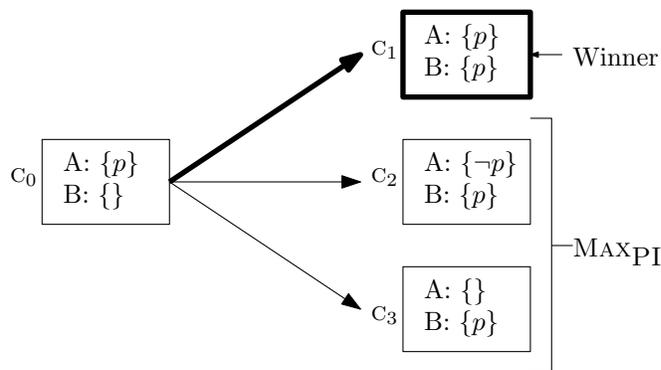
Assign a penalty to any transition  $\langle C, C' \rangle$  for every distinct proposition  $p$  such that there is some agent  $x$  such that  $p \in \text{PI}_x^C$  and  $p \notin \text{PI}_x^{C'}$ .

(141)  $\text{DEP}_{\text{PI}}$

Assign a penalty to any transition  $\langle C, C' \rangle$  for every distinct proposition  $p$  such that there is some agent  $x$  such that  $p \notin \text{PI}_x^C$  and  $p \in \text{PI}_x^{C'}$ .

$\text{MAX}_{\text{PI}}$  encodes a preference for monotonicity in updates to public intentions, while  $\text{DEP}_{\text{PI}}$  encodes a preference for not adding unnecessary commitments. For the example at hand,  $\text{MAX}_{\text{PI}}$  militates against any updates in which the intention that A enters B’s office is eliminated from the public intentions of A in the output context, since this intention *is* among the public intentions of A in the input context. To illustrate, I again make use of diagrams like those I introduced for the discussion of declaratives. Here, since we are only interested in updates to public intentions, I consider partial contexts in which only the public intentions of A and B are represented. Further, I restrict attention to the proposition  $p = P(A) = \text{“A enters B’s office”}$ . Finally, I consider only the input context in which A is committed to  $p$  and B is committed to neither  $p$  nor  $\neg p$ . The diagram in (142) illustrates the update associated with (139a).

(142)



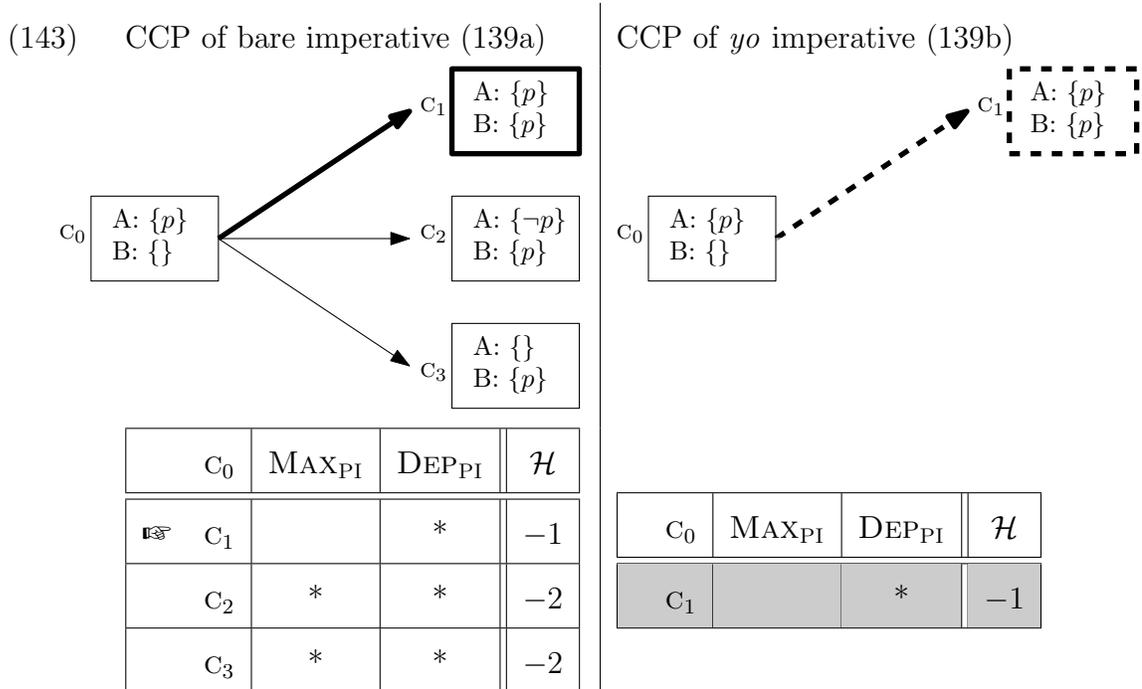
	$C_0$	$\text{MAX}_{\text{PI}}$	$\text{DEP}_{\text{PI}}$	$\mathcal{H}$
☞	$C_1$		*	-1
	$C_2$	*	*	-2
	$C_3$	*	*	-2

In all output contexts compatible with (139a), the public intentions of B contain  $p$ . The semantics of the sentence thus demands a violation of  $\text{DEP}_{\text{PI}}$ , since  $p$  is not in B's public intentions in the input context. Nothing is conventionally required of A's public intentions in the output context.  $\text{MAX}_{\text{PI}}$ , however, serves to penalize any output contexts in which a proposition is removed from any agent's public intentions. For the case at hand, in which A's public intentions contain  $p$  in the input context,  $\text{MAX}_{\text{PI}}$  penalizes any output contexts in which A's public intentions do *not* contain  $p$ . This is sufficient to choose the output context in which the public intentions of both A and B contain  $p$ .

The use of such a transition to grant permission can be understood as follows. To grant permission, under the model of contexts used here, amounts to a situation in which the permission-granter makes it clear that such-and-such an action is in accordance with his intentions. For such an expression of intention to count as a granting of permission will require certain other conditions to hold; in particular, it will need to be understood that the behavior of the addressee is in some way dependent on the intentions of the speaker. Essentially, all that the permission-granting imperative above actually does is commit the speaker to a certain public

intention. In the context of an utterance where the addressee’s allowed actions depend on the intentions of the speaker, this is interpreted as a granting of permission.

So far so good. Now what about the imperative with *yo* in (139b)? Here, I suggest that competition between forms is the key to explaining the infelicity. I note first that the set of transitions denoted by the *yo*-marked imperative in (139b) is a proper subset of the set of transitions denoted by the bare falling imperative in (139a). This is illustrated in (143) for the subset of transitions with the input context relevant to the example under discussion.



As can be seen, the *yo*-marked imperative denotes a subset of the transitions denoted by the bare imperative with falling intonation. Moreover, the transition denoted by the *yo*-marked imperative in this context is the same transition that our pragmatic constraints chose as the optimal transition from among those denoted by the bare imperative.

Now, *if* we assume that the declarative with *yo* is more marked than the bare falling declarative, *then* we can explain its markedness in this context as a consequence of something like Grice’s Maxim of Manner. If an utterance *U* that is less marked

than utterance  $U'$  can be used in context  $C$  to achieve an *optimal* update to context  $C'$ , then  $U'$  cannot be used to achieve that same transition, or is at least a less preferred or more pragmatically marked way of doing so. So a declarative with *yo* cannot be used to achieve an effect that the bare falling declarative could have achieved. More concretely, the *optimal* transition(s) from the less marked utterance are pragmatically *subtracted* (that is, set-subtracted) from the set of transitions denoted by the more marked utterance. The transitions thus eliminated are represented with dashed lines in the rightmost diagram of (143). What pragmatic competition does is block the use of a more marked form in cases where the less marked form could be used to achieve the same update, *given the pragmatic constraints in play*. With the subset of contexts under consideration, pragmatic competition results in the elimination of transitions from the CCP of the *yo*-marked sentence that do not involve non-monotonic revision to the addressee's commitments.

What this amounts to is a kind of scalar implicature at the level of CCPs, using a scale based on the markedness of forms. The use of *yo* is blocked for transitions that could be achieved optimally with the less marked bare imperative with  $\downarrow$ . Accounting for this contrast depended crucially, however, on a semantics for imperatives with  $\downarrow$  that encoded a *speaker*-oriented update to public intentions. The analysis thus supports the idea that bare imperatives with  $\downarrow$  are fundamentally speaker-oriented, rather than addressee-oriented, contra the analysis of Han. This speaker-orientation, however, is not due to the semantics of the IMP-headed imperative itself, contra C&L. Rather, the imperative itself is underspecified, leaving open the agent(s) whose commitments (public intentions) are to be constrained in the output contexts of the resulting CCP. A “bare” imperative ending in  $\downarrow$  makes the update speaker-oriented. But the use of *yo* forces an interpretation in which *both* the speaker *and* the addressee's commitments are constrained. Accounting for the contrast between imperatives with

and without *yo* relies crucially on the underspecification of the imperative itself, in conjunction with pragmatic competition between forms.

The underspecified, relational semantics of imperatives combined with final falling intonation  $\downarrow$  and *yo* thus explain a contrast that neither the addressee-commitment only view of Han nor the speaker-commitment only view of C&L can straightforwardly explain. This gives further evidence for the fine-grained articulation of the semantic operators giving rise to CCP semantics: The force heads DECL and IMP are functions from sets of discourse agents to relational CCPs, and operators like  $\downarrow$  and *yo* serve to specify the agent(s) whose commitments are constrained in the output contexts of this CCP.

The explanation here depended on a new mechanism, which involves a kind of cross-utterance competition. Although I think such an extension is probably needed to handle pragmatic competition based both on markedness and informativity, I will not develop it any further at this point. When the intonational particles  $\downarrow$  and  $\uparrow$  are added to a *yo*-marked imperative, we get effects that further justify the semantics of imperatives developed in this section. I turn now to these effects.

### 4.3 $\uparrow$ and $\downarrow$ in *yo*-marked Imperatives

#### 4.3.1 Basic Data

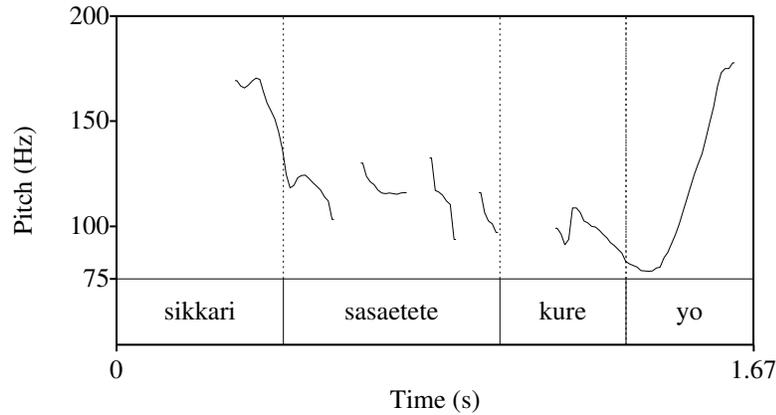
In imperative sentences with *yo*, we find an intonational distinction that parallels that found in declarative sentences. To illustrate, consider the following example of an imperative marked with *yo* from Koyama (1997) (gloss and translation are mine).

- (144) hayaku koi            (*yo* $\uparrow$ /*yo* $\downarrow$ )  
       quickly come.IMP (*yo* $\uparrow$ /*yo* $\downarrow$ )  
       ‘Come quick!’

The sentence can occur with either *yo* $\uparrow$  or *yo* $\downarrow$ . The interpretation, however, differs depending on which is used, as noted by Koyama. If falling intonation is used in

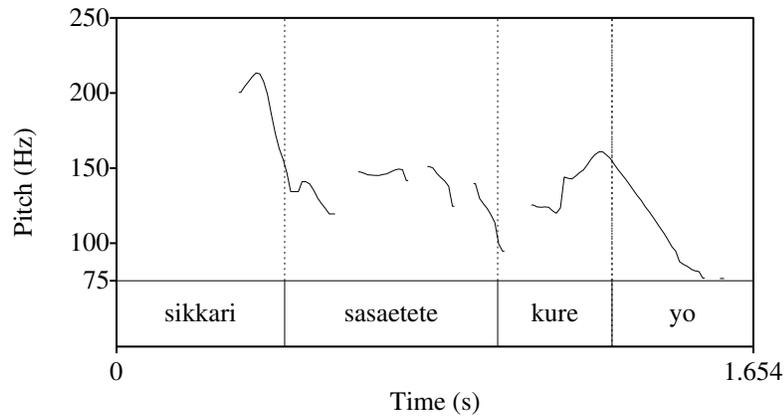


(146) Context: same as (145)



This production contrasts with one in (147), where a corrective context was provided.

(147) Context: Mitaka has already climbed onto Godai's back in an attempt to reach a high spot. Godai begins to shake, causing Mitaka to lose his balance.



In this modified context, the same speaker produced the same sentence with a clear final fall associated with *yo*. The context in (147) differs from that in (146) crucially in that the addressee is *failing* to support the speaker. The imperative thus acts as a kind of corrective to the addressee's current actions. In contrast, the context for the production in (146) has no such corrective sense; instead, the speaker is merely making his desires known, and making sure that the addressee's intentions are in line with those of the speaker.

Shirakawa gives another sequence from *Maison Ikkoku* illustrating the same point (gloss and translation are mine).

(148) Grandma: dousoukai no kaijou made okut-tekure.  
class.reunion GEN meeting.place to send-IMP  
‘Take me to the class reunion.’

Godai: nan da *yo*, sore!?  
what be *yo*, that  
‘What?! Why should I?!’

Grandma: ore, toukyou no michi sappari wakan-ne mon  
I Tokyo GEN street at.all know-NEG PRT  
‘I don’t know my way around Tokyo at all.’

Godai: shira-nai *yo*, sonna no  
know-NEG *yo*, that.kind.of GEN  
‘I don’t know anything about it.’

Grandma: omae-o atenisite-kita n da  
you-ACC depend.on-came  
‘I came here expecting you to help me out.’

Godai: sonna koto yabu kara bou ni iwareta tte, ore datte  
that.kind.of thing grove from stick to was.told even.if I also  
yotei aru si...  
plans have moreover  
‘Even if you come telling me that all of the sudden, I have plans too, you know...’

Kyoko: sonna... Godai-san tuiteitte o-age-nasai *yo*.  
that.kind.of Godai-san go.with HON-give-please *yo*  
‘Hey now - Godai, go with her.’

Shirakawa claims that the request by Kyoko to Godai would naturally have falling intonation on *yo*, which I analyze as corresponding to *yo*↓.

- (149) *tuiteitte oage-nasai yo*↓  
go.with HON-give-please *yo*↓  
'Hey now - Godai, go with her.'

It is clear from the context in which this sentence occurs that the hearer, Godai, does not want or plan to take the grandmother to the reunion, which is what Kyoko is requesting that he do. The use of *yo*↓ here is natural because the hearer obviously does not want or intend to carry out the request. According to Shirakawa, a final rise on *yo* is infelicitous in this context.

What these examples demonstrate is a tendency for imperatives with *yo*↓ to be used in contexts where the addressee has registered reservations about performing the action encoded by the imperative, or has indicated an outright unwillingness to do so. The situation is parallel to that of declaratives with *yo*↓, which in the last chapter were shown to be associated with non-monotonic revisions to the addressee's commitments. This contrasts with *yo*↑, where no corrective flavor is found. In the rest of this section, I show that the semantics of ↓ and ↑ developed in the last chapter can derive these contrasts in imperatives in a straightforward way.

### 4.3.2 Imperatives with *yo*↓

The above examples showed that, like declaratives with *yo*↓, imperatives with *yo*↓ are often associated with an effect that can be described in terms of non-monotonic update. Whereas in the previous chapter we saw many examples in which declaratives with *yo*↓ were used for non-monotonic updates to the addressee's public *beliefs*, with imperatives we find many examples in which *yo*↓ seems to ask for non-monotonic update to the addressee's public *intentions*. As a first look at this tendency, we need

only look at the examples of *yo*↓ from above. The use of *yo*↓ in (144), repeated in (150), illustrates.

- (150) hayaku koi            *yo*↓  
       quickly come.IMP *yo*↓  
       ‘Come quick!’

We might imagine this sentence being used by a parent to a son who is being obstinate and is failing to come down as quickly as the mother wants. Analogously to its use in declaratives, the use of *yo*↓ is quite natural in sequences where demands to the addressee have already been made public, and then are repeated after the addressee fails to act on those demands:

- (151) Context: A mother is calling to her son.  
       a. atataakai uchini gohan tabe ni kite  
           warm    while food eat to come  
           ‘Come eat your dinner while it’s hot.’

The son fails to come to the table after some time, instead remaining absorbed in his video game. The father then makes a second call to the son.

- b. hayaku koi            *yo*↓  
       quickly come.IMP *yo*↓  
       ‘Get over here!’

We also have the observation that imperatives with *yo*↓ are marked in default contexts. This is the import of the example in (145), repeated in (152).

- (152) Context: Mitaka, trying to climb to a high spot, has Godai on all fours, and is using him as a footstool.

- Mitaka: sikkari sasae-te-tekure    *yo*↑/#*yo*↓  
           firmly support-PROG-IMP *yo*↑/#*yo*↓  
           ‘(Be sure and) Keep steady *yo*↑/#*yo*↓’

While Shirakawa focuses on the distinction between  $yo\uparrow$  and  $yo\downarrow$ , a similar intuition exists for the difference between  $yo\downarrow$  and a bare falling imperative in this context. The bare falling imperative would be natural enough in a neutral situation in which Godai has not made any indication that he will fail to support Mitaka, while the use of  $yo\downarrow$  in such a context would be marked. As Shirakawa notes, the use of  $yo\downarrow$  with this sentence seems to indicate that Godai is in some sense failing to support Mitaka, or intends not to support him.

Although the data here are murky and require further empirical investigation, the intuitions culled from the literature for uses of  $yo\downarrow$  in both declaratives and imperatives seem to emphasize the *corrective* nature of such sentences. With declaratives, we saw many examples in which the use of  $yo\downarrow$  was intended to correct an addressee, or at least to convey that the information conveyed goes against some prior expectations. With imperatives, the intuition given by Shirakawa is that the use of  $yo\downarrow$  in some sense indicates that the addressee is actively opposed to performing the action encoded by the imperative radical.

In the last chapter, I argued that falling intonation in  $yo\downarrow$  spells out the intonational morpheme  $\downarrow$ . The denotation of  $\downarrow$  suggested was based on a model of contexts with only public beliefs. With the expanded model of agent commitments articulated in this chapter, the denotation of this morpheme can be recast in such a way that it can target either public beliefs or public intentions for revision. The data from this chapter suggest that  $yo\downarrow$  with imperatives is used to suggest a revision to the addressee's public intentions. But some of the examples of declaratives with  $yo\downarrow$  from the last chapter can also be analyzed in this way. B's response in (98), repeated in (153), can be understood in this way: As described in the last chapter, the use of  $yo\downarrow$  in this example can be understood to indicate something like "stop asking me all these damn questions". With the formal model of public intentions introduced in this chapter, this intuition can be modeled as an update in which the proposi-

tional content of B’s response is added to the public beliefs of both agents, while the proposition  $q \approx$  “keep asking questions of B” is *deleted* from A’s public intentions.

(153) A: gohan mou tabeta?

dinner already ate?

‘Did you eat already?’

B: tabeta  $yo\Downarrow$

ate  $yo\Downarrow$

‘(Yeah,) I ate.’

We thus have declaratives with  $yo\Downarrow$  that suggest revision to commitments based on an agent’s public beliefs, as well as uses that suggest a revision based on an agent’s public intentions. It seems then that we want a semantics of  $\Downarrow$  that is compatible with either of these moves. In order to spell out such a semantics, we can define an extended version of the *commitment set* used by Gunlogson. In Gunlogson’s model, the commitment set of an agent is the set of worlds compatible with all of that agent’s public beliefs. Formally, it is the *intersection* of the propositions in this set, as defined in (154).

(154) Commitment Set (Gunlogson’s version)

$$cs_x^c = \cap PB_x^c = \left\{ w \mid \forall p \in PB_x^c : p(w) = 1 \right\}$$

In the present model, there are two kinds of commitments an agent can have. These can be collapsed into a commitment set as well. One way to do so is given in (155), which requires that the union of the propositions in an agent’s public beliefs and intentions be consistent.

(155) Commitment Set (v 2.0)

$$cs_x^c = \cap (PB_x^c \cup PI_x^c) = \left\{ w \mid \forall p \in PB_x^c, q \in PI_x^c : p(w) = q(w) = 1 \right\}$$

What the commitment set defined in (155) amounts to is the set of worlds given in (154) *filtered* through the public intentions of the agent. In other words, we have

the set of worlds compatible with the agent which are ranked highest by his public intentions. These represent the “best” possible worlds for the agent, given his beliefs and intentions.

A non-monotonic revision to an agent’s public beliefs or intentions will have consequences for the commitment set. In particular, it will cause the commitment set to stop entailing some proposition that it previously supported. To model the non-monotonic effect of  $yo\Downarrow$  for both beliefs and intentions, we can use the revised denotation in (156).

$$(156) \quad \llbracket \Downarrow \rrbracket = \lambda L. \left\{ \langle C, C' \rangle \left| \begin{array}{l} \langle C, C' \rangle \in L \wedge \exists x \in DP^c, \exists q : \\ q \subseteq cs_x^c \wedge q \not\subseteq cs_x^{c'} \end{array} \right. \right\}$$

The denotation in (156) operates on a locution  $L$ , which denotes a CCP. The effect is to shave down the set of CCPs compatible with the complement, requiring that there be some proposition entailed by some agent’s commitments (beliefs and intentions) in the input context, which is not entailed in the output context. The denotation thus directly encodes the non-monotonic effects that  $yo\Downarrow$  was seen to have in both declaratives and imperatives.

As I discussed in §3.3.3, it may be too strong to require that a commitment *entailed* by the agent’s public beliefs/intentions be removed. The above denotation can be modified in accordance with that observation, so that an agent’s *default* commitment set is revised.

$$(157) \quad \llbracket \Downarrow \rrbracket = \lambda L. \left\{ \langle C, C' \rangle \left| \begin{array}{l} \langle C, C' \rangle \in L \wedge \exists x \in DP^c, \exists q : \\ q \subseteq \Delta cs_x^c \wedge q \not\subseteq \Delta cs_x^{c'} \end{array} \right. \right\}$$

As discussed in §3.3.3, the default commitment set will be a subset of the commitment set, with further restrictions derived from non-monotonic default rules.

An imperative with  $yo\Downarrow$  will now have the structure and denotation in (158).

$$(158) \quad \left\{ \langle C, C' \rangle \left| \begin{array}{l} \llbracket P \rrbracket(A_C) \in \text{PI}_{S_C}^{C'} \wedge \llbracket P \rrbracket(A_C) \in \text{PI}_{A_C}^{C'} \wedge \\ \exists x \in \text{DP}^C, \exists q : q \subseteq \Delta \text{cs}_x^C \wedge q \not\subseteq \Delta \text{cs}_x^{C'} \end{array} \right. \right\}$$

```

      /  |  \
     /   |   \
    P  IMP  yo
                    ↓

```

The  $yo\downarrow$ -marked imperative requires that the addressee’s choosing the action denoted by the radical is a public intention of *all* discourse participants in the output context.  $\downarrow$  makes an additional contribution, requiring that there is some non-monotonic revision to some agent’s default commitment set. This explains the “corrective” flavor of  $yo\downarrow$ -marked imperatives in a way that parallels what we saw with  $yo\downarrow$ -marked declaratives. Typically, the correction will be made to a stubborn addressee, by requiring that he fix his intentions.

### 4.3.3 Imperatives with $yo\uparrow$

I now look at  $yo\uparrow$  with imperatives, showing that the semantics proposed on the basis of data for declaratives extends naturally to imperatives as well. The basic contrast, as characterized by Koyama (1997), is that an imperative with  $yo\downarrow$  presupposes that the addressee is intent on *not* doing the action encoded by the imperative, but that no such implication is present in a sentence with  $yo\uparrow$ . This contrast was seen in (145), repeated below.

(159) Context: Mitaka, trying to climb to a high spot, has Godai on all fours, and is using him as a footstool. He says to Godai:

sikkari sasae-te-tekure       $yo\uparrow/\#yo\downarrow$   
 firmly support-PROG-IMP  $yo\uparrow/\#yo\downarrow$   
 ‘(Be sure and) Keep steady!’

Shirakawa (1993) claims that this example is most natural with rising intonation. We can understand the infelicity of  $yo\downarrow$  here, given the corrective semantics derived earlier. What then does  $yo\uparrow$  do? The use of  $yo\uparrow$  in examples like these, as characterized

by Koyama, has two potential effects: *yo*↑ is used in contexts where the *addressee's understanding is not in line with that of the speaker*, or in which *the addressee is not even aware of the issue*.

A similar intuition characterizes examples like (160), from McCready (2005).

- (160) mata nanika      at-tara soudan      ni ki-tekudasai (*yo*↑)  
 again something be-if    consultation for come-IMP    (*yo*↑)  
 ‘If anything else happens, please come talk to me again (*yo*↑).’

McCready notes that if the sentence in (160) occurs with *yo*, then “the speaker seems to have personal reasons for wanting the hearer to consult with him”, while the same sentence without *yo* has no such implication. Although McCready does not consider intonation, native speaker intuitions suggest that this example is most natural with *yo*↑. The intuition here is subtle, but seems to indicate the following pattern: Imperatives with *yo*↑ tend to indicate the existence of some *reason* or *justification* for the addressee performing the action encoded by the imperative. For the example in (160), this reason is relativized (according to the intuitions reported by McCready) to the desires of the speaker. This intuition seems similar to that reported by Koyama, according to which *yo*↑ with imperatives tends to indicate some kind of misalignment of “understanding” between speaker and addressee. With *yo*↑, it seems that the speaker is giving some indication that there are reasons for the addressee doing the action, and that these reasons are perhaps not fully appreciated by the addressee.

On the basis of these data and intuitions, I suggest that imperatives with *yo*↑ make two main contributions:

- (161) An imperative with *yo*↑ can be used to
- a. introduce an important decision problem (choice between alternative actions) whose importance is not fully appreciated by the addressee.

- b. suggest that there are contextually salient reasons for the addressee choosing the action encoded by the imperative, reasons which the addressee has not fully appreciated.

The characteristics sketched in (161) follow straightforwardly from the semantics of  $\uparrow$  argued for in the last chapter. We can calculate what the denotation of an imperative with  $yo\uparrow$  should be. Such a sentence will have the structure in (162). Each node is labeled with the denotation at that node.

$$(162) \quad \left\{ \langle C, C' \rangle \left| \begin{array}{l} \forall x \in DP^c \llbracket P \rrbracket(A_C) \in PI_x^{c'} \wedge \exists a \in \mathcal{A}_{A_C}^{c'} : \\ OPT_{A_C}^c \not\subseteq a(A_C) \wedge OPT_{A_C}^{c'} \subseteq a(A_C) \end{array} \right. \right\}$$

$$\quad \swarrow \quad \searrow$$

$$\left\{ \langle C, C' \rangle \mid \forall x \in DP^c \llbracket P \rrbracket(A_C) \in PI_x^{c'} \right\} \uparrow$$

$$\quad \swarrow \quad \searrow$$

$$\lambda A. \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in PI_A^{c'} \right\} \quad yo$$

$$\quad \swarrow \quad \searrow$$

$$P \quad IMP$$

An imperative of the form  $[P \text{ IMP } yo\uparrow]$  composes to give us a relational CCP with two components. The first component requires that the public intentions of all discourse participants support the proposition resulting from the application of the property  $P$  to the addressee in the input context. This is the result of combining  $yo$  with the imperative. By adding  $\uparrow$ , we get an additional requirement on the CCP. This additional requirement is identical to the requirement we derived for declaratives: There is a decision problem that is resolved in the output context which was not resolved in the input context.

Looking at actual examples of imperatives with  $yo\uparrow$ , it seems that we predict the right results. The two-part characterization of such examples sketched above is accounted for straightforwardly. First, we have the intuition that imperatives with  $yo\uparrow$  can be used to introduce issues about which the addressee was previously

unaware. This use of  $yo\uparrow$  mirrors the pattern we saw for declaratives with  $yo\uparrow$ , in which the speaker actually introduces a decision problem into a previously neutral context. Formally, what we have is an input context in which there is no salient decision problem for the addressee, which we can represent as  $\mathcal{A}_{Ac}^c = \emptyset$ ; when the set of contextually salient alternative actions is empty, this means there is no salient decision problem for the agent. If  $yo\uparrow$  is used, we require (via existential quantification) some element to be in the action set of the addressee in the output context. This will require a non-empty action set, and will thus demand that a previously unrecognized decision problem be introduced.

Which decision problem? For declaratives, the resolution was fairly open, and seemed to depend on a natural relevance relationship between the informational content of the declarative and the resulting decision problem. For imperatives, we seem in every case to resolve the optimal action to the action that the imperative encodes. So, if we have an imperative whose radical is  $P$ , the use of  $yo\uparrow$  seems to indicate that the addressee needs to make a decision about whether or not to choose action  $P$ , and that moreover  $P$  is optimal for the addressee in the output context.

This intuitive picture can be modeled more formally as follows. First, the intuition that imperatives with  $yo\uparrow$  can be used to introduce an issue for an addressee. The intuition is that such imperatives are used not only to suggest that the addressee choose the action denoted by the imperative radical, but also to suggest that, despite the addressee's previous unawareness of the fact, this is a pressing issue. Formally, the "unawareness" of the issue can be modeled by having an input context in which the action set of the addressee is empty, or in any case does not generate an action partition that distinguishes between the action denoted by the imperative radical and its negation.

Assuming a maximally neutral input context, the diagram in (163) shows the optimal transition for an utterance by agent B of  $[IMP P yo\uparrow]$ .

(163) B: [IMP  $P$   $yo\uparrow$ ]



The CCP in (163) requires that  $P(A)$  be in the public intentions of both A and B in the output context, where  $P$  is the property denoted by the imperative radical. The semantics of  $\uparrow$  also requires an action  $a$  in the action set of the addressee A in the output context. The above discussion amounts to an observation that this action, which defines the contextual issue for the addressee in the output context, be equal to the property denoted by the imperative radical. For the example at hand, this means that  $a = P$ . This equality does not follow from the semantics, or from the constraint-based pragmatic calculation of optimal transition, but must be due to some additional kind of pragmatic reasoning.

This is not all that  $\uparrow$  does. It also requires that  $a$  be optimal in the output context, but not in the input context. Given the fact that  $a$  is equated with the property denoted by the imperative radical, this means that  $\uparrow$  requires that  $a$  be among the public intentions of the addressee in the output context, while also pointing to some way in which it becomes optimal, despite being non-optimal in the input context. Since the definition of optimality relies on a contextual ordering source, the way in which this requirement is spelled out will be highly dependent on the non-linguistic context. Notice that optimality might be calculated on the basis of a different ordering in the input and output contexts. Thus, the use of  $\uparrow$  might actually take us from one ordering source (according to which the action is not optimal) to another (according to which it is optimal). The use of  $\uparrow$  can then be an indirect means of suggesting a new metric for optimal action for the addressee. The example in (160), for example, seems to make an ordering based on the speaker's preferences salient. Other examples can make other orderings salient, as we saw with the examples of  $yo\uparrow$  in declaratives.

The way that this choice of ordering gets resolved will be highly dependent on the non-linguistic context, again in ways that will probably elude the kind of constraint-based pragmatic reasoning developed in this dissertation. Nevertheless, it is clear that the semantics of  $\uparrow$  can be used to capture the two intuitions that characterize the use of  $yo\uparrow$  with imperatives: introduction of a previously unappreciated issue corresponding to the action denoted by the imperative radical, and a suggestion that that action is optimal in some way.

#### 4.4 Summary

In this chapter I have provided a semantics of imperative clauses in Japanese that parallels that of declarative clauses developed earlier. The use of *yo* and its intonational associates in imperatives was shown to parallel its use in declaratives. This provides further evidence for the semantics of these particle developed on the basis of declaratives. In the next section, I extend the account to interrogatives.

## CHAPTER 5

### INTERROGATIVES WITH *YO*

In this chapter, I first present a relational CCP semantics for interrogative clauses that derives naturally from my treatment of declaratives and imperatives. The model of contexts will be further articulated so that each agent is associated with a set (or stack) of *public questions*. The model is based on the QUD model of Roberts (1996) and Ginzburg (1996), but is stated in such a way that each agent can have potentially different public questions in play, with the QUD derived from these questions in the same way that the CG is derived from the discourse participants' individual public beliefs. Like the action set introduced earlier, an agent's public questions are a way of modeling that agent's contextual issues. Here, however, we are concerned with issues of fact, rather than issues of action.

As with the other clause types, I build my analysis of interrogatives on the basis of their behavior with *yo* and other associated pragmatic particles. By comparison with the other two main clause types (declaratives and imperatives), there has been very little work examining the behavior of *yo* in interrogatives. The use of *yo* is more restricted, and also more marked, in interrogatives than its use in the other two clause types considered earlier, so much so that it has even been claimed that *yo* is not possible with interrogatives at all. As we will see, there are indeed a large class of questions with which *yo* is impossible. But *yo* is possible with a subset of interrogative constructions, and turns out to alternate with the final fall  $\downarrow$  in a way familiar from the previous chapters. I provide an overview of these interrogatives in §5.1. In §5.2 I give an analysis for class of polar interrogatives with which *yo* is used,

and in §5.3 I examine the associated evidential particle *no*. §5.4 extends the resulting analysis to wh-interrogatives.

## 5.1 The Distribution of *yo* in Questions

As with the other clause types, I will adopt a model of interrogatives according to which a sentence radical is combined with a force head, INTER. I will not delve deeply into the compositional semantics of the sentence radical, but assume a semantics in which it denotes a set of propositions. The INTER head in conjunction with falling intonation ↓ or *yo* will be shown to derive plausible dynamic interpretations, at least for those interrogatives with which *yo* is grammatically compatible in Japanese. Before jumping into the semantic details, I look briefly at the inventory of constructions that spell out a question meaning in Japanese. By a *question* I mean a speech act, the one that is canonically associated with the interrogative clause type. The use of *yo* is restricted to a subset of the total set of constructions that are used for conventionally indicating a question.

There appear to be three classes of question with which *yo* is possible. An example from each class is provided in (164).

(164) a. **Non-Honorific Polar *ka*-question**

sonna            mono taberu ka (↓/*yo*↓/\**yo*↑)

that.kind.of thing eat    Q

“Is (he) going to eat something like that? (No, he isn’t.)”

b. **Non-Honorific Wh-*ka*-question**

dare-ga    sonna            mon ku-eru ka (↓/*yo*↓/\**yo*↑)

who-NOM that.kind.of thing eat-can Q

“Who can eat that sort of thing? (no one!)”

c. **Non-Honorific Wh-*nda*-question**

doko ni it-tara suku-eru nda ( $\downarrow$ / $yo\downarrow$ / $*yo\uparrow$ )

where to go-if save-can *nda*

“Where can we go to be saved?”

In all three types of questions,  $yo\uparrow$  is completely ungrammatical; only  $yo\downarrow$  can be used. The source of the ungrammaticality of  $yo\uparrow$  will not be resolved in this dissertation, and must be left to future research. The use of  $yo\downarrow$  alternates with  $\downarrow$ , and certain interpretational facts are preserved whether  $\downarrow$  or  $yo\downarrow$  is used. In particular, we find that the classes exemplified in (164a) and (164b) seem to receive a consistently rhetorical interpretation, whether  $\downarrow$  or  $yo\downarrow$  is used. This points to an analysis of these two constructions in which the rhetorical interpretation is part of the construction’s meaning. The construction in (164c), by contrast, is compatible with an information-seeking interpretation with either  $\downarrow$  or  $yo\downarrow$ .

Summing up, there are three classes of interrogatives with which  $yo\downarrow$  can occur:

1. Non-honorific polar interrogatives containing the question particle *ka*.
2. Non-honorific wh-interrogatives containing the question particle *ka*.
3. Non-honorific wh-interrogatives containing the particle *nda*.

The first two classes seem to receive an exclusively rhetorical interpretation, or are in any case highly likely to be so interpreted. The third class can receive either a rhetorical or information-seeking interpretation, depending on context. The use of  $yo\downarrow$  in any of these classes can be replaced with a bare final fall, and the rhetorical/information-seeking interpretation of the sentence seems unaffected by this choice. We do, however, get additional pragmatic dimensions to questions with  $yo\downarrow$ , which will be taken up later in the chapter.

In the remainder of this chapter, I focus exclusively on the three classes of interrogatives above, with either a final fall  $\downarrow$  or  $yo\downarrow$ . I leave aside uses with final rise, and

all question types with which *yo* is illicit. For the three classes considered, I will make two structural assumptions. First, I assume that they are *interrogatives*, containing an abstract interrogative operator INTER on par with DECL and IMP. Second, I will take the uniformly rhetorical interpretations of the first two classes as evidence that these contain an additional rhetoricalizing operator RHET.

Before moving on to a discussion of *yo* in these three classes of interrogatives, I want to emphasize the fact that *yo*-marked interrogatives are sociolinguistically marked in a way that other clause types with *yo* are not. This hinders collection of naturalistic data from standard sources. Serious empirical work on the behavior of *yo* in questions is hampered by the lack of corpus data in which the relevant constructions can be found. This is attributable to the fact that the use of interrogatives with *yo* systematically creates a very hostile and ‘rough’ impression of the speaker. They are used mostly by men (especially young men) who are putting on a “tough guy” demeanor. In this respect, the use of questions with *yo* is a lot like the use of a taboo expressive like *fuck* in English. And just like English taboo expressives, speakers are highly unlikely to use questions with *yo* in contexts where naturalistic speech data is systematically collected. This aspect of *yo*’s pragmatics I leave aside in this dissertation. The inability of *yo* to occur with polite questions with addressee-oriented honorification points to a clash in politeness or honorific levels, a clash that does not arise with other clause types.

Since natural dialogue with this construction is relatively unavailable, I have mined the text of the Japanese comic book *Rookies*, featuring characters who frequently use it.<sup>1</sup> Since the comic text is in the form of pseudo-natural dialogues, with surrounding linguistic and non-linguistic context provided for the reader, it is easy to tap native

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<sup>1</sup>*Rookies*, written by Masanori Morita, was serialized in Jump Comics. The story features a class of rebellious male students and a teacher who tries to reform them. It is widely available in paperback compilations in Japanese bookstores.

speaker intuitions about various features of the examples found. Throughout the chapter, I will rely where possible on examples from this corpus, along with native speaker intuitions informed by the (linguistic and non-linguistic) context in which the corpus examples were found.

## 5.2 Polar *ka* Interrogatives

### 5.2.1 Polar Questions in Japanese

There are a number of ways in which information-seeking matrix polar questions can be formed in Japanese. Sudo (2010) gives the examples in (165), illustrating three standard constructions encoding information-seeking polar questions in Japanese.

- (165) Mary-ga    kita    {  $\emptyset$ , no, desho }  $\uparrow$   
      Mary-NOM came  
      “Did Mary come?”

Three options are given in (165), all ending with a final rise  $\uparrow$ . First, there is a bare polar question, which is string-identical with the declarative, but must occur with rising intonation. In fact, it seems to be only the intonation which distinguishes the bare polar question from a bare falling declarative. The next option ends with the particle *no*. This is often described as a question particle, but is at least homophonous with the evidential particle *no* discussed in §5.3. And as with the bare polar question, we only get a question interpretation in this construction when it ends with a final rise  $\uparrow$ . If the sentence ends with a final fall  $\downarrow$ , we get a standard declarative interpretation (that is, as an assertion), along with the evidential contribution of *no*. Finally, we have the polar question ending with the particle *desho*. This particle also encodes something like evidentiality or epistemic (un)certainty (Hara 2006), and is not in any obvious way a question particle. And as with the other two constructions, the questionhood of a sentence ending with *desho* depends on the presence of rising

intonation. With a final fall, the sentence is interpreted as an assertion, with an evidential/epistemic contribution from *desho*.

When *yo*↓ is added to any of the options in (165), we get an utterance that can only be interpreted as an assertion. This suggests that, at least when ending with a final fall or *yo*↓, the sentences in (165) are actually declaratives, rather than interrogatives. This leaves open the question of what clause type we have with a final rise. One possibility would be to treat such “interrogatives” as rising declaratives. I will not attempt such a treatment. Since we do not get interrogative interpretations with either final fall ↓ or *yo*, I will leave this class of “interrogatives” (or rising declaratives) aside.

With these kinds of polar questions out of the way, I turn to the sort of polar questions with which *yo* can be used. These are, in a certain sense,<sup>2</sup> the canonical form of polar questions in Japanese, formed by attachment of the question particle *ka* to what otherwise is string-identical to a typical declarative. An example is given in (166).

- (166) a. ?sonna          mono taberu ka ↑  
           that.kind.of thing eat    *ka*  
           “Is (he) going to eat something like that?”
- b. sonna          mono taberu ka ↓  
           that.kind.of thing eat    *ka*  
           “Is (he) going to eat something like that?” (No, he isn’t.)
- c. sonna          mono taberu ka *yo*↓  
           that.kind.of thing eat    *ka*  
           “Is (he) going to eat something like that? (No, he isn’t.)”

---

<sup>2</sup>The sense here being, on the basis of standard descriptions of question syntax in Japanese, rather than frequency or naturalness in actual conversation.

Notice that the same sentence, containing the question particle *ka*, is interpreted as an information-seeking question with a final rising contour, while it receives a rhetorical interpretation with a final falling intonational contour. This is a consistent pattern. The question in (166a) with rising intonation can still indicate bias on the part of the speaker, to the effect that he thinks it very unlikely, or very surprising, that the person would eat the sort of thing being discussed. But the question in (166b) is truly rhetorical; the speaker is not only indicating a pre-existing bias for the negative answer, but also indicates that he takes the question he has raised to be settled in the utterance context. We get the same sort of rhetorical interpretation with *yo↓*, as seen in (166c), along with additional pragmatic effects to be discussed later.

Although we have a three-way distinction in (166) depending on final intonation or *yo*, the rising interrogative in (166a) is of questionable grammaticality; at the very least, it is marked, and probably deviant in some way.<sup>3</sup> We get a very different pattern when we change the example so that the verb is given addressee-oriented honorific morphology, rather than the plain (non-honorific) morphology of the examples in (166). The honorific variants are given in (167).

- (167) a.   sonna           mono tabe-masu ka ↑  
           that.kind.of thing eat-HON   *ka*  
           “Is (he) going to eat something like that?”
- b.   ?sonna           mono tabe-masu ka ↓  
           that.kind.of thing eat-HON   *ka*  
           “Is (he) going to eat something like that?”

---

<sup>3</sup>I leave open the nature of this markedness/deviance. Native speaker informants report a range of reactions, from flat out ungrammaticality, to a sense of unnaturalness, to a sense that this use is not “standard” but might be expected from certain dialects.

- c. \*sonna            mono tabe-masu ka yo↓  
                           that.kind.of thing eat-HON ka yo↓

With the addressee-oriented honorific morphology, the *ka*-interrogative with rising intonation in (167a) is now perfectly grammatical and natural as an information-seeking question. The version in (167b) with a final fall is less clear. It can perhaps be used with both an information-seeking and rhetorical interpretation. Most importantly for the purposes of this dissertation, the sentence is completely ungrammatical with *yo*.

I will attempt no explanation for the ungrammaticality of *yo* with honorific polar questions (as will be seen shortly, the same restriction holds for wh-questions as well). Since I am interested in the behavior of *yo*, I will focus attention on the class of polar questions with which it is possible. Interestingly, this is also the class in which a final fall is also grammatical and felicitous. This distribution is what we expect, given that ↓ and *yo* are of the same semantic type and combine with the same range of complements.

In this section, I will be focusing exclusively on non-honorific polar questions with the question particle *ka*, like those in (166). Moreover, since rising intonation is of questionable grammaticality/felicity for this class of interrogatives, I will restrict attention to sentences ending with a bare fall ↓ or with *yo*↓. I will adopt an analysis of these questions according to which they *interrogatives*, containing the abstract force head INTER. From here on, I refer to this construction as a rhetorical polar-*ka* interrogative.

### 5.2.2 The Semantics of the Interrogative Radical

As with other clause types, I adopt a structural analysis of interrogatives, in which sentence radical combines with a force head. I use the variable *Q* for interrogative sentence radicals, which combine with the interrogative force head INTER. The first issue to address is the semantics of the radical *Q*. For declaratives, we had radicals

denoting propositions, while for imperatives we had radicals denoting properties. For interrogatives, I adopt an analysis under which the radical denotes a set of propositions.

The question-as-set-of-propositions analysis has its roots in the work of Hamblin (1973). There are a number of interesting issues that arise once we've adopted it, in particular:

1. Exactly which propositions are in the set denoted by (the radical of) a given interrogative?
2. How is this set of propositions derived compositionally?

For polar interrogatives, there are two ways the first question can be answered. Take  $p?$  to represent a polar interrogative built from the proposition  $p$ . There are two obvious choices for what set the interrogative radical  $Q$  should denote for such a polar interrogative, viz. (168):

$$(168) \quad \text{a. } \llbracket Q \rrbracket = \{p, \neg p\}$$

$$\text{b. } \llbracket Q \rrbracket = \{p\}$$

Option (168a) represents an analysis according to which a polar interrogative  $p?$  encodes in its denotation both the positive answer  $p$  (which appears overtly in the question) and the negative answer  $\neg p$  (which does not). Option (168b) makes only the overt proposition  $p$  part of the set characterized by the interrogative radical.

I will argue for the representation in (168b), in which only the overt, positive proposition  $p$  is part of the set characterized by the interrogative radical. The justification for this position can only be made in the context of the entire theory within which the account is embedded. For now, I simply adopt option (168b) in my analysis of polar interrogatives. The compositional derivation of this singleton-set denotation depends on the semantics of the polar question particle *ka*. I take this particle to be

responsible for taking us from a proposition to a (singleton) set of propositions. This is done by the semantic rule in (169).

$$(169) \quad \llbracket p \text{ } ka_{pol} \rrbracket = \{\llbracket p \rrbracket\}$$

The denotation in (169) makes the *ka* in polar questions a function from propositions to sets of propositions. This will do the job for polar-*ka* interrogatives. This denotation will not work for wh-interrogatives that contain *ka*, which is one reason I am not necessarily advocating this denotation as a final analysis of *ka*. On the other hand, Cable (2007, 2008) argues for a semantics of Q-particles in wh-questions that does not extend to polar questions, and suggests that in languages like Japanese there is accidental homophony between these particles in polar and wh-questions. I leave to future research the question of whether these particles should be unified, and if so, how. In (169), I subscript *ka* to indicate that this is the semantics for the polar version; from now on, I use *ka<sub>pol</sub>* in discussing the semantics of polar-*ka* interrogatives.

The first step of building a polar interrogative meaning is now in place. The particle *ka<sub>pol</sub>* takes us from a proposition to a set of propositions. This set of propositions is now fed to the interrogative operator INTER, whose semantics I now take up.

### 5.2.3 CCP Semantics of Interrogatives

The CCP semantics of interrogatives is built on the basis of that for declaratives and imperatives developed in the previous chapters: A force head attaches to a sentence radical to return a function from sets of discourse agents to a relational CCP that constrains some contextual commitment of the agents. An analysis of the sentence radical was just given. This leaves us only to specify the sort of discourse object whose update is targeted by the resulting CCP. An obvious candidate is the *Question Under Discussion* (QUD) of Roberts (1996) and Ginzburg (1996). In the QUD model, contexts come not only with a CG representing common beliefs or assumptions, but a set of questions representing contextually salient *issues*. In Roberts'

model, the QUD is a *stack*, so that the elements (question meanings) in the QUD are totally ordered. Discourse is governed by relevance requirements imposed by the question at the top of this stack, which can be understood as the immediate issue or question whose resolution the participants are committed to addressing.

As with the CG, I will argue for a decomposition of the QUD into agent-specific commitments. As far as I know, this move has not been proposed in the previous literature, but the occurrence of *yo* with interrogatives in conjunction with the analysis of *yo* in this dissertation force this move. After presenting the technical details, I hope to show on the basis of data from interrogatives with and without *yo* that the move is a useful one, giving good empirical results in addition to a pleasing parallelism with the other discourse objects (public beliefs, public intentions, and action sets) introduced earlier.

The decomposition of the QUD will go as follows. Each discourse participant  $x$  in a context  $C$  will have a stack (totally ordered set) of *public questions*,  $PQ_x^C$ . The elements of the set are *sets of propositions*, corresponding to the interrogative radical meanings described earlier, denoting characteristic functions of sets of propositions. For the purposes of this dissertation, I will in general only be concerned with the topmost element of this stack, which corresponds to the immediate question under consideration<sup>4</sup> for that agent. Since  $PQ_x^C$  is a stack, we can refer to any of its ordered elements by an index. The immediate question under consideration for an agent  $x$  in context  $C$  is then given by  $PQ_x^C[0]$ , the 0th (topmost) element in the stack. I will refer to  $PQ_x^C[0]$  as the *immediate public question* for  $x$  in  $C$ .

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<sup>4</sup>I use the term question under *consideration* since we are talking about a single agent. When the topmost public questions of all discourse participants correspond, we can derive an immediate question under *discussion*.

An interrogative will denote a CCP constraining the immediate question under consideration of a set of discourse agents, in accordance with the interrogative radical complement of INTER. This is achieved by the denotation in (170).

$$(170) \quad \llbracket \text{INTER } Q \rrbracket = \lambda \mathbb{A}. \left\{ \langle c, c' \rangle \mid \text{PQ}_{\mathbb{A}}^{c'}[0] = \llbracket Q \rrbracket \right\}$$

We can combine INTER with the polar interrogative to derive the structure and denotation in (171).

$$(171) \quad \lambda \mathbb{A}. \left\{ \langle c, c' \rangle \mid \text{PQ}_{\mathbb{A}}^{c'}[0] = \{\llbracket p \rrbracket\} \right\}$$

What we get is a function from sets of discourse agents to relational CCPs in which the immediate public question of those agents in the output contexts must equal that denoted interrogative radical. For a polar-*ka* interrogative built up from the proposition  $p$ , the interrogative radical denotes the singleton set  $\{\llbracket p \rrbracket\}$ , meaning that the immediate public question of the *set* of agents  $\mathbb{A}$  must equal  $\{\llbracket p \rrbracket\}$ .

A formal explication of what it means for a *set* of agents to have an immediate public question will be taken up shortly. For now, we can say that this amounts roughly to requiring that each agent in the set have the question denoted by the interrogative radical in their immediate public question. What then is the discourse effect of updating one's immediate public question? More generally, what does it mean, pragmatically, to have some question  $Q$  at the top of one's stack of public questions? I follow the lead of Roberts, and assume that such questions are used to define strategies of inquiry. But since we are dealing with agent-specific questions, we get agent-specific strategies of inquiry. Basically, by committing to an immediate public question  $Q$ , an agent commits herself to seeking a resolution to the question.

So what does it mean to resolve a question? To spell this out, it will be useful to consider the *partition* defined by sets of propositions (Groenendijk and Stokhof 1984,

Groenendijk 1999). The question-as-partition-on-worlds view is closely related to the question-as-set-of-propositions view. We can in fact define the relevant partition in terms of the question meanings adopted here. In the example above, we require an immediate public question equal to the singleton set  $\{p\}$ . The issue associated with such a question is whether or not  $p$  is true. This can be spelled as a partition on the set of possible worlds, which sorts all worlds into cells on the basis of whether the proposition  $p$  is true of that world or not. The partition derives from an equivalence relation; two worlds are “equal” with respect to this relation just in case  $p$  returns the same value (1 or 0, true or false) when applied to either world. More generally, given a set of propositions  $Q$ , we can define an equivalence relation as follows:

(172) Question-induced Equivalence Relation over Worlds

$$w =_Q w' \text{ iff}_{\text{def}} \forall q \in Q : q(w) = q(w')$$

The discourse effect of an agent’s immediate public question can then be stated as follows:

(173) Public Question Principle

- a. If  $\text{PQ}_x^c[0] = Q$ , then  $x$  is understood to be committed to seeking a resolution to question  $Q$ .
- b. Resolution of  $Q$  for  $x$  is achieved in a context  $c$  iff:

$$\forall w, w' \in \cap \text{PB}_x^c : w =_Q w'.$$

The above principle states a resolvedness condition for immediate public questions in terms of the partition they define. An agent’s immediate public question is resolved just in case the set of worlds compatible with his public beliefs occupy a single cell of the partition induced by the equivalence relation defined by the question.

The above principles are agent-specific analogs of the principles argued for by Roberts, to whom the reader is referred for more discussion. For my purposes, the important consequence of the definitions above is this: Even though polar interro-

ative radicals only include the *overt* propositions in the sentence (i.e. the positive proposition), the partitions derived are equivalent to those derived from interrogative radicals including the non-overt propositions as well (i.e. the negative proposition). This fact will turn out to be important, as it in effect allows one to have one’s cake and eat it too. The set of propositions characterized by the interrogative radical is asymmetric, leaving certain options out, a fact that will be important in dealing with question bias, and in turn with rhetorical interpretations of questions. At the same time, the partitions defined on the basis of these asymmetric interrogative radicals lose the asymmetry. The partition defined on the basis of  $\{p\}$  is equivalent to that for  $\{p, \neg p\}$ .

With these pieces in place, we are almost in a position to discuss the contrast between  $yo\downarrow$  and  $\downarrow$  in rhetorical polar-*ka* interrogatives. First, though, I must derive the rhetorical interpretation of these interrogatives. This involves two steps. The first step is to derive the latent *bias* of a polar interrogative. The second step is to transform this bias into a conventionalized requirement, reflecting the fact that these interrogatives can only be interpreted rhetorically. I first take up the potential bias of polar interrogatives, before turning to the rhetorical interpretation.

#### 5.2.4 Deriving the Direction of Bias in Questions

There is a large literature on the bias associated with different varieties of polar questions, including among others Ladd (1981), Büring and Gunlogson (2000), van Rooy and Safarova (2003), Romero and Han (2004), Reese (2007), and Asher and Reese (2007). Closely related to the latent bias in non-rhetorical questions is the interpretation of rhetorical questions. Han (1998a) argues that, in English, a rhetorical polar question is typically interpreted as a commitment to the truth of the proposition with opposite polarity, while a rhetorical wh-question receives a “none of the above” interpretation. Han illustrates this with the following examples:

(174) Did I tell you that writing a dissertation was easy?

(Understood: No, I did not)

(175) What has John ever done for Sam?

(Understood: Nothing)

Han proposes that these interpretational facts can be derived as the extreme case of biases that are (potentially) present in standard polar or wh-questions. First, a positive polar question need not be associated with any bias toward which answer is true, but if there is bias, that bias will be toward the negative answer, as illustrated by the following example from Han:

(176) Did John finish the paper?

(Possible bias: John didn't finish the paper.)

Negative polar questions more consistently associate with a bias on the part of the speaker toward the negation of the (already negated) proposition; that is, to the proposition with positive polarity:

(177) Didn't John finish the paper?

(Bias: John finished the paper.)

I put aside the stronger tendency toward bias in negative polar questions. The situation can be summarized as: Uttering a polar question  $p?$  can give a sense that the speaker takes  $p$  to be *no more probable than*  $\neg p$ , according to the speaker's own pre-existing biases. This allows for the two propositions to be given equal probability, or for the complement of the overt proposition to have strictly greater probability. The logical extreme of this asymmetry is one in which the speaker is totally biased toward it being the case that  $\neg p$ .

This bias derives naturally from the discussion of polar interrogatives above. Every polar interrogative  $p?$  corresponds to a two-celled partition on worlds, derived from

the singleton set  $\{p\}$ . Since only one of the alternatives is actually overt in the interrogative, we can then state a principle to the effect that the speaker makes overt the proposition that would be more *informative* to her, if it were true. Informativity is inversely correlated with probability, so that the more informative proposition is the one that the speaker assigns less subjective probability. Then if a speaker asks  $p?$ , it indicates that  $p$  is more informative, more surprising, to her than  $\neg p$ , and thus that the (prior) subjective probability of  $\neg p$  is greater than  $p$ . This is the basic intuition underlying the approach to question bias in van Rooy and Safarova (2003). This principle is spelled out in (178), in terms of the interrogative semantics laid out earlier.

(178) Question Bias Principle

If a speaker uses a question with interrogative radical denotation  $Q$ , then for all  $q \in Q$  (for all propositions in the question set),  $P_{\text{spkr}}(q) \leq P_{\text{spkr}}(\neg q)$

$P_x^c(q)$  is the subjective probability assigned to proposition  $q$  by agent  $x$  in context  $C$ . What the principle in (178) says is that use of a question with radical  $Q$  indicates that the questioner takes each proposition  $q$  in  $Q$  to be no more likely than the negation of that proposition.

This principle works only in light of the semantics of polar interrogative radicals given in the last section. Recall that polar-*ka* interrogatives contain an interrogative radical  $[p \text{ ka}_{pol}]$  denoting the set  $\{\llbracket p \rrbracket\}$ . The set does *not* include the negation of the proposition. The bias principle thus requires that the speaker asking  $p?$  not take the probability of  $p$  to be (significantly) larger than that of  $\neg p$ . The principle in (178) gives an intuitive characterization of question bias that can serve to derive the particular kinds of rhetorical interpretations associated with polar questions. I discuss its applicability to wh-questions later in the chapter.

But what sort of principle is this? I will propose that it is in fact a *pragmatic presupposition* of interrogatives. The relational CCP model of sentence meaning

adopted in this dissertation provides for a natural treatment of pragmatic presuppositions. They are simply restrictions on the domain of the relation denoted by the sentence. The bias of (178) is a feature of *interrogatives*. And as argued in the last section, interrogatives are headed by INTER, which introduces the relational CCP semantics into the derivation. We can derive the effect expressed by the bias principle as a presupposition introduced on input contexts by the INTER operator itself. This requires a simple addition to the denotation in (170). The revised denotation is given in (179).

$$(179) \quad \llbracket \text{INTER } Q \rrbracket = \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \mid \begin{array}{l} \text{PQ}_{\mathbb{A}}^{C'}[0] = \llbracket Q \rrbracket \wedge \\ \forall q \in \llbracket Q \rrbracket : P_{s_c}^C(q) \leq P_{s_c}^C(\neg q) \end{array} \right\}$$

The denotation in (179) does two things. First, it places a constraint on the output contexts of the resulting CCP, such that the immediate public question of the agents in set  $\mathbb{A}$  (specified on the basis of the open argument) must equal that denoted by the interrogative radical  $Q$ . Second, it places a constraint on the *input* contexts of the resulting CCP, involving the subjective probabilities assigned by the speaker to the propositions in  $Q$ . The presupposition in (179) requires that the subjective probability for the speaker of each proposition in  $Q$  not be significantly greater than its negation. That is, for each  $q \in Q$ ,  $P_{s_c}^C(q)$  must be less than or “equal to”  $P_{s_c}^C(\neg q)$ . What exactly counts as “equal to” (i.e. what values satisfy  $P_x^C(p) = P_x^C(q)$ ) is probably vague, and is in any case beyond the scope of this dissertation. Basically, we require that the speaker not be biased *against* the negation of propositions in the interrogative radical, so that what counts as “equal to” in (179) reduces to the question of what counts as “biased toward”.

How does this presupposition serve to dictate the direction of rhetorical interpretation? Consider a polar interrogative with an interrogative radical denoting the set  $\{p\}$ . Assume for the sake of discussion that the interrogative is speaker-oriented, so that the open argument is resolved to the speaker. What we derive is a CCP that

updates the speaker’s immediate question under consideration, and at the same time presupposes that  $P_{sc}^c(p) \leq P_{sc}^c(\neg p)$  in input context  $c$ . This interrogative, interpreted conventionally as a question according to its CCP, is compatible with an input context in which the speaker is biased neither toward  $p$  nor  $\neg p$ . It is also compatible with bias for  $\neg p$ . In the extreme, it is compatible with total commitment to  $\neg p$  by the speaker in the input context.

For the English data considered by Han, in which any given question is compatible with an unbiased, biased, or rhetorical reading, our work is essentially done at this point. All interpretations are compatible with the relational CCP derived on the basis of (179). But the polar-*ka* interrogatives with which *yo* is found only allow a rhetorical interpretation. I will argue that this is due to a rhetoricalizing operator RHET. The details are presented in the next subsection.

### 5.2.5 Deriving the Rhetorical Interpretation of Polar *ka*-Interrogatives

Having provided an initial analysis of the direction of (potential) bias in interrogatives, I turn to the interpretation of rhetorical polar *ka*-interrogatives in Japanese. To get started, consider the example in (180).

- (180) tori-ga    konna        tokoro ni    sum-eru ka ↓  
           bird-NOM this.kind.of in    place live-can *ka* ↓  
           “Can birds live in a place like this?” (only rhetorical reading possible)

As I showed earlier, polar *ka*-interrogatives with non-honorific verbal morphology seem to *require*, rather than just allow, a rhetorical interpretation, at least when combined with a final fall ↓ or with *yo*. And the most natural interpretation for a rhetorical question like this is what we would expect from the last section, namely, an interpretation in which the speaker is committed to the negation of the overt proposition, here “birds cannot live in a place like this”.

But in fact, there seem to be two distinct interpretations for rhetorical questions like the one in (180). For the example at hand, the following contexts illustrate the two interpretations.

- (181) a. Context 1: The speaker is biased towards it being the case that birds cannot live here, but looking out the window is surprised to discover that in fact they do. He utters (180) to indicate his surprise.
- b. Context 2: The speaker believes that birds cannot live here. His friend says something that suggests they do. He utters (180), thereby indicating that his friend is mistaken, and that it should be obvious birds cannot live here.

More generally, rhetorical polar *ka*-questions with with overt proposition  $p$  can be felicitously used in two distinct ways. The first use, corresponding to the context in (181a), is one in which the speaker holds a prior bias towards  $\neg p$ , and finds himself in a context where the truth of  $p$  has become apparent. This use can be understood as one in which the context has settled the issue of  $p?$  towards  $p$ , in violation of the speaker's expectations of  $\neg p$ .

The second use, illustrated by the context in (181b), has in common with the first use the fact that the sentence indicates a pre-existing bias on the part of the speaker for  $\neg p$ . In this use, however, the speaker takes his bias  $\neg p$  to be correct, and moreover indicates that the truth of  $\neg p$  should be obvious or a settled issue. This use can be directed at an interlocutor who has suggested, either directly or indirectly, that  $p$  is or might be true. Note that this is the use we typically see in English rhetorical polar questions. The first use, it seems to me, is not found in English.

While both interpretations seem to be *in principle* available for the sentence in (180), it seems (based on native speaker intuitions) that interpretations like that in (181b) are far more common and natural. As will be seen in §5.3, the addition of the particle *no* makes the interpretation in (180) mandatory. The important thing for

now is that both interpretations (181a) and (181b) have in common a pre-existing bias on the part of the speaker against the overt proposition  $p =$  “birds can live here”. They are also both interpreted rhetorically, requiring that the context end up supporting  $p$  or  $\neg p$ , respectively. The rest of the differences will be derived through different pragmatic interpretations of these core components.

To analyze these kinds of polar interrogatives, I propose the following. First, since they receive only rhetorical interpretations, I argue that they contain a rhetoricalizing operator, RHET. This operator attaches just above INTER, and requires that the immediate question of the open set-of-agents argument be settled by the public beliefs of those agents in all output contexts of the resulting CCP. This is achieved by the denotation in (182).

$$(182) \quad \llbracket \text{RHET} \rrbracket = \lambda S \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \left| \begin{array}{l} \langle C, C' \rangle \in S(\mathbb{A}) \wedge \forall q \in \text{PQ}_{\mathbb{A}}^{C'}[0] : \\ q \in \text{PB}_{\mathbb{A}}^{C'} \vee \neg q \in \text{PB}_{\mathbb{A}}^{C'} \end{array} \right. \right\}$$

To see how the denotation works, let’s apply it to the example in (180). Let  $p =$  “birds can live here”. The interrogative radical for this sentence is built up from  $p$  and the polar question particle  $ka_{pol}$ . The resulting structure and denotation is given in (183).

$$(183) \quad \left\{ \langle C, C' \rangle \left| \begin{array}{l} \text{PQ}_{S_c}^{C'}[0] = \{\llbracket p \rrbracket\} \wedge \\ P_{S_c}^C(\llbracket p \rrbracket) \leq P_{S_c}^C(\neg \llbracket p \rrbracket) \wedge \\ (\llbracket p \rrbracket \in \text{PB}_{S_c}^{C'} \vee \neg \llbracket p \rrbracket \in \text{PB}_{S_c}^{C'}) \end{array} \right. \right\}$$

```

graph TD
    Root(( )) --- p1[p]
    Root --- ka_pol[ka_pol]
    Root --- INTER[INTER]
    INTER --- RHET[RHET]
    INTER --- down[↓]
    RHET --- p2[p]
    RHET --- ka_pol2[ka_pol]

```

The open agent argument is resolved to the singleton set containing the speaker by means of the final falling morpheme  $\downarrow$ , per the semantics from earlier chapters. As with public beliefs and intentions, we need a way to relate the public questions of

sets of agents with the public questions of individual agents to make this work. For a singleton set containing just the agent  $x$ , the equivalence in (184) will do.

$$(184) \quad \text{PQ}_{\{x\}}^c[i] = \text{PQ}_x^c[i], \text{ for all } i, x, c.$$

This allows us to derive the denotation in (183), by replacing  $\text{PQ}_{\{\text{spkr}\}}^c$  with  $\text{PQ}_{\text{spkr}}^c$ . I return to non-singleton sets of agents when the use of *yo* in these interrogatives is discussed.

The resulting CCP has the following components. First, the speaker has an immediate public question “whether or not  $p$ ” in the output context. At the same time, the input contexts are constrained so that the speaker is *not* biased toward  $p$ , but *may* be biased toward its negation. Finally, we require that the speaker’s immediate question is actually resolved by his own public beliefs in the output context, so that his public beliefs contain either  $p$  or  $\neg p$ . In effect, the speaker has succeeded in posing a question, indicating a prior commitment about the relative probabilities of different answers to the question, and also committed to a public belief in one of the answers.

Which answer? As we saw earlier, there is reason to leave this open, since rhetorical polar *ka*-interrogatives seem to be resolvable in either direction, at least in principle. But I also noted that the default interpretation is toward the negative answer, which can be explained in part by the denotation in (183). Since the speaker presupposes a prior bias toward  $\neg p$ , or at the very least a *lack* of bias *toward*  $p$ , then the most natural resolution will be to have the speaker’s public beliefs include  $\neg p$  in the output context. This is simply an extension of the kind of contextual inertia argued for in earlier chapters. When one must make changes, the changes should be *minimal*. If the speaker’s public beliefs are updated to include  $p$  instead, we will end up in a new context where the presupposition on input contexts no longer holds, since the subjective probability of  $p$  (based on the public beliefs of the speaker) is now much greater than that of  $\neg p$ .

### 5.2.6 Strong Corrective Rhetorical Questions with *yo*↓

Having derived the rhetorical interpretation of polar *ka*-interrogatives, I now compare the use of a final fall ↓ with the use of *yo*↓ in this clause type. The first observation is that such interrogatives with *yo*↓ are understood as committing the speaker to  $\neg p$ . This generalization is supported both by intuition and by corpus examples. I provide illustrative corpus examples with the relevant features of rhetorical polar *ka* interrogatives: Plain form of the verb and the question particle *ka*. We saw earlier that sentences with these properties are, in colloquial standard Japanese, interpreted rhetorically, a fact I attributed to the presence of RHET. The relevant examples from the corpus are those in which such a polar interrogative is used with *yo*. Although intonational data is not available for the corpus examples, the use of *yo* in interrogatives is independently restricted to *yo*↓, as described earlier. The sentences in (185) are typical examples.

- (185) a. *konnan de gomakas-eru ka yo*  
           this.kind.of.thing with trick-can     *ka yo*  
           “You think you can fool us with something like that? (no, you can’t!)”
- b. *kyoushi-wa minna teki da ttutteta janee ka yo*  
           teacher-TOP all enemy be COMP.say.PROG.PAST not.be *ka yo*  
           “Didn’t you say that all teachers are our enemy? (yes, you did!)”

In both of the above examples, the question is understood rhetorically. Also, the answer that the questioner takes to be the true answer to his question has the opposite polarity of the question itself. So, in (185a), the question has positive polarity, and the questioner is understood as being committed to a negative answer to the question. In (185b), the question has negative polarity, and the questioner is understood to be committed to its positive counterpart, i.e. to the negation of the negative polar question. In line with the earlier discussion of rhetorical questions, these interpretative tendencies can be seen as stemming from the latent bias inherent in any polar

interrogative, whereby the speaker is potentially biased toward the proposition with opposite polarity from that made overt in the interrogative radical.

Consider first the example in (185a). Let  $p$  be the proposition “he can fool us with something like this”. Then, the interrogative radical characterizes the singleton set of propositions  $\{p\}$ . The context for the utterance in (185a) is this: The new homeroom teacher Kawato Koichi is trying to convince his class of high school ruffians to give him a chance as their new teacher. The students have had a bad experience with previous teachers, and have a policy of not trusting what teachers and other adults say. Kawato has been telling the students that if, after giving him a chance, the students find him to be no good, then he promises to quit teaching. At this point, one of the ruffian students makes the utterance in (185a).

In the context of utterance, it is clear that the speaker is indicating to Kawato that his assumption (that the students are going to take seriously his proposal, or fall for his trap) is wrong. The full interpretation of the utterance is thus as follows: The speaker asks a rhetorical question, committing himself and all other participants to a negative answer (“we will not be fooled by you”). At the same time, he indicates that his addressee (the new teacher) needs to fix his commitments. The precise nature of this fix is highly context-dependent, but in this case something like the belief that “you can fool us” or “we will believe what you say” are likely candidates. The revision might also be to the addressee’s public intentions. So the speaker may also be interpreted as indicating something like “you should stop trying to get us to go along with your plans”. All these possibilities seem compatible with the intent of the utterance in (185a).

A similar analysis goes through in example (185b) as well. The speaker here is the character Aniya, the leader of the ruffians who have been confronting Kawato. He has been investigating Kawato’s past, and has ended up at a school where Kawato used to teach. There, he runs into an old acquaintance who Kawato has managed

to reform. It is in this context, having discovered that Kawato managed to reform his old friend, that he makes the utterance in (185b). The pragmatic import of this utterance parallels that of (185a). The only difference is that here we have a negative polar question, with the speaker committing us to the *positive* option. That is, with  $p = \text{“you can fool us”}$ , the speaker uses the rhetorical question with the form  $\neg p?$  to commit to  $p$  (the proposition with opposite polarity from that expressed). With  $yo\downarrow$ , he also indicates that his addressee needs to make a revision to his commitments. As with the analysis of the previous sentence, the exact nature of the revisions to commitments that the use of (185b) indicates is highly context-dependent. Even with the fleshed-out context in which (185b) was made, there is wiggle-room in what kind of revision the use  $yo\downarrow$  suggests. Here, a likely interpretation would be this: The addressee has been defending Kawato, and the speaker Aniya finds this shocking, given the addressee’s prior history of insubordination. The use of  $yo\downarrow$  here might then indicate something like “stop defending him!”.

The data suggest the following generalization regarding the use of  $yo\downarrow$  in rhetorical polar *ka* interrogatives:

- (186) The use of a rhetorical  $yo\downarrow$ -marked polar-*ka* interrogative with overt proposition  $p$  indicates:
- a. a strong correction to the addressee’s misconception that  $p$  is true, or
  - b. some other strong revision to the addressee’s commitments.

These facts come as no surprise; we have already seen that  $yo\downarrow$  is used to make corrections. The semantics for  $yo\downarrow$  developed on the basis of declaratives and imperatives is sufficient, I argue, to derive the generalizations in (186). We need only integrate the semantics of  $yo\downarrow$  with the semantics of rhetorical polar-*ka* interrogatives developed in the previous section. This is achieved in two steps. First, as in the other clause types examined,  $yo$  itself stands in complementary distribution with  $\downarrow$ , giving rise to a relational CCP. This is given in (187).

$$(187) \left\{ \langle c, c' \rangle \left| \begin{array}{l} \text{PQ}_{\text{DP}^c}^{c'}[0] = \{\llbracket p \rrbracket\} \wedge \\ P_{s_c}^c(\llbracket p \rrbracket) \leq P_{s_c}^c(\llbracket \neg p \rrbracket) \wedge \\ (\llbracket p \rrbracket \in \text{PB}_{\text{DP}^c}^{c'} \vee \llbracket \neg p \rrbracket \in \text{PB}_{\text{DP}^c}^{c'}) \end{array} \right. \right\}$$

This denotation, like the one in (183), has three main components. One component is identical between the two: The speaker must not have a subjective bias toward the proposition denoted by  $p$  in the input context. The other two components have a crucial difference. The sentence with  $\downarrow$  requires that the *speaker's* immediate public question in the output context equal  $\{\llbracket p \rrbracket\}$ , and that his public beliefs support either a positive or negative answer to this question in the output context as well. The sentence with  $yo$  requires that this hold for *all* discourse participants. In order to handle the contribution of  $yo$ , we need a way to handle the immediate public question of non-singleton sets of agents. I propose that this is done by the equivalence in (188).

(188) For a set of discourse agents  $\mathbb{A} = \{x_1, \dots, x_n\}$ :

$$\text{PQ}_{\mathbb{A}}^c[i] = \bigcap_{x \in \mathbb{A}} \text{PQ}_x^c[i] = \text{PQ}_{x_1}^c[i] \cap \dots \cap \text{PQ}_{x_n}^c[i], \text{ for all } i, c.$$

The formalism may be a bit cumbersome, but it says something very straightforward. The  $i$ th public question of a set of agents is equal to intersection of the  $i$ th public question of each agent in the set. Since I am only considering *immediate* public questions (those at the top of the stack) in dialogs consisting of two agents, the derived formulation in (189) will be sufficient.

$$(189) \quad \text{PQ}_{\{x,y\}}^c[0] = \text{PQ}_x^c[0] \cap \text{PQ}_y^c[0]$$

This definition makes the immediate question of a set of discourse participants equal to the *intersection* of their respective immediate questions. In effect, this returns

the maximal set of propositions which the discourse participants are all immediately interested in resolving.

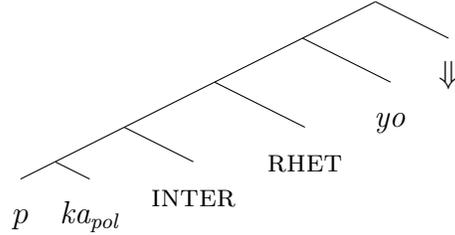
Applying this equivalence to (187), we derive the denotation in (190), assuming a single speaker and addressee in the input context.

$$(190) \quad \left\{ \langle c, c' \rangle \left| \begin{array}{l} P_{S_c}^c(\llbracket p \rrbracket) \leq P_{S_c}^c(\llbracket \neg p \rrbracket) \wedge \\ PQ_{S_c}^{c'}[0] \cap PQ_{A_c}^{c'}[0] = \{\llbracket p \rrbracket\} \wedge \\ \left( \llbracket p \rrbracket \in PB_{S_c}^{c'} \cap PB_{A_c}^{c'} \vee \llbracket \neg p \rrbracket \in PB_{S_c}^{c'} \cap PB_{A_c}^{c'} \right) \end{array} \right. \right\}$$

The derived denotation makes the following requirements. First, the speaker must think  $\neg p$  at least as probable as  $p$  in the input context. Second,  $p$  must be in the immediate public questions of both the speaker *and* the addressee in the output context. Finally, the joint public beliefs of the speaker and addressee must contain  $p$  or  $\neg p$ . This is equivalent to saying that  $p$  must be in the public beliefs of both the speaker and addressee, or  $\neg p$  must be. We do not allow output contexts in which the speaker and addressee have different public beliefs regarding  $p$ . In other words, the question introduced by the interrogative is resolved *in the same way* for both speaker and addressee in the output context. This already derives one fact characterizing the use of  $yo\downarrow$  in rhetorical polar-*ka* interrogatives. The speaker is, in effect, pushing the conversation toward a context in which the addressee is in agreement with him about the answer to the question. He raises a question, and says that it must be resolved *in the same way* for both the speaker and addressee in the output context. And since the interrogative also has a latent bias for the negative answer, a likely way to interpret this is as a demand that the addressee endorse the negative answer in the output context, in accordance with intuition.

We now integrate the intonational particle  $\downarrow$ , resulting in the expanded structure and denotation in (191).

$$(191) \left\langle \langle c, c' \rangle \left| \begin{array}{l} P_{S_c}^c(\llbracket p \rrbracket) \leq P_{S_c}^c(\llbracket \neg p \rrbracket) \wedge \quad (1) \\ PQ_{S_c}^{c'}[0] \cap PQ_{A_c}^{c'}[0] = \{\llbracket p \rrbracket\} \wedge \quad (2) \\ (\llbracket p \rrbracket \in PB_{S_c}^{c'} \cap PB_{A_c}^{c'} \vee \llbracket \neg p \rrbracket \in PB_{S_c}^{c'} \cap PB_{A_c}^{c'}) \wedge \quad (3) \\ \exists x \in DP^c, \exists q : q \subseteq \Delta cs_x^c \wedge q \not\subseteq \Delta cs_x^{c'} \quad (4) \end{array} \right. \right\rangle$$



The resulting denotation may look a bit unwieldy, but it is a simple conjunction of constraints built up compositionally from the particle-rich LF of the utterance. I have labeled the different lines of the restriction on the resulting set of transitions for ease of reference. Lines (1-3) are the same as we saw in (190). Line (4) is the contribution of  $\Downarrow$ . It requires that some (default) commitment of one of the discourse participants be given up in the output context. In the examples seen so far, this discourse participant is resolved to the addressee.

The denotation in (191) correctly captures the characterizations of these sentences summarized in (186). The semantics of *yo* has made a rhetorical requirement of the *addressee's* public beliefs, in addition to the speaker's, so that the speaker is interpreted as pressing the addressee into agreement. Moreover, the speaker says with  $\Downarrow$  that the addressee needs to fix some commitment. In some cases, this will reflect the fact that the addressee must give up a conflicting commitment, just like we saw with *yo* $\Downarrow$ -marked declaratives and imperatives. In other cases, the connection will be more indirect. Since the commitment set is derived from both beliefs and intentions, the revision can target either one, which is what we saw with the examples in (185).

For the examples in (185), we resolved the rhetorical question to the negative answer. This is not required by the semantics, but I argued that it follows naturally from the latent bias toward the negative answer expressed in line 1 of (191). In

the next section, I show that this bias can be overridden by the particle *no*. The semantics of this particle are integrated with those described in this section to provide yet another level of particle-mediated pragmatic effects.

### 5.3 The Evidential Particle *no*

#### 5.3.1 Epistemic Bias vs Evidential Bias: The Contribution of *no*

The interpretation of rhetorical polar *ka*-interrogatives changes if we add the particle *no*. This is illustrated in (192).

- (192) tori-ga      konna          tokoro ni sum-eru no ka ↓  
          bird-NOM this.kind.of place in live-can *no ka*  
          “Ah, so birds can live here after all.”

The sentence in (192) differs minimally from that in (180) in that the Q-particle *ka* is preceded by the particle *no*. The addition of *no* has the effect of eliminating the use corresponding to the context in (181b), repeated in (193b). The sentence can only be used in contexts like that in (193a), which resolve toward the positive rather than the negative answer.

- (193) a. Context 1: The speaker is biased towards it being the case that birds cannot live here, but looking out the window is surprised to discover that in fact they do. He utters (192) to indicate his surprise.
- b. # Context 2: The speaker believes that birds cannot live here. His friend says something that suggests they do. He utters (192), thereby indicating that his friend is mistaken, and that it should be obvious birds cannot live here.

The sentence with *no* cannot be used felicitously in context (193b), even though this is the most natural interpretation of the sentence without *no*. Since all other

components of the sentence are apparently the same, it seems that we need to account for the elimination of this interpretative possibility through the semantics of *no* itself.

In accounting for the contribution of *no*, I follow Sudo (2010) in distinguishing two distinct kinds of bias in question, which he calls *epistemic bias* and *evidential bias*. The kind of bias discussed so far corresponds to Sudo's epistemic bias, and reflects a speaker-oriented prior commitment to the negation of the overt proposition in a polar interrogative. Evidential bias is something different. Sudo illustrates the idea with the following example from Büring and Gunlogson (2000).

- (194) Context: My officemate enters the windowless computer room wearing a dripping wet raincoat.
- What's the weather like out there?
- a. # Is it sunny?
  - b. Is it raining?

The context in which the question is uttered provides evidence for the proposition that it is raining. The infelicity of (194a) shows (according to Sudo) that positive polar questions in English are infelicitous when there is contextual evidence for the negative answer.

So contextual evidence is relevant in determining the pragmatic felicity of polar questions, at least in English. Sudo shows that different kinds of polar questions in Japanese (the three classes exemplified in (165)) impose different kinds of evidential requirements on the context. And crucially, positive polar questions (PPQs)<sup>5</sup> ending in *no* require positive contextual evidence for their felicity. Sudo demonstrates this fact with the examples in (195), with (in)felicity indicated in three contexts: a neutral

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<sup>5</sup>I am calling these "questions" because I do not want to make any claims about the clause type of these constructions. Since these sort of questions do not occur with *yo*, they are not included in the analysis of interrogatives developed in this chapter.

context with neither positive or negative evidence, a context with negative evidence, and a context with positive evidence.

(195) a. *Neutral Context*

Context: We're looking for a left-handed person. I'm wondering about John, who is not around.

# John-wa hidarikiki-na no?

John-TOP left.handed-COP *no*

“Is John left-handed?”

b. *Negative Context*

Context: My friend has just entered our office wearing a dripping wet raincoat.

# ima hareteru no?

now sunny *no*

“Is it sunny now?”

c. *Positive Context* Context: Same as (195b)

ima ame futteru no?

now rain is.falling *no*

“Is it raining now?”

The PPQ *p?* with *no* is only felicitous in the context that provides positive evidence for the proposition *p*. Note that this is *not* the same requirement as we find for bare PPQs in Japanese, as illustrated by the examples in (196). These examples show that bare PPQs, which differ from those above only in the absence of the particle *no*, are only felicitous in neutral contexts. It thus appears that *no* is used to place a specific evidential requirement on the input context. A PPQ *p?* with *no* requires contextual evidence for *p* to be uttered felicitously.

(196) a. *Neutral Context*

Context: We're looking for a left-handed person. I'm wondering about John, who is not around.

John-wa hidarikiki?

John-TOP left.handed

“Is John left-handed?”

b. *Negative Context*

Context: My friend has just entered our office wearing a dripping wet raincoat.

# ima hareteru?

now sunny

“Is it sunny now?”

c. *Positive Context* Context: Same as (196b)

# ima hareteru?

now sunny

“Is it sunny now?”

The classes of polar questions considered by Sudo are, as discussed earlier, not ones with which *yo* or a final fall are possible. Nevertheless, the behavior of *no* in such questions seems to provide a clear window onto its behavior in the rhetorical polar-*ka* interrogatives considered here. For the sentence in (192), the use of *no* has eliminated one of the two context-interpretation pairs that the same interrogative without *no* was compatible with. We are forced to choose the interpretation in which the speaker has received contextual evidence in favor of the overt proposition *p*, which goes against his previous bias for  $\neg p$ .

I account for this observation by arguing that the particle *no* in a polar question *p?* contributes a *pragmatic presupposition* that there is contextual evidence for *p*. We need a way to integrate this pragmatic presupposition with the CCP denoted

by the sentence at the root node. Unlike dynamic theories of meaning that bring CCP meaning “all the way down”, the system developed in this dissertation has a distinct level at which dynamic meaning (spelled out as relations between contexts) is introduced. This means that dynamic accounts of presupposition projection like that of Heim (1992) cannot be ported over to this account, since they are developed for systems that build contextual dynamics into the semantics at every level.

This is not a dissertation about presupposition projection, and I will propose a simple system for achieving the desired results, but without thereby suggesting that this is the best way of achieving the integration of pragmatic presuppositions into the CCP of the root node. The denotations considered so far are ordinary denotations, given by  $\llbracket \cdot \rrbracket$ . I model presuppositional meaning by introducing a new interpretation function,  $\llbracket \cdot \rrbracket^p$ , which collects the pragmatic presuppositions of a sentence. This approach to pragmatic presupposition projection is directly modeled on Portner’s (2007b) reworking of the two-dimensional semantic system of Potts (2005). Unlike Potts, who puts this multidimensionality into the type system, Portner models this extra dimension by means of a separate expressive interpretation function, analogous to the model of focus semantic values proposed by Rooth (1985). In Rooth’s model, the extra dimension is used to model the contribution of focus. In Portner’s model, the extra dimension is used to model expressive meaning. Like the pragmatic presuppositions modeled here, expressives can be introduced at any point in the composition, but have a matrix level interpretation. Moreover, there is (by hypothesis) no compositional interaction in the expressive dimension, so that we can model a sentence’s expressive meaning as the sum of its expressive parts. And so it goes for pragmatic presuppositions. Thus, while I am not forcefully advocating such an approach, it does seem adequate descriptively, and it outlines the structure of the problem.

The presupposition contributed by *no* is a *pragmatic* or *contextual* presupposition. I have already said that such presuppositions should be understood as means of *con-*

*ventionally restricting the domain* of the CCP of the entire sentence. The domain of the CCP is a set of contexts. So what we want is a collection of *properties of contexts*, which serve to constrain the set of input contexts for our CCP denotation. Since we want to collect pragmatic presuppositions from any and all pragmatic presupposition triggers in the sentence, the interpretation function will be a set of such meanings, and will project on the basis of the following composition rules.

(197) Default Rules For Presupposition

a. Default Lexical Presupposition Value

$$\llbracket \alpha \rrbracket^p = \emptyset, \alpha \text{ a lexical item.}$$

b. Default Rule for Presupposition Projection

$$\llbracket \alpha \beta \rrbracket^p = \llbracket \alpha \rrbracket^p \cup \llbracket \beta \rrbracket^p$$

Either of these default rules can be overridden by the lexical semantics of  $\alpha$  or  $\beta$ .

What we have is a system whereby, in the absence of any lexically specified presupposition, the presuppositional interpretation function returns the empty set as the value of a lexical item. For a complex node consisting of sisters  $\alpha$  and  $\beta$ , the default rule says that we take the union of the presuppositions of both  $\alpha$  and  $\beta$ .

The defaults in (197) can be overridden by an individual lexical item's denotation. For the particle *no*, I proposes the following denotation:

(198) The semantics of *no*:

a. Ordinary Semantics:

$$\llbracket p \text{ no} \rrbracket = \llbracket p \rrbracket$$

b. Presupposition:

$$\llbracket p \text{ no} \rrbracket^p = \llbracket p \rrbracket^p \cup \{ \lambda c. \text{Ev}(\llbracket p \rrbracket, c) \}$$

The particle *no* takes a propositional complement. Its ordinary denotation is the same as that of its complement; that is, *no* does not affect the regular semantic

value of the sentence in which it occurs. Its effect is purely at the level of pragmatic presuppositions. There, it contributes a restriction on contexts  $C$ , requiring that there be evidence for the proposition denoted by *no*'s complement in  $C$ . This is the intuitive meaning of  $\text{Ev}(\llbracket p \rrbracket, C)$ . I will not explore in any further detail just what it means for a context to provide evidence for a proposition. This is an empirical question, and beyond the scope of this dissertation. Roughly though, I expect that it will involve the existence of certain propositions in the common ground, perhaps filtered through some evidential modal base, by which an inference to the supported proposition can be made; see McCready and Ogata (2007) for some Japanese-relevant discussion.

Structurally, I assume that *no* attaches at a point lower than the one at which the propositional core of the interrogative has been turned into a singleton set containing that proposition. This assumption gets some motivation from the fact that *no* is lower than *ka<sub>pol</sub>*, as far as can be determined from linear order. Structurally, then, a *no ka* interrogative will be built up from a proposition  $p$ , then the presuppositional particle *no*, and finally the particle *ka<sub>pol</sub>*, to give the interrogative radical on which the interrogative operator INTER will operate. With these pieces in place, I can now proceed with the rest of the composition. Combining *ka<sub>pol</sub>* with  $[p \text{ no}]$  gives the denotation in (199). Note that, in accordance with our default presupposition inheritance rule, we end up projecting the contextual presupposition introduced by *no*. The denotation assumes that  $p$  does not introduce its own presuppositions. If it does, then these will simply be added to the set of presuppositions denoted by  $[p \text{ no } ka_{pol}]$ .

- (199) a.  $\llbracket [p \text{ no } ka_{pol}] \rrbracket = \{\llbracket p \rrbracket\}$   
 b.  $\llbracket [p \text{ no } ka_{pol}] \rrbracket^P = \{\lambda C. \text{Ev}(\llbracket p \rrbracket, C)\}$

Now we have a good interrogative radical, denoting a set of propositions. We also have a presuppositional value, which is a set (here singleton) of properties of contexts. The next step is to integrate these presuppositions into the CCP of the entire of sentence.

As discussed in §2.1.2, pragmatic presuppositions are a means of restricting the set of input contexts that the CCP denoted by the sentence is defined for. We just need to integrate the properties of contexts in the presuppositional value of the sentence in the right way to get this restriction. One way to do this is conventionally, at the level of force, as in the modified denotation of INTER in (200).

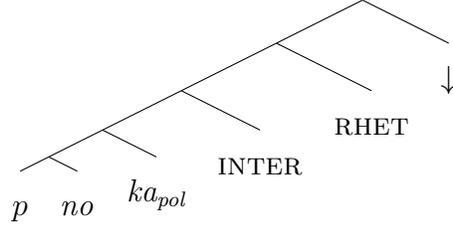
$$(200) \quad \llbracket \text{INTER } Q \rrbracket = \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \left| \begin{array}{l} \text{PQ}_{\mathbb{A}}^{c'}[0] = \llbracket Q \rrbracket \wedge \\ \forall q : \llbracket Q \rrbracket : P_{\text{sc}}^c(q) \leq P_{\text{sc}}^c(\neg q) \wedge \\ \forall P \in \llbracket Q \rrbracket^p : P(C) \end{array} \right. \right\}$$

The integration takes place in the third line of the denotation. It takes every property of contexts in the presuppositional value of INTER’s complement, and requires that these properties hold of the input contexts in the resulting CCP.

Adopting this way of integrating pragmatic presuppositions into the CCP semantics of sentences would require a similar revision to the other force operators DECL and IMP. This lexical approach to integration of pragmatic presuppositions seems to miss something important, namely, that pragmatic presuppositions are *always* integrated at the top level, contributing a restriction on the domain of the resulting CCP. The lexical approach does not address this generality; why can’t we have an operator INTER’ that simply lacks this third line in the denotation? A non-lexical alternative to this pragmatic integration can be achieved by building a general rule of interpretation into the system. Roughly, this would tell us to take the CCP denotation at the root node of the sentence, and further restrict the domain of this relation using the pragmatic presuppositions of the sentence.

With these pieces in place, a fully compositional derivation of a rhetorical *no ka* interrogative with final fall  $\downarrow$  can be given. I assume that these have the same structure as the previously analyzed rhetorical polar-*ka* interrogatives, modulo the contribution of *no*. The structure and denotation are given in (201).

$$(201) \quad \left\{ \begin{array}{l} \langle C, C' \rangle \left| \begin{array}{l} \text{PQ}_{s_c}^{c'}[0] = \{\llbracket p \rrbracket\} \wedge \quad (1) \\ P_{s_c}^c(\llbracket p \rrbracket) \leq P_{s_c}^c(\neg\llbracket p \rrbracket) \wedge \quad (2) \\ \text{Ev}(\llbracket p \rrbracket, C) \wedge \quad (3) \\ (\llbracket p \rrbracket \in \text{PB}_{s_c}^{c'} \vee \llbracket \neg p \rrbracket \in \text{PB}_{s_c}^{c'}) \quad (4) \end{array} \right. \end{array} \right\}$$



To help parse the resulting denotation, I have sorted the restrictions into numbered lines. What we get is a CCP with four components:

1. The speaker has an immediate public question in the output context: whether or not  $p$  is true.
2. The speaker has a potential epistemic bias against  $p$  in the input context.
3. The input context contains contextual evidence for the positive answer  $p$ .
4. The speaker's public beliefs contain either the positive answer  $p$  or the negative answer  $\neg p$  in the output context.

These four components give a good characterization of the dimensions of meaning of rhetorical polar *no ka* interrogatives exemplified in (192), and are sufficient, when coupled with an additional interpretational constraint, to derive the observed direction toward which the rhetorical force of the question is resolved (that is, toward the positive answer).

Component 2 of the denotation indicates a prior *subjective* bias on the part of the speaker about the relative likelihood of  $p$  versus  $\neg p$ , so that  $p$  is no more likely than  $\neg p$ , while  $\neg p$  may be more likely than  $p$ . At the same time, the speaker indicates with *no* that there is contextual evidence for  $p$  in the input context. These requirements

are in conflict; the presupposed contextual evidence is in conflict with the speaker's biases. The CCP requires that the speaker's public beliefs contain one of these two propositions in the output context, and that the conflict be resolved, one way or the other. Empirically, it seems that this conflict is always resolved toward the positive proposition *p*, in line with the contextual evidence and against the speaker's subjective biases. This resolution motivates a principle like that in (202).

(202) *Contextual Evidence trumps Subjective Bias*

When forced to decide between the requirements imposed by contextual evidence and subjective bias, resolve toward the answer determined by contextual evidence.

It is far from obvious that a principle like (202) is a general property of language interpretation, to say nothing of human decision-making. Büring and Gunlogson (2000) explicitly consider cases suggesting that (non-rhetorical) positive polar questions in English require a *lack* of contextual evidence *against* the positive answer in the utterance context. They then show that such questions, when asked in a context with contextual evidence *for* the positive answer, do not necessarily indicate that the speaker is going to give up his own biases, which are in conflict with the evidence.

Nevertheless, it may seem necessary that some such principle apply for the cases at hand, given the empirical situation for this construction in Japanese. There is, however, an alternative explanation for the asymmetry in how the utterance is resolved. This alternative account relies on pragmatic competition between polar rhetorical *ka* interrogatives with and without *no*. We have already seen a way of modeling pragmatic competition. The general principle was that optimal transitions from competing sentences that are less marked are subtracted from more marked sentences.

It is plausible enough that sentences with and without *no* would engage the same kind of pragmatic competition as sentences with and without *yo*. And it is also plausible that in this case the sentences with *no* are more marked than those without.

We have already seen that rhetorical *ka* interrogatives *without yo* are preferentially resolved toward a *negative* rhetorical interpretation, in which the question raised is resolved to the negative answer. What this means is that, for these sentences, the optimal transitions from the denoted set of candidate transitions are those in which the negative answer is selected. Now, if these sentences compete pragmatically with *no ka* rhetorical interrogatives, then we can derive the resolution of the latter directly in terms of competition. Basically, the optimal transitions from the *ka* interrogative will be subtracted from the *no ka* interrogative, leaving only the transitions leading to outputs resolved toward the positive answer. We might then derive the asymmetry in interpretation without relying on principle (202).

### 5.3.2 The Contribution of *yo*↓

I now consider the contribution of *yo*↓ to rhetorical *no ka* interrogatives. Some corpus examples are given below.

(203) shitten      no ka yo  
       know.PROG *no ka yo*  
       “You know (him)? (yes, you do).”

(204) Aniya-wa    sonna      yatsu ni furimawas-are-ten    no ka yo  
       Aniya-TOP    that.kind.of jerk    by exploit-PASS-PROG *no ka yo*  
       “Is Aniya getting duped by a jerk like that? (yes, he is).”

These questions are interpreted rhetorically, and in just the way that the previous discussion of *no* predicts. As with other corpus examples, we do not have intonational information, but only *yo*↓ is grammatical in interrogatives, so that these examples can be taken as exemplifying the use of *yo*↓. The presence of *yo*↓ in these sentences seems to contribute an extra dimension of meaning above and beyond the rhetorical character of the utterance. This can be illustrated by the use of minimal pairs constructed on the basis of the corpus sentences. The example in (204) has a distinctly

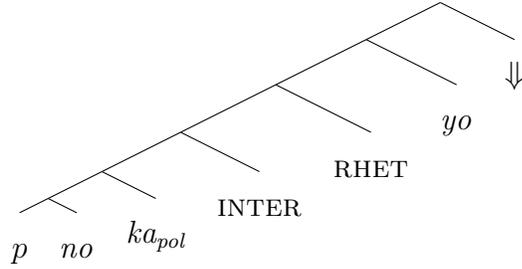
different flavor if *yo*↓ is not used. If this sentence is produced with ↓ instead of *yo*↓, then the rhetorical interpretation remains unaffected. However, the addition of *yo*↓ adds an element of shock and dismay (or anger) to the utterance.

The sentence in (204) was used in the context of a story in which the character Aniya is the leader of group of high school ruffians. The new teacher Kawato is attempting to reform them, and the utterer of (204) has come to think that Aniya is being duped by the new teacher. The sentence in (204) registers not only that the speaker takes the answer to his question to be established at this point, but also indicates the fact that Aniya's being duped is highly surprising, and also disappointing. In the context of the story, Aniya is a particularly recalcitrant and anti-authoritarian character, so his perceived gullibility toward the new teacher's methods are shocking to the speaker. This shock is indicated by the use of *yo*↓.

The same pattern is seen in (203). This sentence is used in a context where the speaker has just figured out that the addressee knows who the new teacher at their school is. He registers his shock at this fact by the use of *yo*↓. Thus, the full force of this sentence is as follows: The speaker asks a rhetorical question whose answer's polarity agrees with that of the question itself. But this answer goes against previous expectations that the speaker had, and he registers shock at this state of affairs with the use of *yo*↓. Like the previous example, the strong note of surprise depends on the presence of *yo*↓ here; if the sentence is used in the same context with a bare fall ↓ instead of *yo*↓, the strong sense of surprise disappears.

These intuitions fall out naturally from the compositional semantics of a *yo*↓-marked rhetorical polar *no ka* interrogative. The structure and denotation are given in (205).

$$(205) \left\{ \begin{array}{l} \text{PQ}_{S_c}^{c'}[0] \cap \text{PQ}_{A_c}^{c'}[0] = \{\llbracket p \rrbracket\} \wedge \quad (1) \\ P_{S_c}^c(\llbracket p \rrbracket) \leq P_{S_c}^c(\neg\llbracket p \rrbracket) \wedge \quad (2) \\ \langle c, c' \rangle \text{Ev}(\llbracket p \rrbracket, c) \wedge \quad (3) \\ (\llbracket p \rrbracket \in \text{PB}_{S_c}^{c'} \cap \text{PB}_{A_c}^{c'} \vee \llbracket \neg p \rrbracket \in \text{PB}_{S_c}^{c'} \cap \text{PB}_{A_c}^{c'}) \wedge \quad (4) \\ \exists x \in \text{DP}^c, \exists q : q \subseteq \Delta \text{cs}_x^c \wedge q \not\subseteq \Delta \text{cs}_x^{c'} \quad (5) \end{array} \right\}$$



The denotation differs from that for the *yo*-less variant in (201) in two respects. First, *yo* make demands on the output public questions and beliefs of both the speaker and the addressee. This is just like what we saw in the last section for rhetorical polar-*ka* interrogatives without *no*. The effects of  $\downarrow$  are spelled out in line 5 of the denotation. As before, we require that the default commitments of some agent be non-monotonically revised.

The crucial difference from previous examples of *yo* $\downarrow$  is that, in *no ka* interrogatives, this agent seems to be resolved to the speaker, rather than to the addressee. Line 2 tells us that the speaker had a potential bias for the negative answer  $\neg p$ . But line 3 tells us there is contextual evidence for the positive answer *p*. This creates a tension which must be resolved one way or the other, as required by line 4. As we already saw, the resolution seems to favor contextual evidence over subjective bias, meaning that the speaker is forced to give up whatever biases he may have had toward the negative answer. When we add line 5, we can make more explicit that the speaker is giving up some prior commitment.

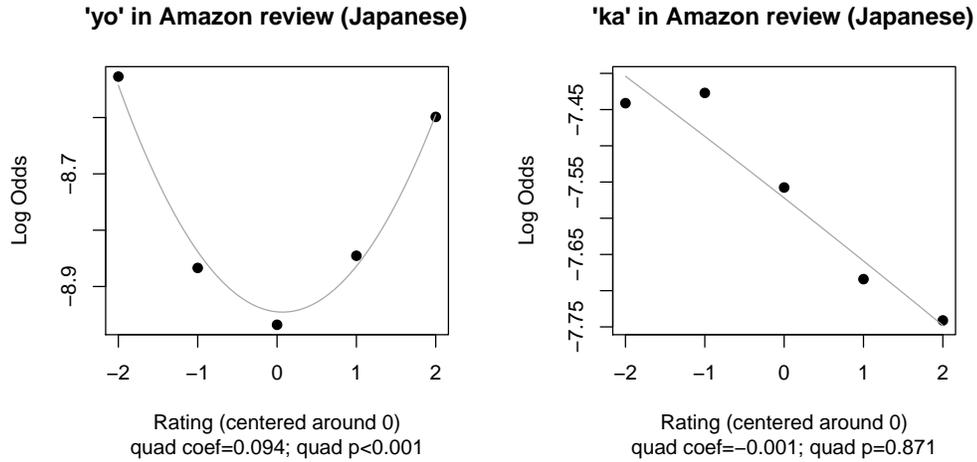
The identity of the downdated proposition *q* must be contextually resolved. Examples like the ones above suggest that the use of *yo* $\downarrow$  in rhetorical *no ka* interrogatives tends to emphasize some kind of *shock* or *dismay* on the part of the speaker, in a way

that is stronger or more highly marked than the same sentence without  $yo\downarrow$ . Since default commitments are based both on *beliefs* and on *intentions*, a revision can target both kinds of commitment. The semantics of  $\downarrow$  can thus explain the fact that  $yo\downarrow$  in these examples can contribute both a sense of violated expectations as well as violated desires, intentions, or the like. This contrasts with the  $yo\downarrow$ -less version in (201), which only seemed to index a sense of surprise.

The denotation in (205) is undoubtedly complex, but it is completely compositional. The apparent complexity arises from the fact that the LF of this construction is rich in particles, and these each contribute their own restrictions to the CCP denoted by the sentence. General pragmatic pressures must sort through the transitions that remain compatible with the resulting CCP. I have sketched a plausible way in which such pragmatic pressures constrain the interpretation for the interrogatives considered here, but future research should go further in making these additional pragmatic constraints more explicit. This can only be done on the basis of further empirical work on the subtle pragmatics of these sentences. It is hoped that the discussion here has provided a framework in which such future investigations can be carried out.

### 5.3.3 The Negativity of *ka yo* $\downarrow$ Interrogatives: Corpus Evidence

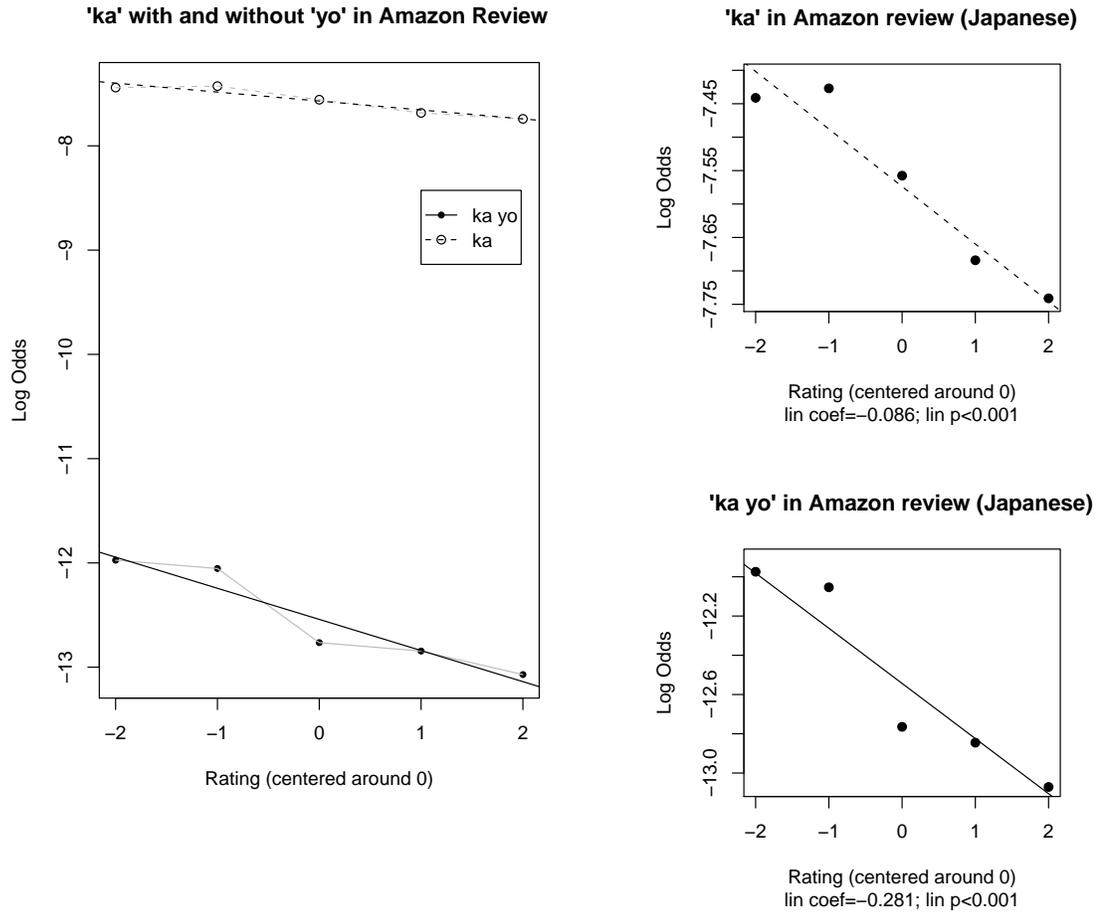
At this point, I have examined two kinds of polar *ka*-interrogatives, differing in whether they contain the particle *no*. Both kinds of interrogative can only get a rhetorical interpretation when combined with either a bare final fall  $\downarrow$  or with  $yo\downarrow$ , a fact I attributed to the rhetoricalizing operator RHET. The addition of  $yo\downarrow$  to both these interrogatives adds an additional pragmatic dimension to the utterance, which I have attempted to account for in above. One consistent trend is that *ka yo* $\downarrow$  interrogatives convey a strong sense of anger, dismay, or frustration. These utterances are, in other words, totally negative.



**Figure 5.1.** Distribution of *yo* and *ka* in the review text of the Japanese Amazon corpus.

This pragmatic negativity is confirmed by the distribution of *ka yo* bigrams in the UMass Amherst Sentiment Corpus. This corpus was introduced in §3.4, where we saw that *yo* had a significant U-shaped distribution across rating categories, meaning that it is used more frequently in extreme reviews than in moderate reviews. The particle *ka*, on the other hand, did not exhibit any significant curvature in its distribution. The data for these particles are repeated in Figure 5.1. These distributions are based on bigrams containing the particle followed by either a full stop, a question mark, or an exclamation point. This was done to insure that I was looking at only sentence-final occurrences of the particles. This means that tokens of *ka yo* are excluded from the plot of *ka* in Figure 5.1, which therefore represents sentence-final uses of *ka* that do *not* include *yo*. We can compare the distribution *ka* without *yo* to the distribution of those tokens of *ka* that *are* followed by *yo*. These are shown in Figure 5.2.

The graph on the left side of Figure 5.2 shows the log odds of *ka* without *yo* (labeled *ka*) along with the log odds of *ka yo*. Both sets of empirical points are plotted along with a fitted linear logistic regression line. The linear regression fits the points to a model of the form in (206).



**Figure 5.2.** Distributions of *ka* with and without *yo* in the review text of the Japanese Amazon corpus.

$$(206) \quad \log \text{ odds} = \beta_0 + \beta_1(\text{rating})$$

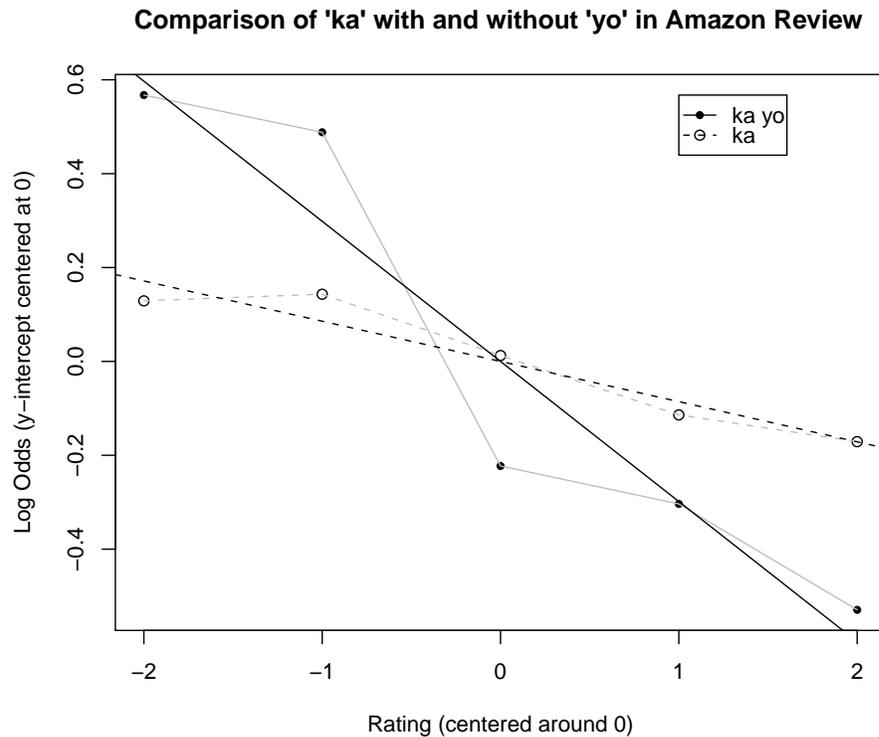
The term  $\beta_0$  in this model is the *y*-intercept of the estimated regression line. In other words, it is the predicted log odds value when  $x = 0$ , which in our centered ratings scale corresponds to the three-star reviews. The term  $\beta_1$  is the *linear coefficient*, which gives the slope of the fitted regression line. What this term tells us is the predicted *change* in log odds as a function of rating category.

Because the overall frequency of *ka yo* is much lower than that of *ka* without *yo*, the data in the leftmost graph are difficult to parse visually. On the right side

of Figure 5.2 I have “zoomed in” on the distribution of both items and plotted the fitted regression lines along with the linear coefficients and their associated  $p$  values. Although there is not a significant quadratic component to  $ka$ ’s distribution across rating categories, the top right graph in Figure 5.2 shows that there *is* a clear linear tendency. The particle shows up more frequently in more negative reviews, a fact that is confirmed by the significant linear coefficient in the associated logistic regression model. This is also true of  $ka\ yo$ , as seen in the lower right graph in Figure 5.2. But looking at the *size* of the linear coefficients, it is clear that  $ka$  followed by  $yo$  has a *greater* negative bias than  $ka$  without  $yo$ . Remember that the linear coefficient in these models indicates the slope of the of line. A negative coefficient means that the probability goes down as the rating goes up. This negative trend is over three times greater when  $ka$  is followed by  $yo$  than when it is not.

This difference in slope is not apparent in these graphs, because the  $y$ -axes of both are cropped according to the empirical points and fitted models of each item. The difference in slope is hard to make out in the zoomed-out graph on the left because of the large difference in the  $y$ -intercepts of the two models, due in turn to the large difference in underlying frequency of  $ka$  with and without  $yo$ . The plot in Figure 5.3 makes the difference in slope much more obvious. To correct for the fact that  $ka\ yo$  is much less frequent in all rating categories than  $ka$  without  $yo$ , I adjusted the  $y$ -intercept to 0 for both distributions in the plot, so that the difference in their slopes (which represent the degree of bias toward negativity) can be more readily appreciated. In effect, this is the same graph as the leftmost one in Figure 5.2, but with both sets of points and their associated regression lines shifted down to the same  $y$ -intercept, allowing for direct visual comparison of the slopes.

Figure 5.3 makes it clear that there is a much greater bias for negativity when  $ka$  is accompanied by  $yo$  than when it is not, since the presence of  $yo$  seems to decrease the slope of the line. This impression is confirmed by a fitting a logistic regression



**Figure 5.3.** Relative degree of negativity of *ka* with and without *yo* in the review text of the Japanese Amazon corpus.

model with two independent variables (centered rating category and the presence or absence of *yo*) and an interaction term, which is summarized in Table 5.1 (note that the model is based on the original *y*-intercept values, rather than the ones shown in Figure 5.3). The model has the form in (207).

$$(207) \quad \log \text{ odds} = \beta_0 + \beta_1(\text{rating}) + \beta_2(\text{yo}) + \beta_{1*2}(\text{rating} \times \text{yo})$$

As before, our model includes the category rating as an independent variable with coefficient  $\beta_1$ . The model also includes the dichotomous variable labeled *yo*, which is set to 1 when looking at the distribution of *ka* with *yo*, and set to 0 otherwise. There are also two new coefficients in the model,  $\beta_2$  and  $\beta_{1*2}$ , that depend on the presence of *yo*.

	Estimate	Std. Error	z value	<i>p</i>
Intercept ( $\beta_0$ )	-7.57378	0.01073	-706.147	$< 2 \times 10^{-16}$
Rating ( $\beta_1$ )	-0.08626	0.00676	-12.761	$< 2 \times 10^{-16}$
<i>yo</i> ( $\beta_2$ )	-4.96960	0.12048	-41.247	$p < 2 \times 10^{-16}$
Rating: <i>yo</i> ( $\beta_1 * \beta_2$ )	-0.19502	0.07853	-2.483	0.0130

**Table 5.1.** Logistic regression model of the distribution of *ka* across rating categories, showing a significant interaction of *yo* with rating category.

So how does the model work? When looking at the distribution of *ka* without *yo*, the terms with *yo* equal 0 and cancel out, so that the equation reduces to the one in (206),  $\log \text{odds} = \beta_0 + \beta_1(\text{rating})$ . As before,  $\beta_0$  specifies the *y*-intercept, which gives the log odds when  $x = 0$ . With the centered rating categories used here,  $\beta_0$  thus tells us the log odds of finding *ka* without *yo* in a three star review. The value of  $\beta_1$  tells us the slope of the line, which in turn tells us how the log odds changes as a function of rating category. The estimated values of these two terms are given in the first two rows of the model summary in Table 5.1, along with their associated *p* values. The intercept tells us that when  $x = 0$  (that is, in a three-star review), the log odds of finding *ka* without *yo* is about  $-7.57$ . The value of  $\beta_1$  tells us the slope of the line, which in turn tells us the way in which the log odds of finding *ka* without *yo* changes as we move to different rating categories. The estimated value of this term tells us that the log odds *decrease* by 0.086 when the rating increases by 1, and conversely that the log odds *increase* by 0.086 when the rating decreases by 1. This term is highly significant, meaning that there is a significant negative trend in the distribution of *ka* without *yo* in the corpus data.

What about the distribution of *ka* with *yo*? The model captures the influence of *yo* with the terms  $\beta_2(\text{yo})$  and  $\beta_{1*2}(\text{rating} \times \text{yo})$ . The first term gives us an estimate of the change in the *y*-intercept of *ka yo* by comparison with that of *ka* without *yo*. The value of this term is about  $-4.97$ , meaning that the *y*-intercept for *ka* with *yo* is  $-7.57 + -4.97 = -12.54$ . This reflects the fact that *ka yo* is much less frequent overall

than *ka* without *yo*, and therefore less frequent in three-star reviews as well, when  $x = 0$ . We aren't interested in this difference; what we want to know is the difference in the *slope* of the line. This is what the estimated value of the interaction term  $\beta_{1*2}(\text{rating} \times \text{yo})$  tells us. The estimated value of  $\beta_{1*2}$  is  $-0.195$ , meaning that the slope of the line changes by this amount when *ka* occurs with *yo* compared to when it does not. To get the slope of the line that models the distribution of *ka yo* in the corpus, we add this value to that of  $\beta_1$ . Here, we get a slope of  $-0.086 + -0.195 = -0.281$ . What this tells us is that the negative change in log odds as a function of rating category is over three times greater when *ka* is used with *yo* than when it is not, a difference whose significance is confirmed by the low  $p$  value ( $< 0.05$ ) of this term in the model. The model confirms the visual impression in Figure 5.3: The use of *ka* is significantly more negative when used with *yo* than without *yo*.

Although the corpus does not provide intonational information, we know that only  $\text{yo}\Downarrow$  is possible with *ka* interrogatives. This means that the negative bias for *ka yo* in the corpus data may reflect the contribution of  $\Downarrow$ , rather than of *yo* itself. We already saw a very different general distribution for *yo*-marked sentences in Figure 5.1. The U-shaped distribution of *yo* in the corpus was discussed in §3.4.2, where I argued that it could be understood as a reflex of the rising intonational particle  $\Uparrow$ . Since *yo* in *ka* interrogatives can only occur with  $\Downarrow$ , the negative distribution of *ka yo* sentences might reflect a pragmatic effect of *yo* in conjunction with  $\Downarrow$ .

I have argued that  $\Downarrow$  is used to make strong and explicit corrections to an agent's commitments. In *ka yo* interrogatives, this corrective flavor can be either addressee oriented or speaker oriented, depending on the presence of *no*. What the corpus data show is that this corrective flavor has strong negative overtones. Presumably, this is why the use of *yo* in interrogatives is felt to be rude or abrupt. The corrective semantics of  $\text{yo}\Downarrow$  argued for in this dissertation does not encode a negative expressive

semantics, but its effect on *ka* interrogatives seems to have a pragmatically negative component.

The tendency for semantic negation to show a bias toward negative sentiment in corpora like these has been detailed by Potts (2010). Moreover, the use of emphatic NPIs enhances this latent negative bias, in the same way that *yo* has a significant negative influence on the slope of the regression model in Table 5.1. Potts suggests a pragmatic explanation of the facts: at the semantic level, negation is purely logical, and specifies nothing about emotional or evaluative negativity. The negative sentiment profiles of semantically negative operators is a case of *emergent expressivity*, in which actual usage suggests an expressive effect that does not directly follow from any lexically specified meaning component. This suggests that the use of *yo*↓ brings out a latent negative tendency in the construction with which it occurs, in this case *ka* interrogatives.

Whence the negativity? First, notice that *ka* without *yo* has a small but significant negative tendency in the corpus. I suggest that this reflects the latent negative bias inherent in the interrogative semantics presented in §5.2. The semantics of the interrogative operator INTER encodes a potential bias toward the *negation* of the overt proposition, a fact that was used to explain the negative polarity of typical rhetorical interpretations polar *ka* interrogatives. When *yo*↓ is used, it seems to make this negative bias more emphatic. An utterance of *p-ka-yo*↓ reveals a strong bias against *p* on the part of the speaker, as well as an exasperated correction of a mistaken addressee who has suggested that *p* might hold. When *no* is added to the mix, we turn the tables, and get an interpretation where the speaker is strongly correcting his own prior convictions. In both cases, the use of *yo*↓ seems to heighten the latent negativity of the rhetorical interrogative, a fact that is reflected in the corpus data examined above.

### 5.3.4 The Use of *no* in *yo*↓-Marked Declaratives

The presence or absence of *no* in rhetorical polar *ka* interrogatives with *yo*↓ was seen to shift the direction of interpretation as follows: When *no* is present, the speaker is interpreted as correcting his own beliefs, while when *no* is absent, the speaker is interpreted as correcting the addressee's beliefs. Satoshi Tomioka (p.c.) has suggested a parallel pattern in *yo*↓-marked declaratives with and without *no*. In §3.3, I looked at examples of *yo*↓-marked declaratives that targeted the *addressee's* commitments for revision. The semantics of ↓, however, does not *require* that the target of correction be identified with the addressee. It should in principle, therefore, be possible to use a *yo*↓-marked declarative to register a correction to the speaker's own prior commitments. The context in (208) sets the stage for a self-correcting use of *yo*↓.<sup>6</sup>

(208) Context: I thought Professor Kusumoto had plans to go to a conference in Paris, and I therefore didn't expect her to be at work. But then I walked by her office, and surprisingly she WAS at work.

Tomioka reports the felicity contrast in (209), suggesting that the self-correcting use of *yo*↓ is licensed by the presence of *no*, but is unavailable without *no*. Note that the use of *no yo* sounds a bit feminine; men are more likely to use the particle cluster *nda* rather than *no*, with the same effect. The particle cluster *nda* can be analyzed as deriving from *no* in conjunction with the copular particle *da*, in which case both variants exemplify the effects of *no*.

(209) odoroitakotoni, Kusumoto-sensei ita          #(no/nda) *yo*↓  
surprisingly,    Kusumoto-sensei was.there #(no/nda) *yo*↓  
“Surprisingly, Professor Kusumoto was there #(no/nda) *yo*↓.”

---

<sup>6</sup>I thank Angelika Kratzer for bringing this issue to my attention, and for suggesting this test context.

At an intuitive level, the pattern exhibited in (209) mirrors what we saw in rhetorical polar *ka* interrogatives. When *no* is used, it seems to indicate that there is some contextual evidence for the propositional content of the sentence (in this case, the fact that Kusumoto-sensei is in her office). This violates a prior expectation of the speaker, leading to a self-correction that is marked with *yo*↓. Without the particle *no*, it seems impossible to interpret the same *yo*↓-marked sentence as a self-correction. Instead, it is understood as a correction to a mistaken addressee (“despite what you thought, Professor Kusumoto IS in her office”).

The parallel effects of *no* in *yo*↓-marked declaratives and interrogatives suggests that a unified analysis is in order. The semantics of *no* articulated in this section provides a partial solution, but I suspect that more needs to be said. For one thing, the particle *no* is probably focus sensitive. Tomioka (p.c.) suggests that S-*no-yo*↓ sentences are felicitous when there is a focus alternative of S that was expected to be true instead of S. If this is right, then we need an additional focus-sensitive semantic component in the denotation of *no*. This sets up a tension with the evidential meaning of the particle identified earlier; in effect, the particle seems to be saying that there is contextual evidence for one proposition, while also saying that the speaker had a pre-existing expectation that some alternative proposition was true. I leave further exploration of these effects to future work.

## 5.4 Wh-Interrogatives

### 5.4.1 Distribution of *yo*↓ in Wh-Interrogatives

I close the chapter by looking briefly at the use of *yo*↓ in wh-interrogatives. As with polar questions, the use of *yo*↓ is restricted to a subset of the wh-question constructions in standard Japanese. One such class is characterized by non-honorific verbal morphology combined with the final particle *ka*. As we saw with polar-*ka*

interrogatives, these *wh-ka* interrogatives can end with either ↓ or with *yo*↓. The examples in (210) illustrate.

- (210) a. *dare-ga sonna mon ku-eru ka* (↓/*yo*↓)  
 who-NOM that.kind.of thing eat-can *ka*  
 “Who can eat that sort of thing? (no-one!)”
- b. *doko ni it-tara suku-eru ka* (↓/*yo*↓)  
 where to go-if save-can *ka*  
 “Where can we go to be saved? (no where!)”

A few points are in order. First, as we saw with polar-*ka* interrogatives, the *wh-ka* interrogatives here seem to only allow a rhetorical reading. Second, the answer to these questions is consistently taken to be the negation of the possibility that any potential substitution for the *wh*-word is true; so (210a) is understood to mean that there is no one who can, in fact, eat the sort of thing being referred to, and (210b) conveys that there is in fact no place such that our going there will allow us to be saved.

To make these *wh-ka* interrogatives into true information-seeking questions, rising intonation seems to be required. But as with non-honorific polar-*ka* interrogatives, the resulting sentence is less than natural. To make a natural-sounding information-seeking question, addressee-oriented honorific morphology can be added to the verb. But the resulting sentence can no longer be used with *yo*↓:

- (211) *doko ni it-tara suku-e-masu ka* (↑/\**yo*↓)  
 where to go-if save-can-HON *ka*  
 “Where can we go to be saved?”

The situation parallels that for polar-*ka* interrogatives.

There is one more class of *wh*-questions with which *yo*↓ can be used. This class, illustrated by the example in (212), can occur with a final rise, final fall, or *yo*↓, and

can receive either information-seeking or rhetorical interpretations with any of these choices, depending on the context of the utterance.

- (212) *doko ni it-tara suku-eru nda* ( $\uparrow/\downarrow/yo\downarrow$ )  
where to go-if save-can *nda*  
“Where can we go to be saved?”

The key feature of sentences in this class is the combination of non-honorific verbal morphology with the particle (or perhaps particle cluster) *nda*.

I will assume that the two classes of wh-questions with which *yo\downarrow* can occur are semantically interrogatives; their canonical interpretation as questions arises from an interrogative semantics deriving from the morpheme INTER. In the rest of this section, I look at the interpretation of each type of interrogative in turn.

#### 5.4.2 Wh-*ka* Interrogatives

The first step in the analysis of wh-interrogatives is to provide a semantics for the interrogative radical. I have already argued that the radical denotes a set of propositions. For wh-interrogatives, this leaves two questions:

1. What alternative propositions are in the set?
2. How are the alternative propositions derived compositionally?

Japanese, like many other languages, has a system whereby indeterminates (often called wh-words) are combined at a distance with a question particle. The semantics of indeterminates, question particles, and the mechanics of their composition is a complicated empirical domain with a rich literature. For Japanese, the work of Hagstrom (1998), Shimoyama (1999, 2001), and Kratzer and Shimoyama (2002) are particularly relevant. Cable (2007, 2008) proposes a system similar in spirit that takes a cross-linguistic view on the association between indeterminates and Q-particles, focusing on wh-questions in Tlingit.

I adopt a Hamblin-inspired account of wh-interrogative radical semantics, derived from that of Kratzer and Shimoyama (2002) (K&S). The basic idea is that the indeterminate (what many would call the wh-word) is associated with a set of alternatives. In the K&S system, all regular semantic denotations are taken to be sets. In the default case, these sets are singleton. Indeterminate phrases serve to introduce non-trivial sets of alternatives. The indeterminate phrases are then semantically bound by higher operators, corresponding to universal quantification (Japanese *mo*, Shimoyama 2006), existential quantification, etc.

The mechanics of the system is illustrated by the following example from page 6 of K&S:

$$\begin{aligned}
 (213) \quad \llbracket \text{dare} \rrbracket^{w,g} &= \{x: \text{human}(x)(w)\} \\
 \llbracket \text{nemutta} \rrbracket^{w,g} &= \{\lambda x \lambda w'. \text{slept}(x)(w')\} \\
 \llbracket \text{dare}(-\text{ga}) \text{ nemutta} \rrbracket^{w,g} &= \{p: \exists x[\text{human}(x)(w)] \ \& \ p = \lambda w'. \text{slept}(x)(w')\}
 \end{aligned}$$

The composition in (213) illustrates the essence of how the system works. The indeterminate *dare* denotes a set of human entities. The verb *nemutta* denotes a singleton set whose single member is the property  $\lambda x \lambda w'. \text{slept}(x)(w')$ . The composition proceeds by point-wise function application: The single property denoted by *nemutta* is applied to each of the elements of *dare*, and the resulting set consists of the result of each application.

At this point in the computation, we have a non-singleton set of propositions. These can then be selected by a higher operator. In the K&S system, these correspond to existential quantification (existential *ka*), universal quantification (*mo*), negation, and the question particle. For the purposes of this dissertation, only the question particle is important. For wh-*ka* interrogatives, the question particle is *ka*, which I represent as  $ka_{wh}$  to distinguish it from the polar question particle  $ka_{pol}$ . According to K&S, this can be given a trivial identity-function semantics, returning the same set as denoted by its complement.

At a technical level, the K&S system builds the Hamblin alternatives associated with indeterminates into the regular denotation of the sentence, meaning that ordinary denotations are always sets. This is not a necessary feature of the system, however. In fact, the approach to wh-phrases/indeterminates and their association with Q-particles developed by Beck (2006) and Cable (2007, 2008) has indeterminates generate alternatives as their *focus* semantic value, rather than their regular semantic value. The Q-particle is then taken to be a focus-sensitive operator that integrates the non-trivial focus alternatives introduced by the indeterminate phrase into an appropriate regular denotation. What this means for present purposes is that adopting a K&S-style approach to the compositional derivation of wh-interrogatives in Japanese does not necessitate the adoption of Hamblin-style denotations for a sentence’s regular denotation. In a Beck/Cable approach, the particle  $ka_{wh}$  can be given a focus-sensitive denotation that pulls the set-theoretic focus alternatives introduced by the indeterminate into the regular semantic dimension.

Since the compositional semantics of the wh-interrogative radical are not the focus of this chapter, I leave the discussion at that. For me, the important aspect of the K&S system lies in the set of propositions it gives rise to. Consider the example in (213), with the indeterminate *dare* “who”. The indeterminate introduces alternative human entities. The set of propositions derived only includes *positive* answers to the wh-question; the answer “Nobody slept” is not included in the set characterized by the wh-interrogative radical. This is similar to the analysis adopted above for (positive) polar questions, in which the negative answer was not included in the set characterized by the interrogative radical.

An interrogative radical in a wh-*ka* interrogative will then have a semantics like the one sketched in (214):

$$(214) \quad \llbracket P(\text{wh}) ka_{wh} \rrbracket = \left\{ p \mid \exists x \in \text{wh} : p = P(x) \right\}$$

I will henceforth ignore the compositional details of the interrogative radical. The variable  $Q$  will be used to designate the appropriate set of propositions, which should be understood to include all and only the positive substitutions for the indeterminate/wh-phrase. The interrogative radical combines with the interrogative force head INTER to derive the denotation in (215).

$$(215) \quad \lambda\mathbb{A}. \left\{ \langle c, c' \rangle \left| \begin{array}{l} \text{PQ}_{\mathbb{A}}^{c'}[0] = \llbracket Q \rrbracket \wedge \\ \forall q \in \llbracket Q \rrbracket : P_{s_c}^c(q) \leq P_{s_c}^c(\neg q) \end{array} \right. \right\}$$

The denotation includes the bias toward negative answers that was introduced for polar interrogatives. In the context of a wh-interrogative, what this means is that the speaker is potentially biased *against* any particular positive substitution, but is not biased *toward* any substitution. Han (1998a) suggests that normal, positive wh-questions have a potential speaker bias that the number of true substitutions is smaller than the number of false ones. That is, for property  $P$  in (214), there are fewer relevant  $x$ 's satisfying property  $P$  than there are  $x$ 's not satisfying it. The potential bias generated by (215) says that, for each relevant entity  $x$ , the prior probability of  $P(x)$  is no greater than that of  $\neg P(x)$ .

It is unclear to me at this point whether either sort of bias is exactly what we want for a wh-interrogative. But using the potential bias in (215), we can derive the direction of rhetorical interpretation for wh-interrogatives in a manner parallel to polar interrogatives. For polar interrogatives, this bias pushed us toward a negative interpretation (all else being equal) in rhetorical uses. For a wh-interrogative, the same bias will push us to a negative interpretation for each proposition in the question, which amounts to a “none of the above” rhetorical interpretation.

As we already saw, *wh-ka* interrogatives with either  $\downarrow$  or  $yo\downarrow$  seem to get consistently rhetorical interpretations, illustrated by the constructed examples in (216).

(216) dare-ga sonna mon ku-eru ka ( $\downarrow/yo\downarrow$ )  
 who-NOM that.kind.of thing eat-can *ka*  
 “Who can eat that sort of thing? (no-one!)”

(217) doko ni it-tara suku-eru ka ( $\downarrow/yo\downarrow$ )  
 where at go-if save-can *ka*  
 “Where can we go to be saved? (no where!)”

The way that these rhetorical readings are derived follows the logic laid out above. Since these constructions *only* get a rhetorical interpretation, I again assume that the rhetoricalizing particle RHET is a part of the construction. When combined with  $\downarrow$ , we get the structure and denotation in (218).

$$(218) \left\{ \langle C, C' \rangle \left| \begin{array}{l} PQ_{sc}^{C'}[0] = \llbracket Q \rrbracket \wedge \\ \forall p \in \llbracket Q \rrbracket : P_{sc}^C(p) \leq P_{sc}^C(\neg p) \wedge \\ (p \in PB_{sc}^{C'} \vee \neg p \in PB_{sc}^{C'}) \end{array} \right. \right\}$$

We get a rhetorical interpretation in which the speaker is committed to a positive or negative answer for *every* substitution for the *wh*-phrase. The only possible pragmatic interpretation is one in which *all* of these substitutions come out false, so the denotation underdetermines the interpretation. But we do derive a latent bias for negative answers, which goes at least some way toward deriving the correct interpretation. I should note that the particle *no* is not possible with a *wh-ka* interrogative,

so there is no way to force a positive rhetorical interpretation, unlike with polar-*ka* interrogatives.

When combined with  $yo\downarrow$ , we get the structure and denotation in (219). This differs minimally from the one with  $\downarrow$  in the by-now familiar way; requirements are made of both the speaker's and hearer's commitments, and in addition there is a non-monotonic revision required of some agent's default commitment set.

$$(219) \quad \left\langle \langle C, C' \rangle \left| \begin{array}{l} \text{PQ}_{S_c}^{C'}[0] \cap \text{PQ}_{A_c}^{C'}[0] = \llbracket Q \rrbracket \wedge \\ \forall p \in \llbracket Q \rrbracket : P_{S_c}^C(p) \leq P_{S_c}^C(\neg p) \wedge \\ (p \in \text{PB}_{S_c}^{C'} \cap \text{PB}_{A_c}^{C'} \vee \neg p \in \text{PB}_{S_c}^{C'} \cap \text{PB}_{A_c}^{C'}) \wedge \\ \exists x \in \text{DP}^C, \exists q : q \subseteq \Delta \text{cs}_x^C \wedge q \not\subseteq \text{cs}_x^{C'} \end{array} \right. \right\rangle$$

The intuitions are subtle, but there seems to be a more strongly corrective flavor, even a sense of angry exasperation (what are you thinking?!) when  $yo\downarrow$  is added to this class of interrogative. The first example (216) would be a natural, if aggressive, thing to say to someone who had offered food to the speaker, a food which the speaker thinks is obviously unfit for human consumption. The speaker would be then be taken to be in some sense chastising the addressee for his foolish mistake, ignorance, or misapprehension of the speaker's own culinary standards. The tone of correction and chastisement seems much stronger with  $yo\downarrow$  than with the bare fall  $\downarrow$ . The same holds for (217). While the version with  $\downarrow$  might be understood as merely an expression of the speaker's own conviction that there is nowhere one can go to be saved, the version with  $yo\downarrow$  is more clearly corrective, uttered perhaps by an old cynic to a naive dreamer. These additional effects are what we expect, given both the

addressee-orientation that arises from *yo*, and the corrective semantics contributed by ↓.

While the agent whose commitments are to be corrected is left open in the semantics, the non-monotonic revision seems to be consistently addressee-oriented for this class of examples. The context of use described above for (210a) is clearly of this kind. And we see once again the utility of building commitments on the basis of both beliefs and intentions, since either of these seem to be possible targets for the non-monotonic update being demanded in this example. The speaker might be challenging the addressee’s beliefs (How could you possibly believe that thing is fit for human consumption? It’s not!). Or he might be targeting the addressee’s intentions (How could you possibly suggest that I eat such a thing? Forget about it!). Both interpretations seem possible in this context, and both can be modeled by the denotation in (219).

### 5.4.3 Wh-*nda* Interrogatives

The second class of wh-interrogatives with which *yo* can occur are those ending with the particle (or particle cluster) *nda*. Unlike the *ka*-interrogatives with which *yo* can occur, these sentences can easily have either rhetorical or interrogative interpretations, depending on the context of utterance. Some corpus examples illustrate both interpretative possibilities. There is a systematic phonological reduction of the present tense marker *ru* with the following nasal in *nda*.

(220) itte oretachi ni nan-no      merito-ga a-nda    yo  
       go we            to what-GEN merit-NOM be-nda yo  
       “What merit is there in us going? (none!)”

(221) nani si ni kite    nda    yo  
       what do to came nda    yo  
       “(Tell me:) What did you come to do?”

Once again the corpus examples of *yo* must correspond to *yo↓*, given the impossibility of *yo↑* with interrogatives. The example in (220) has a rhetorical interpretation. Like the *wh-ka* interrogatives, the rhetorical interpretation here is one in which the answer is understood as the negation of all possible substitutions for the indeterminate, in this case giving rise to the rhetorical reading “there is no merit in us going there”. The example in (221) has an information-seeking interpretation; the speaker is understood to be seeking an answer to his question. There is an extra dimension of meaning to this question, though, that seems to be contributed by the use of *yo↓*. The speaker here seems to be indicating (according to a native speaker consultant) that he is surprised (and angry) that the addressee came at all. The utterance seems to convey something like “you shouldn’t be here” or “why the hell are you here”, in addition to the purely interrogative semantics conveyed by the utterance. This extra meaning is attributable to *yo↓*, since a minimal pair in which ↓ is substituted for *yo↓* seems to lose this extra dimension of meaning.

Other corpus examples attest to the fact that *yo↓* seems to very regularly contribute a meaning of this kind to *wh*-interrogatives ending in *nda*. I provide another example for illustration.

- (222) *omae asa doko it-te-ta nda yo*  
 you morning where go-PROG-PAST *nda yo*  
 “Where did you go this morning? (you shouldn’t have been out!)”

As indicated in the translation, this sentence is used to convey both an information-seeking question, to which the speaker expects an informative answer, as well as a (more nebulous) meaning to the effect that the speaker thinks the addressee shouldn’t have been out in the first place. This extra dimension of meaning seems to vanish if *yo↓* is dropped from the sentence.

So what’s the pattern here? First, we can get the same kind of rhetorical interpretation we got with *wh-ka-yo↓* interrogatives. And with an information-seeking

interpretation, we get an additional contribution from  $yo\downarrow$ . This additional contribution can be related to the rhetorical interpretation as follows. The rhetorical interpretation says in essence that, despite what the addressee may have thought, the correct answer to the wh-question is “none of the above”. The information-seeking interpretation indicates that the speaker thinks the “none of the above” answer *should have* been true. For the example in (222), the speaker uses  $yo\downarrow$  with the interrogative to indicate that the addressee shouldn’t have been out at all.

A full of analysis of this class of interrogatives will require a fuller picture of the empirical situation, as well as some understanding of what the particle *nda* is contributing. But the examples here show that  $yo\downarrow$  contributes a non-monotonic revision similar to what we saw in other interrogatives. For rhetorical uses like that in (220), we have an effect like we saw for wh-*ka* interrogatives. For information-seeking interpretations, we have something similar. Like the rhetorical uses, the speaker seems to indicate some kind of prior bias for the “none of the above” answer, in the sense that there is no substitution for the wh-word that satisfies the speaker’s prior expectations. The example in (221) is one in which the speaker did not expect the addressee to come at all, and hence any substitution for the wh-word results in an unexpected proposition. The speaker in (222) is surprised and annoyed that the addressee went anywhere at all; he had a prior bias for the addressee staying put. So any substitution for the wh-word results in a proposition that violates prior expectations.

We’ve already seen the way in which such latent biases can be derived from the semantics of the interrogative operator INTER itself. The use of  $yo\downarrow$  seems to emphasize the fact that these latent biases were very strong. With a rhetorical question, the speaker’s prior biases are maintained, and a mistaken addressee is being non-monotonically corrected, so that his own beliefs come into line with those of the speaker. In the information-seeking use, the speaker is indicating a non-monotonic

revision to his own prior commitments; his prior biases have been disconfirmed, and he expresses this fact with the use of  $yo\Downarrow$ .

While a detailed semantics of this construction will depend in part on an analysis of the particle *nda*, the denotation in (223) can be derived on the basis of the discussion thus far, assuming no role for *nda*. Since this construction does not require a rhetorical interpretation, I assume that the particle RHET is not present.

$$(223) \left\{ \langle c, c' \rangle \left| \begin{array}{l} \text{PQ}_{S_c}^{c'}[0] \cap \text{PQ}_{A_c}^{c'}[0] = \llbracket Q \rrbracket \wedge \\ \forall p \in \llbracket Q \rrbracket : P_{S_c}^c(p) \leq P_{S_c}^c(\neg p) \wedge \\ \exists x \in \text{DP}^c, \exists q : q \subseteq \Delta \text{cs}_x^c \wedge q \not\subseteq \text{cs}_x^{c'} \end{array} \right. \right\}$$

```

graph TD
    Root(( )) --- Q
    Root --- INTER
    Root --- yo
    yo --- Arrow[↓]
  
```

The only difference between this denotation and the one for  $yo\Downarrow$ -marked *wh-ka* interrogatives in (219) is the absence of the rhetoricalizing operator RHET. The semantics does not require that the public question be settled in the output context, and so we predict (correctly) that non-rhetorical interpretations are possible.

What we are left with is the following. The first line requires that the public question of both discourse participants contain all propositions in the interrogative radical in the output context. That is, we require that both speaker and addressee be committed to answering  $Q$ . The second line encodes the potential speaker bias against any positive substitutions for the *wh*-word. The last line is the contribution of  $\Downarrow$ , which demands that there be a non-monotonic revision to some agent's commitment set. Recall that the commitment set reflects both beliefs and intentions, so that its non-monotonic revision can reflect an adjustment to an agent's public beliefs, his public intentions, or both. And the examples (220) and (221) reflect this; the speaker using  $yo\Downarrow$  seems to indicate both surprise (based on prior beliefs) and annoyance (based on prior intentions) in (221) and (222). Surprise and annoyance about the violation of which prior commitments? The commitment reflecting the potential bias

of the wh-interrogative itself, namely that there are no true positive substitutions for the wh-word.

## 5.5 Summary

The investigation of interrogatives has increased our inventory of pragmatic particles. Each addition was motivated by particular facts of interrogative interpretation, and the resulting denotations, while complex, are fully compositional, and seem to line up well with the range of interpretations seen for each construction. The resulting denotations integrate with the particles  $\downarrow$ ,  $yo$ , and  $\Downarrow$  in a straightforward way, providing further support for the analyses of these particles developed earlier in the dissertation.

The picture of interrogatives in Japanese provides particularly compelling support for the idea that sentential force is not determined only on the basis of a single morpheme. We saw that there are many different constructions spelling out some kind of interrogative semantics. These were analyzed as sharing a common force head INTER, but the semantics of each construction was determined on the basis of a number of different particles, all interacting to constrain the resulting CCP denotation for the entire sentence. These semantically derived constraints on CCPs were shown to interact in subtle ways with pragmatic interpretational constraints, reinforcing the idea that pragmatic particles work in tandem with general pragmatic pressures to derive optimal dynamic interpretations.

## CHAPTER 6

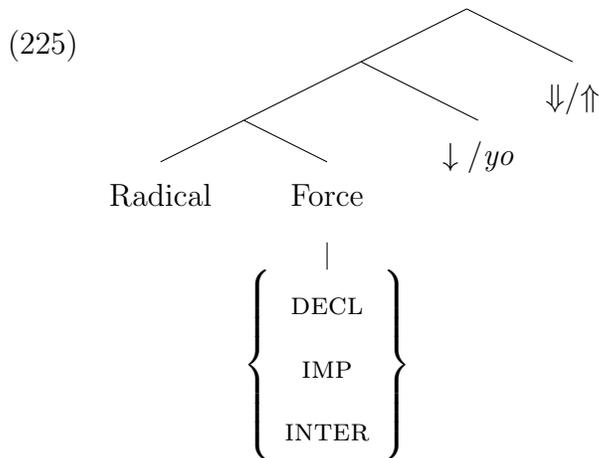
### CONCLUSION: SUMMARY AND FUTURE DIRECTIONS

#### 6.1 The Semantics and Pragmatics of Force

In this dissertation, I staked out a particular model of dynamic semantics, deriving from the basic picture in (224).

$$(224) \quad \alpha \longrightarrow \boxed{\text{Force}} \longrightarrow \boxed{\text{PRAG}}$$

With  $\alpha$  representing the sentence radical, I have argued for a layer of meaning that maps the radical (denoting a proposition, a set of propositions, or a property depending on the clause type) to a CCP. In the preceding chapters, I have argued that the grammar does not map sentence radicals to CCPs in a single step. Following Gunlogson (2003), I argued that the sentential force head combines with the sentence radical to give an “open-agent” CCP, whose open argument must be resolved by the use of an additional particle. I argued that two particles fill this position in Japanese: the falling intonational particle  $\downarrow$  resolves the open agent to the speaker, while the particle  $y_o$  resolves it to the entire set of discourse participants. I showed that this basic picture applies not only to declaratives, but to imperatives and interrogatives as well. Moreover, I argued that when  $y_o$  is used, the resulting CCP is further constrained by one of two final intonational particles,  $\downarrow$  and  $\uparrow$ . These particles make additional requirements on the CCP denoted by the sentence:  $\downarrow$  adds a non-monotonic revision to an agent’s default commitments, while  $\uparrow$  is used to introduce and resolve decision problems for the addressee. The pieces fit together as shown in (225).



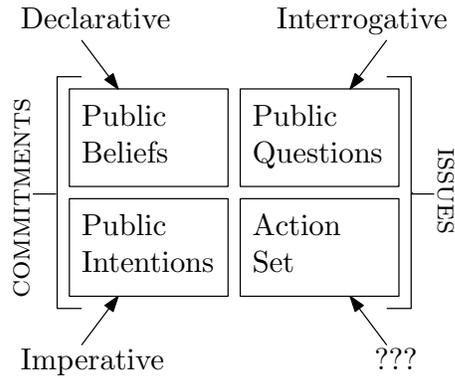
The resulting CCP denotation is not a function, but a relation. It *constrains* the set of contextual updates that are compatible with the semantics of the sentence, but it does not *determine* a unique update. It is the job of pragmatics to further constrain the set of semantically compatible updates. I argued for a set of pragmatic constraints inspired by Beaver (2002) that serve to *rank* the semantically compatible alternative transitions.

The interpretation of a sentence at the level of the CCP is thus constrained both semantically and pragmatically. The semantic constraints are introduced at and above the level of sentential force, while the pragmatic constraints help filter through the transitions that are compatible with the resulting semantics. In OT terms, the semantics is in effect constraining the *candidate set*. Pragmatic constraints only apply to candidates that pass through the semantic filter. The system thus distinguishes the contribution of semantic and pragmatic constraints at a fundamental level: Semantic constraints are absolute, and specify which contextual transitions are in the competition. Pragmatic constraints rank these competitors, giving back a winner or set of winners, interpreted as the pragmatically preferred interpretation(s) for the utterance.

In the rest of this chapter, I address some outstanding issues and areas for further investigation.

## 6.2 Commitments and Issues

In the course of the dissertation I have articulated a four-part structure of discourse contexts, schematized in Figure 6.1.



**Figure 6.1.** Four-part structure of discourse contexts.

The left side of the figure is the representation of an agent’s discourse *commitments*, along with the clause types which conventionally target these commitments. The declarative clause type targets public *beliefs*, while the imperative clause type targets public *intentions*. Both objects are modeled as sets of propositions. The only difference is in how these sets are interpreted; the former narrow down the way the world might be, given our agent’s commitments, while the latter narrow down the way our agent intends the world to be. This two-part division of commitments is motivated in part by the complementary function of the declarative and imperative clause types.

The right side of the diagram models an agent’s contextual *issues*. Public questions model issues of fact, like public beliefs model commitments to fact. And there is a clause type that provides a conventional means of updating this discourse component: the interrogative. The lower right object, the *action set*, models issues of action. Again, this object finds a natural counterpart in the commitments column. Public

intentions model commitments that guide action, and the action set models issues about which actions should be taken. The parallel with commitments and issues about fact is clear.

Strangely, however, there does not seem to be a distinct clause type dedicated to updating this discourse object. By hypothesis, interrogatives are conventionally associated with updates to the public questions of an agent. We might expect an analogous way of updating the action set, with a fourth clause type. But there does not seem to be such a clause type, either in Japanese or in any other language that I am aware of.

How then are issues of action introduced? I have argued that the rising intonational associate of *yo*, the morpheme  $\uparrow$ , is one such way. And there seem to be more indirect ways as well. The most obvious is the use of a root modal with an interrogative clause. The connection between root modals and imperative update has been explored in some detail by, among others, Portner (2007a). By using such a modal in an interrogative, for example by asking “what should I do?”, a speaker can indirectly introduce an issue of action. But it does not seem that natural language provides a distinct clause type for updating this discourse object.

In light of this gap, one might seek to consolidate the modeling of contextual issues, by collapsing the public questions and action sets together in some way. We would be left wondering by there are two distinct kinds of contextual commitments, but only one kind of contextual issue. We might attempt to consolidate further, by integrating commitments and issues (as in Groenendijk 1999) or integrating beliefs and intentions. I leave this possible consolidation as an open problem for future research. Briefly, however, I want to address the consequences that any such changes would have for the proposals made in this dissertation.

There is an important sense in which the core proposals I have made are independent of these issues. Although I have articulated a semantics for the three main

clause types that makes use of the contextual model in Figure 6.1, the semantic type of every forced sentence is actually the same. Once we have attached a force head to a radical, we always get back a function from sets of discourse agents to relational CCPs. This fact can be appreciated by comparing the denotations in (226).

$$\begin{aligned}
 (226) \quad \llbracket \text{DECL } p \rrbracket &= \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \mid \llbracket p \rrbracket \in \text{PB}_{\mathbb{A}}^{C'} \right\} \\
 \llbracket \text{IMP } P \rrbracket &= \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \mid \llbracket P \rrbracket(A_C) \in \text{PI}_{\mathbb{A}}^{C'} \right\} \\
 \llbracket \text{INTER } Q \rrbracket &= \lambda \mathbb{A}. \left\{ \langle C, C' \rangle \mid \begin{array}{l} \text{PQ}_{\mathbb{A}}^{C'}[0] = \llbracket Q \rrbracket \wedge \\ \forall q \in \llbracket Q \rrbracket : P_{s_c}^c(q) \leq P_{s_c}^c(\neg q) \end{array} \right\}
 \end{aligned}$$

For each of the clause types considered in this dissertation, we have denotations of the same type. The particles  $\downarrow$  and *yo* serve to resolve the open set-of-agents argument  $\mathbb{A}$ , and give back a relational CCP. The other particles considered in this dissertation serve to further constrain this CCP.

If we were to simplify our model of contexts by, for example, collapsing public beliefs and public questions into a single object, as Groenendijk (1999) does, the basic picture would be unaffected, *as long as* we have agent-specific versions of this consolidated contextual object. The semantics of the declarative and interrogative force heads DECL and INTER would need to be adjusted so that they would target this new contextual object for update. As long as the denotation of the forced sentence remains a function from sets of discourse agents to relational CCPs, the basic picture laid out in this dissertation can be maintained. Nothing crucial hinges on the specific model of contexts adopted here; the only crucial feature is that we maintain separate commitments/issues (however represented) for each discourse agent.

### 6.3 Pragmatic Particles and Multidimensionality

The particles examined in this dissertation were used to argue for an articulated model of sentential force and a relational semantics of the resulting CCP denotation. The level of sentential force provides a bridge between the semantics of the sentence

radical (truth-conditions, in the case of declaratives) and the discourse move associated with the utterance. Particles occurring at this level of the sentence are pragmatic in the same sense that the CCP itself is pragmatic. The CCP is the primary means by which a speaker conventionally specifies the range of contextual updates compatible with his utterance. I have argued that pragmatic constraints can only select updates that are compatible with the CCP semantics of the sentence. Therefore, any particle that places further constraints on the CCP of the sentence will have important pragmatic consequences, since it can in effect serve to knock out candidate transitions that would have been more optimal according to pragmatic reasoning.

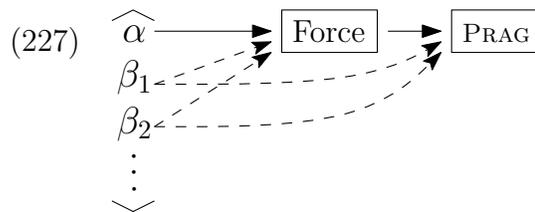
Zimmermann (to appear) argues that discourse particles denote *expressive* meanings. By this, he means that these particles do not contribute to the descriptive, or truth-conditional, content of the utterance. This claim is certainly true of the particles examined in this dissertation. These particles were all argued to contribute their meaning at and above the level of sentential force. This level forms a bridge between the static, descriptive content of the sentence, and its dynamic interpretation as an utterance-in-context. The particles are expressive in the sense that they contribute to this second layer of meaning, rather than the first.

This bridge is built in a single, at-issue dimension of meaning. The pragmatic particles in this dissertation exert their influence within this at-issue dimension, by attaching above the level of force. It has been argued, however, that expressive meaning is found *outside* the at-issue dimension in a multidimensional semantic theory (Potts 2005, 2007). According to this view, it is a fundamental formal property of expressives that they contribute to non-at-issue meaning dimensions. Under this definition, the particles considered in this dissertation are *not* expressive at all, since they are found in the at-issue dimension.

This view of expressives is built on the assumption that the at-issue dimension is devoted to truth-conditions. Thus, if we have meaning that is not truth-conditional,

it must be found in another meaning dimension. This dissertation has argued for a layer of at-issue meaning that is not about truth conditions or descriptive content, but about contextual dynamics. The resulting meanings are not so different from the kind proposed for expressives by Potts (2007), who argues for a model in which the meanings of these items are stated in terms of how they affect the context. We might then say that the at-issue dimension is divided into two layers, the first descriptive and the second expressive. The particles examined in this dissertation are expressive, but they contribute this expressive meaning without exploiting extra dimensions.

There are other particles, however, that have been argued to denote *multidimensional* expressive meaning. Kratzer (1999), for example, argues for such an analysis of the German particle *ja*. The question, then, is how multidimensional expressive content should be integrated into the model articulated in this dissertation. Schematically, the problem is illustrated in (227).



The top row of the diagram in (227) has been the focus of this dissertation. How should non-at-issue dimensions of meaning be integrated? One possibility is that these other dimensions influence the calculation of the CCP at the level of sentential force. In §5.3 I suggested that the particle *no* introduces a pragmatic presupposition, spelled out formally as a property of contexts. I proposed that such presuppositions are handled by a separate interpretation function  $\llbracket \cdot \rrbracket^p$ . This gives a multi-dimensional model of pragmatic presuppositions. I then suggested that these presuppositions are used to constrain the input contexts of the CCP denoted at the root node. An analogous treatment of other dimensions is also possible. Non-at-issue expressive meaning might also constrain the CCP of the sentence, but do so by constraining the

set of *output* contexts compatible with the CCP at the root node. They might in effect contribute pragmatic *postsuppositions*.

This approach would require us to integrate the various meaning dimensions *semantically*, at the root node of the sentence. An alternative approach would be to do the integration *pragmatically*. This is the second option sketched in (227). In such an approach, expressives would be truly pragmatic, and exert their influence at the level of the pragmatic calculation itself, rather than at the level of the CCP denotation that feeds into pragmatics. Teasing these possibilities apart is a task for future research.

Stepping back, I think the present discussion brings to light an important distinction that should be made in discussions of expressive meaning. When someone says that some item contributes “expressive” meaning, there are two possible interpretations. One is that the meaning is to be found in a non-at-issue dimension, in the formal sense of Potts (2005). In terms of the diagram in (227), such items give rise to meaning in one of the  $\beta$  dimensions. Another interpretation is that the item does not contribute to the *descriptive content* of the sentence. This second interpretation does not entail multidimensionality. The descriptive content of the sentence is, following Lewis, to be found in the sentence radical. This meaning is built up in the at-issue dimension, but there is more to this dimension. This additional layer of at-issue content is found at and above the level of force. The particles discussed in this dissertation are expressive in the second sense (they don’t effect truth conditions or descriptive content), but they are *not* expressive in the first sense, since their meaning is spelled out in the main, at-issue dimension.

What this in turn tells us is that these two kinds of expressivity must be teased apart. You cannot conclude multidimensionality from the fact that an item contributes non-descriptive content. This follows from the fact that our at-issue dimension of meaning now has a layer beyond descriptive content. Certain kinds of

expressive meanings are to be found at this layer. Other kinds of expressive meanings (those that are compositionally derived using extra dimensions) might be semantically reintegrated into the at-issue dimension at this layer as well. In other words, the post-force layer might provide the locus for semantic integration of multiple dimensions of meaning, as well as the interface between semantically derived constraints on interpretation and post-semantic pragmatic constraints. Further investigation of how this integration takes place is left to future research.

## APPENDIX

### GLOSS LINE ABBREVIATIONS

ACC	accusative case
COMP	complementizer
COP	copular
DAT	dative
GEN	genitive
IMP	imperative
HON	honorific
HORT	hortative
NEG	negation
NOM	nominative case
PASS	passive
PAST	past
PERF	perfective
PROG	progressive
PRT	discourse particle
Q	question particle
QUOT	quotative
TOP	topic

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