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Decisions, Dynamics and the Japanese Particle *yo*

CHRISTOPHER DAVIS
University of Massachusetts Amherst

Abstract

I provide an account of the Japanese sentence-final particle *yo* within a dynamic semantics framework. I argue that *yo* is used with one of two intonational morphemes, corresponding to sentence-final rising or falling tunes. These intonational morphemes modify a sentence's illocutionary force head, adding an addressee-directed update semantics to the utterance. The different intonational contours specify whether this update is monotonic or non-monotonic. The use of *yo* is then argued to contribute a pragmatic presupposition to the utterance saying that the post-update discourse context is one in which the addressee's contextual decision problem is resolved. This proposal is shown to account for a range of constraints on the felicitous use of *yo*, including its restriction to addressee-new and addressee-relevant information in assertions, as well as its behaviour in imperatives and interrogatives.

1 INTRODUCTION

1.1 *Basic facts*

The particle *yo* is one of a number of sentence-final particles (SFPs) in Japanese.[1] A typical example of a sentence with *yo* is given in (1).

(1) densha-ga ki-ta *yo*
train-NOM come-PAST *yo*
'The train is here *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 (1) is true just in case a train arrived; these truth conditions hold with or without the presence of *yo*.

[1] That is, standard Tokyo Japanese. The inventory of SFPs and their range of uses are subject to dialectal variation. The facts reported in this article reflect the judgments of native speakers of Tokyo Japanese.

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Like other SFPs, the syntactic position of *yo* is extremely rigid. It must occur sentence finally[2] and cannot be embedded, as seen in (2), which is ungrammatical unless the complement of *omot-ta* 'thought' is interpreted as a direct quotation of John's thoughts.

(2) *densha-ga ki-ta *yo* to John-ga omot-ta
train-NOM come-PAST *yo* COMP John-NOM think-PAST
'John thought [that the train had come *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), 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 a non-exhaustive list of references.

Uttering (1) is infelicitous if the hearer already knows that the train has arrived, reflecting the observation (Kamio 1994; Suzuki Kose 1997a,b) that a sentence with *yo* marks information that is new to the hearer, or which the hearer has forgotten. Also, uttering (1) 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, (1) is odd unless the hearer is assumed to have some interest in the arrival of the train, as noted by McCready (2005), citing Noda (2002), reflecting the observation that *yo* marks the relevance of the asserted content to the addressee.

The account of *yo* I propose in this article captures all of these observations. The formal proposal builds on the intuition that *yo* marks the relevance of an utterance's content to the addressee. However, I formalize this notion in a way that encompasses the use of *yo* in imperatives and questions, whose characterization is not captured by the above generalizations, since imperatives and questions do not encode informational content in the same way that assertions do. The

[2] SFPs can co-occur in Japanese, as in the following example with the particles *wa* and *yo*, so that strictly speaking it is the particle cluster that has to appear sentence finally.

mou kaet-ta *wa* *yo*
already return-PAST *wa* *yo*
'(He) already went home.'

When multiple particles occur, their relative ordering is rigid. The only particles that can follow *yo* are *ne* and *na*, which are themselves in complementary distribution. This article does not deal with particle clusters, focusing instead on sentences containing only the particle *yo*. The question of other particle meanings, and a compositional account of particle clusters, remains for future research.

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intuition that *yo* gives a sense of urgency or insistence to an utterance is argued to stem from one of two intonational morphemes with which *yo* occurs. Before giving my account of the semantics and pragmatics of *yo*, I review the account of McCready (2009), which most closely resembles that proposed in this article.

1.2 *McCready's (2009) account: dynamics and relevance*

McCready (2009) proposes the two-part semantics of *yo* in (3), with a dynamic component (3a) in which *yo* contributes a specific kind of update semantics, and a presuppositional component (3b) that captures the intuition that the use of *yo* indicates the relevance of the utterance for the hearer.

(3) $[\![yo(\varphi)]\!] =$
   a. Semantics: $\sigma \| \text{S-ASSERT}(\varphi) \| \sigma'$
   b. Presupposition: $\mathcal{B}_S IV_H(Q, \varphi) > d_s$

The dynamic component of *yo*'s meaning involves a 'strong assertion' of *yo*'s propositional complement φ, S-ASSERT(φ), defined in (4).

(4) $\sigma \| \text{S-ASSERT}(\varphi) \| \sigma' =$
   a. $\sigma \| \varphi \| \sigma'$ if $\sigma \| \varphi \neq \emptyset$
   b. $\sigma \| \downarrow \neg\varphi \; ; \; \varphi \| \sigma'$ otherwise.

S-ASSERT(φ) is an instruction to the interpreter to update its information state σ with φ if the post-update information state σ' is non-empty. If the state resulting from an update to σ with φ would cause an empty information state, then the interpreter is instructed to first *downdate* with the negation of φ (written $\downarrow \neg\varphi$), then update with φ. Taking the information state σ to be a set of propositions, the downdate operator is an instruction to remove $\neg\varphi$ from σ. In simple cases, this corresponds to set subtraction, so that the new 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 (see, e.g. Gärdenfors 1988 for discussion). 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 (3b) says that it is a presupposition of $yo(\varphi)$ that

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the speaker believes ($\mathcal{B}_S$) that the information value for the hearer of φ 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 φ is associated with φ'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 (3b) measures the extent to which the proposition φ 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 φ. This difference is the informativity value for the hearer of φ with respect to Q. The presupposition in (3b) requires that this value be above some contextual threshold.

McCready's proposal is the starting point for my own analysis. I take the idea underlying his proposal as essentially correct, in that it attempts to account for both the dynamic effect of using *yo* and the intuition that *yo* has something to do with marking the relevance of the utterance to the addressee. I further explore both of these aspects of *yo*'s meaning. In section 2, I argue that the dynamic component of *yo*'s meaning depends on the intonational pattern with which *yo* is used: *yo* with a falling intonational pattern is associated with a non-monotonic update similar to that contributed by McCready's S-ASSERT, while a rising intonational pattern is associated with a standard, monotonic update. Both intonational morphemes encode an update to the addressee's, rather than the speaker's, public beliefs in the discourse context, accounting for the addressee-directedness of utterances with *yo*. I then present evidence that the same generalization holds in imperatives. This leads to an extension of *yo*'s dynamic semantics to imperatives.

In section 3, I present data showing that *yo* is used with utterances that are intended by the speaker to guide the action of the addressee, and moreover that in such contexts bare declaratives are infelicitous in Japanese. On the basis of these observations, I propose a non-assertive component of *yo*'s meaning that captures its use as a guide to action and at the same time accounts for the intuition that *yo* marks information that is in some sense relevant to the addressee. This proposal accounts for the behaviour of *yo* not only in assertive utterances but also in imperatives and questions as well. Section 4 concludes with discussion about the architecture of the semantic system developed in this article

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and the way that semantics and pragmatics interact in governing the felicity conditions of discourse particles like *yo*.

2 INTONATION AND THE DYNAMICS OF *YO*

At the very least, one can identify distinct rising and falling intonational patterns with which *yo* can occur (Shirakawa 1993; Matsuoka 2003).[3] I use *yo*↑ to designate *yo* with rising intonation, and *yo*↓ to designate *yo* with falling intonation. Koyama (1997) argues that the meaning of *yo* (and other SFPs in Japanese) should be distinguished from the meaning attributable to the intonational contour with which it occurs. I follow Koyama in this respect, arguing that *yo*↑ and *yo*↓ are morphologically complex, consisting of the morpheme *yo* and one of two other morphemes that I represent as ↑ and ↓, reflecting their phonological manifestation on the intonational tier.

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 & Beckman (1988)]. BPMs are a robustly attested phenomenon in spoken Japanese and are generally considered to be 'pragmatic morphemes' (see Venditti *et al*. 2008:13, for discussion and extensive references). Under the analysis implicit in the X-JToBI labelling schema, BPMs are associated with the right edge of an accentual phrase and can thus occur both sentence-medially and sentence finally.

The dialogues from the 'core' portion of the Corpus of Spoken Japanese [Kokuritsu Kokugo Kenkyuujo (National Institute for Japanese Language) 2006] contain 55 utterance-final occurrences of *yo* with associated X-JToBI intonational labelling, 33 of which are associated with the rising BPM tune L%H% and 12 with the falling BPM tune L%. Based on these data, I assume that the morpheme I represent as ↑ is realized phonologically by a tune on the intonational tier which in the X-JToBI system is represented as the tune L%H%. The morpheme I represent as ↓ is phonologically manifested as the

[3] Koyama (1997) claims that *yo* can occur with a distinct falling–rising contour intonation, in addition to simple falling and simple rising intonations. However, in terms of the contextual restrictions and interpretations that I discuss in this article, the rising intonation and the falling–rising contour intonation pattern seem to pattern identically, so I treat them as a group. Further work may, though, reveal interpretational differences between the simple rising and the falling–rising intonations.

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tune L%. This makes the phonology of ↓ indistinguishable (at least in the X-JToBI labelling conventions) from the default final fall associated with the right edge of accentual and intonational phrases in the phonology of Japanese. The justification for positing a distinct morpheme ↓ comes from semantic arguments presented just below.

In this section, I provide data suggesting that the dynamic component of *yo*'s meaning is a function of the intonational pattern with which it is used. I argue that the morpheme ↑ encodes an addressee-directed monotonic update, while ↓ encodes an addressee-directed non-monotonic update. In section 2.1, I describe the contribution of intonation to the dynamic component of *yo*'s meaning in assertions. In section 2.2, I show that *yo*'s intonation has a function in imperatives that is analogous to its function in assertions.

2.1 *Intonation of yo in assertions*

My analysis of the dynamic effects of *yo*'s intonation in assertions is situated within the model of discourse context proposed by Gunlogson (2003), in which the Common Ground (Stalnaker 1978) is derived from the discourse participants' *public beliefs*. $PB_A(C)$ represents the public beliefs of agent A in context C.[4] Gunlogson's definition of public beliefs is given in (5).

(5) Let PB_A and PB_B 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

A conversational context C is a tuple whose elements are the public beliefs of each conversational participant. In case there are two participants A and B, $C = \langle PB_A, PB_B \rangle$. I will use the notation $PB_X(C)$ to refer to the set containing the public beliefs of a discourse participant X in discourse context C.

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

[4] In Gunlogson's model, the public beliefs of an agent are identified with what are called *discourse commitments*. In this article, I expand the notion of discourse commitments to include an agent's *public intentions*, a topic addressed in section 2.2 when I turn to imperatives.

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and B, a simplifying assumption I make throughout this article, this reduces to the following:

(6) $CG_{\{A,B\}}(C) = PB_A(C) \cap PB_B(C)$

Throughout the article, I abbreviate $CG_{\{A,B\}}(C)$ to $CG(C)$, with the understanding that this refers to the common ground constructed from the intersection of the public beliefs of both discourse participants in context C.

Gunlogson follows Heim (1982) and others in treating the meaning of a sentence in terms of its context-change potential (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.

Gunlogson leaves the discourse participant whose public beliefs are updated with the content of the declarative unspecified, arguing that intonation serves to specify the target of the update. I depart from Gunlogson's approach on this point, arguing that an assertive declarative sentence in a context C is uniformly associated with an update to the speaker's public beliefs in C. The update function + operates on a subpart of a discourse context and adds to that subpart a proposition. For example, $PB_X(C) + p$ is a context that is just like C in every respect, except that $PB_X(C)$ now contains p. An assertion encodes such an update to the speaker's public beliefs. This is encoded in the assertive operator ASSERT in (7).

(7) CCP of assertions:
$[\![\text{ASSERT}]\!] = \lambda p \lambda C.PB_{spkr}(C) + p$

ASSERT is a monotonic function taking a propositional argument and returning a function from contexts to contexts (i.e. a CCP), whereby the input context C is updated by adding the proposition p to the speaker's public beliefs in C.

There is nothing in the semantics in (7) directly encoding an update to the *addressee*'s public beliefs, unlike the proposal in, for example Portner (2007b), in which an expressive analysis of force markers is outlined. Typically, in a dialogue, an assertion is made not only to achieve an update to the speaker's public beliefs but also to influence the public beliefs of the addressee, and thus the contents of the common ground. I propose that a bare assertion (i.e. one without

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the particle *yo*) is typically intended and understood as an attempt to get the addressee to update his public beliefs. More concretely, an utterance of ASSERT(p) is interpreted as a function from contexts to contexts, in which the resulting context has p as a public belief of the speaker. The conversational function of such an utterance is to update the current discourse context according to the semantics of ASSERT(p). This has the effect of publicly committing the speaker to the truth of p. Further pragmatic considerations will in many circumstances lead one to interpret the speaker's assertion as an invitation (or suggestion, demand, etc.) to the addressee to update his own public beliefs with p.

Turning to the dynamic contribution of *yo*↑ and *yo*↓ in assertions, I first note a number of facts that motivate the analysis. Koyama (1997: 105) says that *yo*↑ exhibits the 'most typical' of the meanings associated with *yo*, including 'notification, information-transmission, and attention-calling'.[5] On the other hand, Koyama argues, *yo*↓ gives to an utterance a sense that there is some kind of conflict or incompatibility in the speaker's and addressee's understanding.[6] This is illustrated by the dialogue in (8).

(8) A: souridaijin-ga nakunat-ta
prime.minister-NOM die-PAST
'The prime minister died.'
B: sin-de-nai *yo*↓/#*yo*↑
die-INF-NEG *yo*↓/#*yo*↑
'(No), he did not die.'

In the dialogue in (8), B indicates that he disbelieves A's assertion that the prime minister has died. In this context, B must use *yo*↓ in his rebuttal to A's utterance. It is infelicitous for B to use *yo*↑.

In dialogues where the speaker is not challenging any of the addressee's commitments, the use of *yo*↑ becomes natural, as illustrated by the dialogue in (9).

(9) A: go-han mou tabe-ta?
HON-rice already eat-PAST?
'Did you eat already?'
B: tabe-ta (*yo*↑/*yo*↓)
eat-PAST (*yo*↑/*yo*↓)
'(Yeah,) I ate.'

[5] The original Japanese is 'kono taipu ga yo no youhou no naka de mottomo tenkeiteki de aru to omoware, iwayuru kokuchi, jouhoudentatsu, yobikake nado ni bunrui sareru'.

[6] 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'.

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By asking an information-seeking yes/no question, A indicates that he is uncommitted regarding whether B has eaten. Unlike in the dialogue in (8), there is nothing in A's assertion that is incompatible with B's response, and the use of *yo*↑ is felicitous. If B nevertheless 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 A should not take for granted (e.g. 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?!'[7] For this reason, in neutral, non-confrontational contexts, the use of *yo*↓ is perceived as infelicitous. The use of *yo*↑ has no such implications.

I propose that the differences in use of *yo*↑ and *yo*↓ illustrated above are due to the semantic contributions of the morphemes ↑ and ↓. These morphemes, I argue, attach to the force head ASSERT and return a function of the same type, from propositions to CCPs. They are essentially adverbial modifiers of the force head. The denotations are given in (10).[8]

(10) a. $[\![\uparrow]\!] = \lambda F \lambda p \lambda C.F(p)(\mathrm{PB}_{addr}(C) + p)$

b. $[\![\downarrow]\!] = \lambda F \lambda p \lambda C.F(p)\ ((\mathrm{PB}_{addr}(C) \downarrow q) + p)$

The denotation of ↑ encodes a standard monotonic update to the addressee's public beliefs, parallel to the update to the speaker's public beliefs encoded by the ASSERT operator in (7). The denotation of ↓ also encodes an update to the addressee's public beliefs, but only after an initial downdate with another proposition q, which is a free propositional variable whose value must be contextually supplied. In cases like (8), this will be the negation of the propositional argument of ↓. In cases like (9), it will have to be inferred more indirectly from the context.

The data in (8) can now be accounted for as follows: in this dialogue, A first indicates his belief in the truth of the proposition p = 'The prime minister has died' by uttering ASSERT(p). This has the effect of adding p to the public beliefs of A. B responds by asserting that the prime minister did not die, ASSERT($\neg p$). This constitutes a contradiction to A's public belief in p and thus requires the use of *yo*↓; *yo*↑ is infelicitous. This is explained by the fact that since B's assertion is

[7] I thank Eric McCready for pointing out to me that the use of *yo*↓ is not simply infelicitous in such cases.

[8] F is a variable over force heads, of type $\langle st, \langle C,C \rangle \rangle$.

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inconsistent with A's public beliefs, A must first downdate with the negation of B's assertion before he can update. If he were instructed simply to update his belief state with the content of B's assertion, the resulting set of public beliefs would be inconsistent, since it would contain both the proposition 'The prime minister has died' and 'The prime minister has not died'.[9]

While an assertion of p with *yo*↑ is infelicitous in contexts in which the addressee has a public belief that $\neg p$, it is completely natural in a context in which the addressee has not made any commitment to the truth of p or $\neg p$. Thus B's assertion in (9) is felicitous. We also account for the fact that, if B uses *yo*↓ in (9), he is understood to mean that there is some proposition q to which A is publicly committed that B is instructing A to renounce. This proposition is contextually determined, and in the case at hand might be resolved to q = 'It is possible that B has not eaten' or q = 'It is appropriate for A to ask B whether he has eaten'.

The use of ↑ and ↓ with an assertion explicitly encodes the update that the speaker wants the addressee to perform to his public beliefs. In bare assertions, by contrast, this update is indicated indirectly, via pragmatic reasoning. This allows us to account for the observation that, unlike bare assertive declaratives, assertions with *yo* are limited to dialogues and are not used in monologues, except in quotative contexts, a fact noted by Katagiri (2007). Related to this fact is the claim made by Shirakawa (1992) (cited in Koyama 1997: 104) that the use of *yo* (with either intonational pattern) serves to 'emphasize the fact that an utterance is being directed toward the addressee'.[10] These observations follow from the semantics of ↑ and ↓, which make explicit the fact that the speaker's assertion is intended as an update to the addressee's public beliefs.

2.2 *Intonation of yo in imperatives*

Portner (2005) argues that the dynamics of imperatives can be understood with respect to what he calls an agent's *To-Do List* (TDL). Just as the function of assertions is to update a discourse participant's public beliefs, the function of imperatives is to update a discourse participant's TDL. In Portner's model, an agent A's TDL is a set of properties that A is publicly committed to trying to make true

[9] A consistent public belief set is one in which the set of worlds consistent with every proposition in the set is non-null. Since there is no possible world in which both p and $\neg p$ hold, any set of public beliefs containing both of these propositions is inconsistent.

[10] Original Japanese: 'hatsuwa ga kikite ni mukerareteiru koto no kyouchou'.

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of herself, assuming rationality. I adopt a slightly modified version of Portner's model, in which the TDL is expanded to what I will call an agent A's *public intentions* in a context c, $PI_A(c)$, which are taken to consist of a set of propositions (not properties), to whose realization in the actual world the agent is publicly committed in c. The contents of an agent's public intentions are interpreted, per Portner's TDL, as providing a guide to what a rational and cooperative agent can be expected to do, relative to the contents of their public beliefs. The model of discourse contexts with two agents A and B is expanded to the four-tuple $\{PB_A,PB_B,PI_A,PI_B\}$. I use the term *discourse commitments* to refer to both the public beliefs and the public intentions of a given agent. Thus, in a context c, the discourse commitments of X consist of the two sets $PB_X(c)$ and $PI_X(c)$.

The update semantics of the imperative operator IMP is then defined in a manner parallel to ASSERT, except that the update targets the speaker's public intentions, rather than his public beliefs.

(11) $[\![\text{IMP}]\!] = \lambda p \lambda c.PI_{spkr}(c) + p$

In the same way that an utterance of ASSERT(p) serves to update the speaker's public beliefs with p, an utterance of IMP(p) serves to update the speaker's (not the addressee's) public intentions with p. The speaker A can make his intention that B enter his study public by uttering the imperative sentence *Come in*. This has the effect of placing the proposition *come-in*(addr) in the set of A's public intentions. With a bare imperative (one without *yo*), the fact that the speaker intends for the addressee to add p to his public intentions as well will follow from pragmatic considerations, in the same way that a bare assertion pragmatically indicates the speaker's intention of having the addressee update his public beliefs with the propositional content of his assertion.

In imperatives of various sorts (commands, requests, etc.), the contribution of *yo*'s intonation parallels that found in assertive sentences. Koyama (1997) argues that an imperative with *yo*↓ presupposes that the addressee is intent on *not* doing the action encoded by the imperative. An imperative with *yo*↑, according to Koyama, carries no such presupposition and indicates only that the addressee's understanding is not in line with that of the speaker, or that the addressee is not even aware of the issue.

This contrast is seen in the following example, due to Shirakawa (1993), taken from the comic book *Maison Ikkoku* (gloss and translation are mine):

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(12) 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-te-kure	*yo*↑/#*yo*↓
firmly	support-INF-PROG-give.IMP	*yo*↑/#*yo*↓

'(Be sure and) Keep steady!'

Here, it is most natural for *yo* to have rising intonation. Shirakawa (1993) notes that if *yo* is used with falling intonation here, it would indicate that Mitaka believes that Godai is in fact failing or will fail to support him securely; in the context of the story, however, Mitaka is simply checking to make sure that Godai will support him, with no implication that Godai is failing or will fail to do so. On the other hand, if the context is changed to one in which Godai is failing to hold Mitaka up, then the use of *yo*↓ becomes felicitous.

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

(13) Context: Godai's grandmother has asked Godai to take her to a class reunion. Godai tries to refuse, saying he already has other plans. At this point, Kyouko says the following:

sonna...	Godai-san	tuiteit-te	oage-nasai	*yo*↓/#*yo*↑
that.kind.of	Godai-san	go.with-INF	HON-please	*yo*↓/#*yo*↑

'Hey now - Godai, go with her.'

Shirakawa claims that the request by Kyouko to Godai would naturally have falling intonation on *yo*. It is clear from the context in which this sentence occurs that the addressee, Godai, does not want or plan to take the grandmother to the reunion, since he has other plans that conflict with Kyouko's request. The use of *yo*↓ here is natural because the hearer obviously does not want or intend to carry out the request. According to Shirakawa, using *yo*↑ in this context is infelicitous.

The contribution to imperatives of the intonational morphemes associated with *yo* is parallel with that in assertions. We need only modify the denotations in (10) so that the contextual object whose update is targeted is sensitive to whether the complement is ASSERT or IMP. The denotations in (10) are extended to handle imperative sentences by the denotations in (14).

(14) a. $[\![\uparrow]\!] = \begin{cases} \lambda F \lambda p \lambda c.\, F(p)(\mathrm{PB}_{addr}(c) + p) & \text{if} \quad F = \textsc{assert} \\ \lambda F \lambda p \lambda c.\, F(p)(\mathrm{PI}_{addr}(c) + p) & \text{if} \quad F = \textsc{imp} \end{cases}$

b. $[\![\downarrow]\!] = \begin{cases} \lambda F \lambda p \lambda c.\, F(p)((\mathrm{PB}_{addr}(c) \downarrow q) + p) & \text{if} \quad F = \textsc{assert} \\ \lambda F \lambda p \lambda c.\, F(p)((\mathrm{PI}_{addr}(c) \downarrow q) + p) & \text{if} \quad F = \textsc{imp} \end{cases}$

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Now the imperative facts can be explained in the same way as the assertion facts in 2.1 were. We expect for pragmatic reasons that an utterance of *yo*↓ (IMP(*p*)) should be used in a context C if the addressee's public intentions in C already contains ¬*p*, or some other proposition that is inconsistent with *p*. In such a context, a straightforward update to PI_{addr}(C) with *p* will lead to inconsistency. Thus, the speaker must first request that the addressee remove ¬*p*, or some other proposition *q* inconsistent with *p*, from his set of public intentions before updating it with *p*. This is precisely the dynamic effect that an utterance of *yo*↓ (IMP(*p*)) has. This accounts for the observation of Koyama (1997) and Shirakawa (1993) that imperatives with *yo*↓ are felicitous just in case the hearer is taken to be committed to not doing the action encoded by the imperative. The example in (13) is thus felicitous with falling intonation on *yo*, since in this context Godai has made it clear that his prior plans and intentions are inconsistent with the request that he escort his grandmother. The infelicity of *yo*↑ in this context is also predicted, since in this situation an update with the content of the imperative to Godai's public intentions would lead to inconsistency.

On the other hand, when the addressee is not contextually committed to a proposition inconsistent with *p*, the use of *yo*↑(IMP(*p*)) is felicitous, while *yo*↓(IMP(*p*)) is infelicitous. This fact was illustrated by the example from Shirakawa in (12). Recall that in the context of this example, it is not the case that Godai has indicated his unwillingness to keep steady for Mitaka. If Mitaka were to utter his imperative with *yo*↓, it would instruct Godai to remove some proposition, most likely one that conflicts with the requested update, from his public intentions; but since Godai has not indicated any other intentions in this context, *yo*↓ is infelicitous, and *yo*↑ must be used instead.

The above account of the semantics of *yo*'s intonational associate in imperative utterances commits us to an account in which the dynamic effect of bare imperatives is an update to the speaker's, but not the addressee's, public intentions. An imperative with either *yo*↑ or *yo*↓, on the other hand, encodes both an update to the speaker's public intentions (due to the IMP operator) and an update to the addressee's public intentions (due to ↑ or ↓). This distinction is supported by evidence from imperatives used to grant permission to the addressee. This use of the imperative is discussed briefly by Han (1999), who mentions the case of the imperative sentence *Come in* used in a context where the addressee has just knocked on the speaker's door. Han argues for a semantics of imperatives in which the IMP operator encodes an update to the addressee's *plan set* (analogous to the public intentions of the present article), but notes that permission imperatives

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are not handled straightforwardly by such a semantics, since the addressee has, by knocking, publicly conveyed an intention to come in. Thus, a request that she update her public intentions would be redundant. Han argues that such cases should be handled as indirect speech acts.

I would like to suggest instead that in such cases the speaker is using the imperative in the usual way, to update his own public intentions with the proposition *come-in*(addr). As mentioned earlier, an update to the addressee's public intentions is not conventionally encoded by the imperative itself, but is pragmatically inferred as the intent of the utterance, depending on the circumstances of the utterance. In the present circumstance, no such inference is made, since the addressee's public intentions already include this proposition. If, however, either *yo*↑ or *yo*↓ is used, then the sentence encodes an update to the addressee's public intentions, due to the semantics of ↑ or ↓. As illustrated in (15), the use of *yo*↑ and *yo*↓ is infelicitous in contexts where the imperative is interpreted as granting permission.

(15) Context: The addressee knocks on the speaker's door. The speaker says:
hait-te kudasai (#*yo*↑/#*yo*↓)
come.in-INF please
'Come in please (#*yo*↑/#*yo*↓).'

The infelicity of *yo*↑ and *yo*↓ in this context can be explained by the fact that the intonational morphemes ↑ and ↓ encode an update to the addressee's public intentions, and it does not make sense to request that the addressee update her public intentions with a proposition to which she is already publicly committed. The felicity of the bare imperative falls out from the fact that it does not encode an addressee-directed update.

2.3 *Interim conclusion*

In this section I have argued for a semantics of the intonational morphemes associated with *yo* according to which they encode an update to the addressee's discourse commitments. In assertions, this update is to the addressee's public beliefs, while in imperatives it is to his public intentions. Bare assertions and imperatives, by contrast, encode only an update to the speaker's own public beliefs or intentions. The semantic object returned by the combination of ↑ and ↓ with one of the force operators is a function from contexts to contexts, a CCP. It is up to the addressee whether this change goes through.

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I have argued for a morphological decomposition of *yo*↑ and *yo*↓, according to which the morphemes ↑ and ↓ contribute to the update semantics of the sentence. The idea that intonational morphemes are used to relate the propositional content of an utterance to mutual beliefs of the discourse participants is found in Pierrehumbert & Hirschberg (1990), who say that in a dialogue between S and H, 'S may seek to inform H of some proposition *x* by communicating that *x* is to be added to what H believes to be mutually believed between S and H—via the tune S chooses'. This idea is reflected in my account of the morphemes ↑ and ↓, which encode an update to the addressee's discourse commitments. When combined with one of the force heads ASSERT or IMP, the semantics of the resulting complex force head encodes an update to the discourse commitments of both the speaker and the addressee with its propositional complement.

The approach to the meaning of ↑ and ↓ contrasts with the approach to intonational meaning taken by Pierrehumbert & Hirschberg (1990), however, in that these authors argue for a one-to-one mapping between intonational phonemes and meaning in English. In particular, the boundary tone H% is argued (p. 305) to indicate that the speaker wishes the hearer to 'interpret the utterance with particular attention to subsequent utterances'. In contrast, I do not assume that every L%H% tune in Japanese carries the semantics of the morpheme ↑. In bare declaratives, for example rising intonation gives rise to an interrogative interpretation, rather than the addressee-oriented update semantics contributed by ↑ in *yo*↑. Moriyama (1997) notes that rising intonation is ungrammatical with 'command' imperatives in standard (as well as Kyoto) Japanese, but that when *yo* is added to the imperative, the rising intonation becomes available. I take this as evidence that the morphemes ↑ and ↓ are licensed by the presence *yo* and that not all occurrences of sentence-final rising and falling intonation should be identified with the morphemes ↑ and ↓. I leave to future research the question of whether the morphemes ↑ and ↓ are completely parasitic on *yo* or whether they are found in other contexts as well.

3 RELEVANCE AND *YO*

In this section I argue that the use of *yo* indicates that the speaker's utterance is intended to guide the addressee in decision making. While in English the relevance relation between an assertion and the addressee's decision problem may be left implicit, in Japanese these

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relations must often be overtly indicated by the use of a discourse particle. I propose a formal analysis of *yo*'s meaning that captures the intuition that the use of *yo* serves to point out the relevance of an assertion to the addressee, and I extend the account to imperatives and questions.

3.1 *yo as a guide to action*

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

(16) Context: 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 (1975) places special emphasis on the 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.

The obvious connection linking B's remark to A's remark (given the non-linguistic context) is simply that B's assertion is made in order to help A get some petrol 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 dialogue in Japanese brings the obviousness of the connection between B's assertion and A's problem into doubt. The sentence in (17) is made by B in response to A's situation[11]:

(17) B: kono miti-o zutto it-ta tokoro ni
this road-ACC straight go-PAST place at
gasorinsutando-ga ari-masu #(*yo*↑)
gas.station-NOM be-HON
'There's a gas station straight down the road *yo*↑.'

[11] This example contains *yo*↑, rather than *yo*↓, because the speaker's assertion does not contradict any of the public beliefs of the addressee in this context. Similar considerations apply to the other examples in this subsection, all of which are felicitous with *yo*↑ as opposed to *yo*↓ for the same reason.

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The plain 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 follows his assertion with *yo*.

This pattern is robust; in both of the following cases, the context is such that A faces some kind of dilemma, and B's assertion is meant to provide information that will guide A in making a decision. In each case, B's assertion is infelicitous as a plain declarative with no particle, but becomes completely natural with *yo*.

(18) A: aa, mayot-ta. dono susi-ni si-you ka na.
Oh at.a.loss-PAST which sushi-DAT do-HORT Q PRT
'I'm stuck—I wonder which sort of sushi I should get?'
B: koko-no maguro-wa oisi-i #(*yo*↑)
here-GEN tuna-TOP tasty-NONPAST #(*yo*↑)
'The tuna here is good *yo*↑.'

(19) A: tabe-te-kara eiga-o mi ni ik-ou ka na
eat-INF-from movie-ACC see to go-HORT Q PRT
'I wonder if I should eat before going to the movie?'
B: mou 7-ji sugi deshou? eiga-wa
already 7-o'clock past right movie-TOP
8-ji kara hajimar-u #(*yo*↑)
8-o'clock from start-NONPAST #(*yo*↑)
'It's already 7, right? The movie starts at 8 *yo*↑.'

In the dialogue in (18), the implication is that, since the tuna is good, the hearer should get the tuna. But if B uses the bare declarative in this context, the sequence is infelicitous. Native speakers strongly prefer the version with *yo*. A similar situation is seen in example (19). 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. By using *yo* with the second assertion, the speaker indicates that the fact that the movie starts at eight, in conjunction with the fact that it is already seven, is sufficient to rule out the possibility that the speaker goes to eat before going to the movie. Just as in (18), the bare assertion is infelicitous in this context.

A similar generalization is found with assertions that are used to suggest that the addressee do something other than what she is currently doing. The following examples all show that in such situations, the bare declarative is infelicitous, while the same sentence with *yo* is perfectly natural.

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(20) 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 ki-ta #(*yo*↑)
train come-PAST #(*yo*↑)
'The train is here *yo*↑.'

(21) 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 both of these examples, the assertion is not made primarily in order to transmit the information encoded by the sentence to the hearer. Rather, the purpose is to guide the hearer's action. In (20), 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. In (21) the speaker knows that the addressee plans to go to the meeting and that the information that the meeting is starting at three will be sufficient to cause the hearer to stop what she is doing and go.

The example in (20) is one in which the addressee's expected reaction to the information conveyed is based on the speaker's assumptions regarding the addressee's desires. But the example in (21) 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. More generally, *yo* can engage the law, morality, pleasure or any other contextually salient guide to action for the addressee.

The examples in this subsection serve to show that when an assertion is made in order to guide the addressee's action, the relevance relation between the information asserted and consequence for the addressee's action must be explicitly indicated by the use of a discourse particle. I will argue in the rest of this section that *yo* serves to make these assertions felicitous precisely because it encodes the kind of relevance relation that, in English, is left implicit.

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3.2 *Formal analysis*

I propose that *yo* serves to indicate the *optimality* for the addressee of some contextually salient action, given the post-update common ground. This account borrows from van Rooy (2003b) the idea of a contextually salient *decision problem*. I do not adopt all of the decision-theoretic apparatus (world-action pairs, utility functions, etc.) used by van Rooy, but just the notion that a context C has a salient set of possible actions, $\mathcal{A}$(C), from which the agents in that context must choose.[12] As I show in section 3.4, this object can be seen as an extension of Roberts's (1996) QUD to dialogues driven not by the question 'What is the world like?', but by the question 'What should we do?'. Formally, I treat the elements of $\mathcal{A}$ as properties; the decision problem amounts to the question of which property it is *optimal* for an agent to have. The calculation of optimality, I argue, is relative to the contextual *ordering source* (Kratzer 1981), 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. I adopt the ordering relation in (22), slightly modified from Portner (2007a):[13]

(22) ***Partial Ordering of Worlds*** [modified from Portner's (2007a)]:
For all worlds w_i, $w_j \in \cap$ CG(C), $w_i <_C w_j$ iff
$\exists p \in$ g(C) $[p(w_j)$ & $\neg p(w_i)$ & $\forall q \in$ g(C) $[\,q(w_i) \rightarrow q(w_j)\,]\,]$
where g(C) is the *ordering source* in C (Kratzer 1981).

The semantics of *yo* is defined with respect to the ordering on the context set defined in (22).

(23) a. $[\![yo]\!]$(CCP)(C) is defined iff:
$\exists a \in \mathcal{A}(C')\ \forall w_i, w_j \in \cap$ CG(C′)
$[\,(a(\text{addr})(w_i)\ \&\ w_i <_{C'} w_j) \rightarrow a(\text{addr})(w_j)\,]$,
where C′ = CCP(C)

[12] The set $\mathcal{A}$(C) might be added as primitive element to the context, so that C is expanded to the five-tuple $\{PB_A, PI_A, PB_B, PI_B, \mathcal{A}\}$. Alternatively, $\mathcal{A}$(C) might be derived from the other elements of C in a systematic way.

[13] This ordering is in Portner's article relativized to the properties in an agent's TDL, which Portner argues contribute to the contextual ordering source. I use the definition more generally, as a definition of what the ordering source does. In a given context, the ordering source may be contextually specified with the contents of an agent's TDL, or a similar discourse object, like the public intentions introduced in section 3.1. I should note that the partial ordering defined in (22) 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.

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b. Where defined, $[\![yo]\!](\text{CCP})(c) = \text{CCP}(c)$.

The denotation in (23) is broken into two parts. The denotation in (23b) is a simple identity function, taking a CCP-type complement and returning an identical CCP (function from contexts to contexts) as a value. The presupposition[14] in (23a) restricts the set of utterance contexts in which the value of (23b) is defined to those in which there is some contextually relevant action *a* such that there are no worlds compatible with the common ground in the post-update context (i.e. the context returned by applying the function denoted by the complement of *yo* to the utterance context) in which the addressee chooses action *a* that are lower ranked according to the ordering source than a world in which the addressee does not choose action *a*. Or more simply put, all worlds in which the addressee chooses action *a* are at least as good in terms of the contextual ordering source as ones in which he does not. I describe this situation by saying that the action *a* is *optimal* in the post-update context, given the common ground and ordering source. The contribution of *yo*, then, is to indicate to the addressee that there is a contextually salient optimal action, if he accepts the context update associated with *yo*'s complement.

I now give an extended discussion of how the semantics in (23) applies to the example in (18). For the sake of simplicity, consider a context in which there are only two kinds of sushi on the menu, tuna and salmon. A is trying to decide which of these to order. The set of contextually salient actions for A is thus $\mathcal{A} = \{t, s\}$ consisting of the actions $t =$ 'order the tuna' and $s =$ 'order the salmon'. Assume that as far as A's decision is concerned, the main criterion is taste. Assume further that A has never eaten at this restaurant and does not know whether the tuna is tasty or whether the salmon is tasty.

The CG in this context can be partitioned into three subsets T, S and B, where T is the set of all worlds in which only the tuna tastes good, S is the set of worlds in which only the salmon tastes good and B is the set of worlds in which both the tuna and the salmon taste good. This partition can be further partitioned into those worlds in which A chooses tuna and those worlds in which A chooses salmon (ignoring for simplicity those worlds in which the speaker chooses neither or both). We can indicate this further subdivision with the subscripts t(A) and s(A), respectively. Thus, for example the subset of

[14] The presupposition in (23a) is taken here as a definedness condition, but might also be understood as a condition on felicitous contexts of utterance, in which cases the semantic value of utterances that violate the condition in (23a) would not be undefined, but the utterance as a whole would be pragmatically infelicitous.

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worlds compatible with the common ground in which only tuna is tasty but in which A chooses salmon is written $T_{s(A)}$, while the subset of worlds in which only the tuna is tasty and A chooses tuna is written $T_{t(A)}$.

The ordering source in this context ranks worlds in which A eats tasty sushi over worlds in which A eats sushi that is not tasty. This gives us the following partial ordering on worlds in the pre-update context, expressed in the subset notation just introduced:

(24) $\{T_{s(A)}, S_{t(A)}\} <_C \{T_{t(A)}, S_{s(A)}, B_{t(A)}, B_{s(A)}\}$

It can be seen from the ordering in (24) that neither of the two actions is optimal in the pre-update context.

B now makes a *yo*↑-marked assertion of φ = 'The tuna here is good'. As per the discussion in section 2, the intonational morpheme ↑ combines with ASSERT, which then combines with φ to return a function from contexts to contexts in which both the speaker's and addressee's public beliefs, and hence the CG, in the output context are updated with φ. The contextual update encoded by B's utterance has the effect (if the addressee accepts and applies the update encoded) of eliminating from the output CG those worlds in which only the salmon is tasty, that is, the subsets $S_{s(A)}$ and $S_{t(A)}$. The ordering on the worlds consistent with the (potential) post-update context is thus as in (25).

(25) $\{T_{s(A)}\} <_{c'} \{T_{t(A)}, B_{t(A)}, B_{s(A)}\}$

The ordering in (25) satisfies the requirements imposed by the semantics of *yo*, since action *t* is optimal. We do not require for the felicitous use of *yo* a context in which all maximal worlds in the ordering are tuna eating worlds; the possibility exists in this context that both the tuna and salmon are tasty, and in this case worlds in which A chooses salmon are maximal according to this ordering source. The optimality of action *t* in this context is in virtue of the fact that there are no worlds in which A chooses *t* that are ordered below worlds in which A chooses *s*. This shows how use of *yo* indicates the relevance of an assertion. In this case, use of *yo* indicates that the asserted proposition is sufficient to resolve the addressee's decision problem, since the post-update context contains only worlds in which it is optimal to order tuna.

The semantics of *yo* does not make explicit which action is optimal; this must be inferred by the same pragmatic mechanisms that apply in English, where the equivalent assertion without *yo* is understood to resolve the addressee's decision problem, in this case by suggesting that the addressee order tuna. The difference between English and Japanese

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is that in Japanese this relevance relation between the asserted content and the addressee's decision problem must be made explicit by a particle like *yo*, while in English it can be left implicit.[15]

A similar analysis applies to the example in (17), in which the contextually salient decision problem is how A can get gas in the car. In a realistic context, there are going to be any number of potential options for A, including calling a tow truck, walking down any number of streets in search of a gas station, syphoning gas from a car in a nearby parking lot, etc. By using *yo* with his assertion, B indicates that, after learning the asserted information, the addressee's decision problem is resolved, since he can walk to the gasoline station to purchase gasoline.

In the preceding examples, the addressee's contextual decision problem was more or less explicitly given by the preceding linguistic context, but we also have examples in which *yo* is used without any previous linguistic clue as to the decision problem being referenced. In these examples, the non-linguistic context plays a particularly crucial role in understanding the meaning of *yo*. Without a preceding linguistic context that sets up a decision problem faced by the addressee, use of *yo* typically indicates that the addressee should do something other than what he or she is currently doing. This can be seen in example (20). We can represent the set of alternative actions for the addressee in this context as $\mathcal{A} = \{b, s\}$, where b = 'get ready to board the train' and s = 'keep sitting'. In the context in which the speaker makes the assertion in (20), the addressee is sitting down, and there is no indication that she is going to get ready to board the train. But an ordering source based on the addressee's desires in this context ranks worlds in which the addressee boards the train above those in which she misses it. We can further assume that once the train has arrived it is necessary to get ready to board the train in a timely fashion in order not to miss it. The assertion in (20) thus serves to update the common ground in such a way that all worlds consistent with the post-update context are ones in which it is optimal for the addressee to stop sitting and get ready to board the train.

The same pattern is seen in the example in (21). In this context, the set of relevant alternative actions to which *yo* makes reference is something like $\mathcal{A} = \{g, \neg g\}$, where g = 'go to the meeting now' and $\neg g$ = 'do not go to the meeting now'. The behaviour of the addressee

[15] At least if we follow Grice. J. Kingston (personal communication) suggests that the English facts are not as straightforward as this discussion suggests. It seems likely that a natural discourse in English would require a particular intonational pattern, the use of a particle like *well*, or similar devices in order to make sequences like this one felicitous.

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suggests that, without intervention, she is not going to get ready to go to the meeting, and her behaviour is thus consistent with $\neg g$ rather than g. The speaker expects her assertion in (21) to be sufficient to get the addressee to go to the meeting. The addressee's obligations are such that she must attend the meeting, and so in all worlds consistent with the common ground in which the meeting is starting soon, the optimal action for the addressee, given an ordering source based on the addressee's obligations, is to get ready to go, since otherwise she will be late or miss the meeting.

3.3 *Imperatives with yo*

We have seen that, in assertions, *yo* is used to indicate that all worlds consistent with the post-update common ground are such that a particular action is optimal for the addressee. Unlike assertions, the CCP of imperative sentences does not serve to update the common ground. Instead, imperatives encode an update to the speaker's public intentions. When combined with *yo*↑ or *yo*↓, an imperative also encodes an update to the addressee's public intentions, due to the semantics of ↑ and ↓. When used with imperatives, *yo* seems to indicate that the common ground is such that the addressee should do the action encoded by the imperative. That is, the use of *yo* indicates that the action encoded by the imperative is optimal with respect to some contextually specified ordering, given the common ground. While the optimal action must be inferred in assertions with *yo*, in imperatives it is resolved to the action encoded by the imperative. An imperative with *yo* thus makes explicit the action that is indicated by the semantics of *yo* to be optimal according to the common ground and ordering source.

Consider the following example: A has made dinner for B, putting a lot of effort into the process. A notices that B does not seem to be eating his food and gets upset about this, since she worked so hard to cook dinner for B. She then says[16]:

(26) tabe-te *yo*↓
eat-IMP *yo*↓
'Eat *yo*↓.'

Native speakers report that by using *yo* in this context, not only is A telling B to eat but is also pointing to the fact that B *should* eat, in this context because A has gone to the trouble to make the food for him. The imperative without *yo* does not have this implication. In this

[16] The use of ↓ here follows from the fact that the addressee's public intentions seem to be incompatible with the request that the speaker is making.

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context, it is already common ground that the speaker went to a lot of trouble to make dinner for the addressee. The use of *yo* indicates that it follows from this (and other facts in the common ground) that it is optimal for the addressee to eat his dinner. Optimal in what sense? In this case, the optimality is determined by the speaker's desires or perhaps the addressee's obligations.

We can compare the imperative in (26) with the assertion in (27).

(27) isshoukenmei tsukut-ta nda *yo*↑
with.much.effort make-PAST PRT *yo*↑
'I put a lot of effort into this *yo*↑.'
(Implied: 'And therefore you should eat it.')

The sentence in (27) asserts that the speaker went to a lot of trouble to make the addressee dinner, and the use of *yo* indicates that from this it follows that the addressee should eat. By contrast, as we saw, the imperative in (26) directly encodes the action that the addressee should do, and the use of *yo* indicates that the addressee should do this on the basis of what is already in the common ground.

The example in (28) combines the assertion with the imperative.

(28) A: isshoukenmei tsukut-ta nda kara tabe-te *yo*↓
with.much.effort make-PAST PRT so eat-IMP *yo*↓
'I put a lot of effort into this, so eat *yo*↓.'

Here, A explicitly indicates the basis for her suggestion that B really should eat the food, namely, because A has made it for him, and therefore it follows from politeness, consideration for A's feelings, or the like, that B should eat.

The example in (29) is from McCready (2005)

(29) mata nanika at-tara soudan ni ki-te
again something be-COND consultation for come-IMP
kudasai (*yo*↑)
please (*yo*↑)
'If anything else happens, please come talk to me again (*yo*↑).'

McCready notes that if the sentence in (29) 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. This can be understood by assuming that in this context optimality is defined relative to the speaker's desires, so that the use of *yo* says that all worlds consistent with the common ground are worlds in which it is optimal according to the speaker's desires that the addressee come to talk to the speaker.

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These examples all lead to the following generalization: with assertions, *yo* is used to indicate that the asserted content is sufficient, given the common ground, to make some action optimal for the addressee. On the other hand, with imperatives *yo* indicates that the pre-update common ground is sufficient to make the action encoded by the imperative optimal, relative to some contextually specified ordering, for the addressee. This follows from the fact that, with imperatives, the post-update common ground is the same as the pre-update common ground, because the CCP of imperatives with *yo* targets the addressee's public intentions rather than her beliefs. The semantics of *yo* says that all the worlds compatible with the *post*-update common ground are ones in which a particular action is optimal. But since with imperatives the post-update common ground is the same as the pre-update common ground, this is the same as saying that an imperative with *yo* conveys that all worlds compatible with the *pre*-update common ground are ones in which a particular action, namely, the one encoded by the imperative, is optimal.[17]

3.4 *Questions and yo*

Compared to declaratives and imperatives, little has been written about the behaviour of *yo* in interrogatives. In fact, with canonical information-seeking questions, *yo* seems to be simply ungrammatical, as noted by Shirakawa (1993). He gives the following examples:

(30) a. mada, ame, fut-te-ru ka (**yo*)
still rain fall-PROG-NONPAST Q (**yo*)
'Is it still raining?'

b. nomimono, nani-ga ar-u ka (**yo*)
drink what-NOM be-NONPAST Q (**yo*)
'What do you have to drink?'

c. ima, nan-ji da ka wakari-masu ka (**yo*)?
Now what-time COP Q know-HON Q (**yo*)
'Do you know what time it is now?'

These are all information-seeking questions, with the canonical syntax for questions in Japanese using the question particle *ka*.

[17] The fact that it is the action encoded by the imperative that is understood as the optimal one referred to by *yo* does not fall out directly from the semantics, since *yo* merely serves to say that there is *some* action that is optimal in the post-update common ground. I assume that the identification of this action with that encoded by the imperative is handled pragmatically; since the imperative itself encodes an action, its utterance serves to make that action salient.

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The fact that the sentences in (30) are ungrammatical with *yo* cannot be attributed to just the form of the sentence, however. Shirakawa gives the following examples of sentences containing the question marker *ka* that are grammatical with *yo*.

(31) a. kimi-no kyuuryou de ie-ga
you-GEN salary with house-NOM
tate-rare-ru ka (*yo*↓)
build-can-NONPAST Q (*yo*↓)
'You think you can build a house with your salary!?'

b. konna hon, dare-ga ka-u ka (*yo*↓)
this.kind.of book who-NOM buy-NONPAST Q (*yo*↓)
'Who the hell would buy a book like this!?'

The questions in (31) are not information seeking, but rhetorical, as I have tried to indicate in my translations. The sentence in (31a) can be used if the speaker is convinced that the hearer cannot in fact build a house with his salary, while the sentence in (31b) can be used if the speaker is convinced that no one would buy the kind of book in question. The syntax of the rhetorical questions in (31) is no different from that of the standard information-seeking questions in (30), suggesting that the restriction of *yo* to rhetorical questions must be accounted for in terms of meaning rather than syntax.[18]

One way to understand these facts would be to treat rhetorical questions as assertions and collapse the treatment of *yo* in rhetorical questions with its treatment in assertions. Then one could state a restriction to the effect that *yo* is infelicitous in interrogatives, but that rhetorical questions are assertive rather than interrogative. This analysis would commit us to the view that rhetorical questions are semantically assertions. Han (2002) has argued, though, that the assertive character of rhetorical questions is due to pragmatic reasoning. I would like to suggest a way in which the behaviour of *yo* in rhetorical questions can be explained without assuming that rhetorical questions are semantically assertions.

A special case of a decision problem is one in which an agent is trying to decide what she should believe about the world. In a possible-worlds setting, this amounts to the question of which of all the possible worlds the agent in fact inhabits. This can be cast as a decision problem in which each possible action corresponds to picking a cell of the partition to believe. We can represent such actions as b_p for each

[18] The sentences in (31) can be interpreted as rhetorical questions in the absence of *yo*, so that *yo* is not required for a rhetorical reading. If *yo* is present, however, only the rhetorical reading is possible.

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proposition p that picks out a cell in the partition induced by the question under consideration. For a question with n cells (possible answers), there will be n distinct actions b_{p_i} of believing in the proposition corresponding to the ith cell, giving the action set $\mathcal{A} = \{b_{p_1}, b_{p_2}, \ldots, b_{p_n}\}$.

Viewed in this way, the QUD of Roberts (1996, 2004) is reduced to a special case of a decision problem in which the discourse participants are all trying to decide which answer to a contextually salient question they should believe. For every question $Q = \{p_1, p_2, \ldots, p_n\}$ there is a corresponding decision problem $\mathcal{A} = \{b_{p_1}, b_{p_2}, \ldots, b_{p_n}\}$. If the set of worlds consistent with the common ground in a context C entails some $p_i \in Q$, then the question Q is resolved in C, as is the corresponding decision problem as to which proposition in Q the agent should believe.

By asking a question Q, the speaker is introducing the decision problem of which of the elements of Q should be believed. This fact can be used to understand the behaviour of *yo* in rhetorical questions as well as its infelicity in non-rhetorical questions. The question Q gives rise to a contextual decision problem $\mathcal{A}$. The use of *yo* indicates that all worlds in the post-update context set are ones in which a particular action $a \in \mathcal{A}$ is optimal. Optimality in this case can be equated with truth; it is optimal for the agent to believe the proposition p in just those worlds in which p is true. This amounts to saying that using *yo* with a question indicates that the post-update context set entails an answer to the question. But a question does not serve to add a proposition to any discourse participant's discourse commitments and does not eliminate worlds from the common ground.[19] Thus the post-update common ground is identical to the pre-update common ground when a question is used. We thus predict that the use of *yo* in a question indicates that the pre-update common ground entails an answer to the question being asked. This is precisely what we find. The use of *yo* in a question forces a rhetorical interpretation, indicating that the answer to the question is already known to all discourse participants.

The example in (32) seems to violate the generalization that *yo* cannot occur with information-seeking questions.

(32) dare-ga boku-no biiru-o non-da *nda* *yo*↓
who-NOM me-GEN beer-ACC drink-PAST *nda* *yo*↓
'Who drank my beer *nda yo*↓?'

[19] For a concrete proposal on the dynamics of interrogatives which affects the structure of the CG without eliminating worlds, see Groenendijk (1999).

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The sentence in (32) constitutes a request for information; it is used in situations where the speaker does not know who drank his beer and wants the hearer to tell him who did. This seems to violate the restriction against *yo* in information-seeking questions that was suggested by the ungrammaticality of the examples in (30) and was argued to follow directly from the semantics of *yo* and the dynamics of questions.

The sentence in (32) contains *nda*, which I have left unglossed, rather than the question particle *ka*. Questions are canonically formed in Japanese with the sentence-final question particle *ka*.[20] Examples of canonical yes/no and wh-questions are given in (33).

(33) a. Tarou-ga ki-ta ka
Taro-NOM come-PAST Q
'Did Taro come?'
b. dare-ga ki-ta ka
who-NOM come-PAST Q
'Who came?'

The examples in (30) and (31) that formed the basis of the generalization that *yo* occurs only with rhetorical questions all have this canonical syntax. Sentence (32) has a different syntax, with *nda* replacing the question particle *ka*. It is rather clear that *nda* is not simply a variant question particle. For one thing, the question particle in the wh-question (33b) can be replaced with *nda* and still be interpreted as a question, while the question particle in the yes/no question in (33a) cannot be replaced with *nda* while retaining its interrogative meaning.

(34) a. Tarou-ga ki-ta *nda*
Taro-NOM come-PAST *nda*
'Taro came.' (Cannot mean 'Did Taro come?')
b. dare-ga ki-ta *nda*
who-NOM come-PAST *nda*
'Who came?'

This reflects a general pattern: *nda* may be used to form wh-questions, but not yes/no questions. Another contrast between questions with *nda* and questions with *ka* is that the latter can be embedded, while the former cannot:

(35) dare-ga tabe-ta *ka*/**nda* sira-nai
who-NOM eat-PAST *ka*/**nda* know-NEG

[20] When the verb has non-honorific morphology, the use of *ka* sounds slightly unnatural. In general, the particle *ka* can be left absent, as long as the utterance is given rising intonation.

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'I don't know who ate.'

Morphologically, *nda* seems to be a contracted form of *no da*, which in turn consists of the nominalizer *no* and the copula *da*. This suggests that a sentence ending with *nda* is syntactically a declarative and might have a different CCP than canonical questions with *ka*. This view is supported by examples like (36) showing that *nda* is used to form assertions. The example in (37) is interpreted pragmatically as an imperative but seems to be syntactically and semantically an assertion, as indicated in the gloss.

(36) boku-no biiru-o maiku-ga non-da *nda*
me-GEN beer-ACC Mike-NOM drink-PAST *nda*
'Mike drank my beer.'

(37) omae-ga tabe-ru *nda*
you.ANTI.HON-NOM eat-NONPAST *nda*
'You will eat.'

These examples suggest the possibility that wh-interrogatives with *nda* might not be associated with the same CCP as canonical questions. I tentatively suggest that wh-interrogatives with *nda* should be treated as a kind of assertion or imperative. A sentence like that in (32) would then correspond to an assertion like *The question is who drank my beer* or an imperative like *Tell me who drank my beer*. The use of *yo* in wh-interrogatives formed with *nda* would then work as it does in assertions or imperatives.

Some further notes are in order regarding the behaviour of *yo* in questions. First, *yo* must have falling intonation in order to be felicitously used with questions; *yo*↑ in these examples is bad to the point of ungrammaticality. This holds for both the rhetorical questions in (31) and *nda* interrogatives like that in (32). Also, the examples in (31) and (32) have a distinctly aggressive or confrontational flavour to them. This hint of aggressiveness or anger is one that seems to hold for all cases of questions with *yo*, even though other sentence types with *yo* do not have this character. I have no explanation for these facts at this time.

3.5 *Comparison with McCready's account*

I have traced the connection between *yo* and relevance to the addressee's decision problem, represented as a choice from a contextually salient set of actions. I showed that this idea accounts for the behaviour of *yo* not only in assertions but also in imperatives and questions. McCready's (2009) presuppositional component of *yo*'s

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meaning, repeated in (38), captures the intuition that *yo* is used in assertions whose propositional content is informative to the addressee.

(38) $\mathcal{B}_S IV_H(Q, \varphi) > d_s$

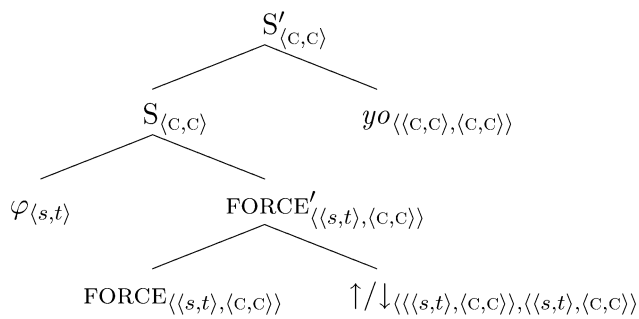
The present account can also derive the restriction of *yo* to assertions of hearer-new, informative propositions. This follows from the fact that *yo* requires that the post-update common ground resolve some contextually salient decision problem of the addressee. Since this will only occur if the post-update common ground differs from the pre-update common ground, it follows that an assertion with *yo* will be informative. Moreover, I have shown that the contribution of *yo* in assertions goes beyond an indication that the asserted proposition is informative to the addressee. It must also be relevant, in a sense made precise in this section. An advantage of the present account is that it extends naturally to the behaviour of *yo* in non-assertive utterances. It is unclear how the meaning in (38) should be extended to the behaviour of *yo* in imperatives and questions. The present proposal builds on the intuition underlying McCready's denotation in (38), but is better able to capture *yo*'s contribution in a range of contexts and clause types.

4 FURTHER ISSUES

4.1 *Structural considerations*

The decomposition of *yo*↑ and *yo*↓ into the single morpheme *yo* plus one of two intonational morphemes ↑ or ↓ gives rise to the structure in (39).

(39)



The structure in (39) shows the syntactic organization of a sentence containing *yo*↑ or *yo*↓. At the lowest node a force head combines with one of the intonational morphemes ↑ or ↓, returning a function of the

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same type as the original force head. The intonational morphemes thus act as a kind of adverbial modifier to the force head. The modified force head FORCE′ then combines with a propositional complement, returning a CCP, of type ⟨C,C⟩. The morpheme *yo* then combines with this CCP, returning the same CCP with an added presuppositional meaning, as described in section 4.1.

One nice consequence of the semantics proposed for *yo* in this article is that it is able to explain why *yo* cannot be embedded. I have argued that *yo* takes as its argument an object that is a function from contexts to contexts. The force head of a sentence is responsible for taking a propositional object and returning a CCP, so that *yo* is structurally higher in the syntax than the force head. To the extent that force heads cannot be embedded, it follows that *yo* is also unembeddable.

4.2 *Other particles*

I have provided evidence in this article that the particle *yo* functions as a modifier of CCP meanings. Moreover, the intonational associate of *yo* functions as a modifier of the illocutionary force head itself. This analysis may offer a useful approach to a host of particles which have been argued to affect meaning at the level of speech acts. Karagjosova (2003) suggests that the German modal particles (MPs) *ja*, *doch*, *eben*/*halt* and *auch* carry meaning in two ways: by affecting the speech act performed by the utterance and by affecting the discourse function of the utterance. Thus, for example declaratives with *doch* are said to encode an illocutionary *remind*-act, as opposed to the *assert*-act conventionally conveyed by a bare declarative. Moreover, the use of *doch* in a declarative serves to convey (in a context-dependent way) the intended discourse function of the declarative, for example as a correction of the addressee's previous linguistic act.

This dual nature of discourse particles is reflected in semantics of *yo*↑ and *yo*↓, but with the two kinds of meaning decomposed. The intonational morphemes ↑ and ↓ encode a change to the illocutionary force of the utterance by directly modifying the semantics of the illocutionary force head. The morpheme *yo* conveys, in a context-dependent way, information about the intended discourse function of the utterance: to guide the addressee in the resolution of a contextually salient decision problem.

There is evidence that, language internally, different discourse particles occupy different syntactic positions, with attendant differences in meaning and semantic composition. Zimmermann (2009), following Jacobs (1991), argues that the German particle *ja* is a modifier of

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illocutionary operators, while the particles *doch* and *wohl* are not. Evidence for this position comes from the fact that the latter particles can be embedded and are interpreted in their embedded environment, while *ja* resists embedding except in reported speech acts and is always interpreted relative to the utterance context. If Zimmermann is right, then *ja* might be given an analysis either as a modifier of the illocutionary force head itself, like the intonational morphemes ↑ and ↓, or as a function on the CCP meaning of the entire utterance, like *yo*. Law (2002) provides evidence that a subset of SFPs in Cantonese occupy the Force head at the periphery of the clause structure, providing further support for the idea that some discourse particles function semantically at the level of illocutionary force operators.

A final issue of cross-linguistic relevance is the decomposition of particle meanings from their associated intonational or stress patterns. The German MPs, such as *doch* and *ja*, can be stressed or unstressed, with attendant differences in meaning. The question arises whether a decomposition of particle meanings into a basic core and an additional intonational meaning can be applied to these particles as well.[21]

4.3 *Discourse particles and pragmatics*

We saw that the dialogue in (16), repeated in (40), was argued by Grice to exhibit such an obvious relevance relation between B's remark and the prior remark of A that no maxim violations were risked.

(40) Context: 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.

But in Japanese, bare assertions are not felicitous in these kinds of contexts. Rather, the relevance relation has to be overtly indicated with the use of a particle. Bare assertions 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 assertion addresses. The generalization can be seen by comparing B's assertion in (41) in response to each of the two preceding utterances of A.

(41) A: a. Nihon-no sinbun doko de ka-e-ru?

[21] I thank an anonymous reviewer for pointing out this issue.

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Japan-GEN newspaper where at buy-can-NONPAST
'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-e-ru (*yo*↑)
station at buy-can-NONPAST (*yo*↑)
'You can buy one at the station (*yo*↑).

If A asks the question in (41a), then B's assertion 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*. 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 (41b), then native speakers consistently report that B's assertion without *yo* is completely infelicitous. 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 assertions in Japanese degrades rapidly in so far 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.

Why should there be cross-linguistic variability in the pragmatic licensing conditions of basic assertions? It may be that if a language has a robust system of discourse particles that provide scaffolding for pragmatic inference, then failure to use an available particle is not free of pragmatic implications. A similar situation is seen in the system of honorific marking in Japanese. The example in (42a) from Potts & Kawahara (2004) contains what Harada (1976) calls *performative honorification*. This example can be contrasted with the one in (42b) which differs minimally in that it does not contain the performative honorific.

(42) a. Mary-ga ringo-o tabe-**masi**-ta
Mary-NOM apple-ACC eat-**perf.hon**-PAST
i. 'Mary ate the apple.'
ii. 'I am speaking nicely to you.'

b. Mary-ga ringo-o tabe-ta
Mary-NOM apple-ACC eat-PAST

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'Mary ate an apple.'

The contribution of the performative honorific is roughly described by the gloss in (42a-ii). As indicated, the effect of the morpheme is to express politeness to the addressee. In contrast, the sentence in (42b), which lacks an honorific, does not contain any meaning component indicating the speaker's politeness, or lack thereof, towards the addressee. But using a non-honorific sentence like the one in (42b) has the effect of being non-polite. That is, if the addressee is someone to whom polite speech is socially appropriate, the use of a non-honorific sentence like that in (42b) will sound rude. This is not because the sentence encodes anything like non-politeness. Rather, since the option in (42a) exists, if the speaker fails to use it, he indirectly indicates that he is being non-polite, and often (by implicature) impolite, to the addressee.

The use of sentences without direct encoding of addressee honorification thus implicates that the speaker does not show the addressee the kind of politeness that the performative honorific encodes. One cannot opt out of the system; a speaker cannot simply choose to never use honorifics, and allow other linguistic and non-linguistic features of his behaviour to indicate the politeness that is conventionally encoded by the honorific. Once a system of grammaticized honorification is in place, failure on the part of the speaker to use an honorific is interpreted as non-politeness on the part of the speaker.

The same pattern holds in the examples of assertions in Japanese whose pragmatic felicity requires the use of a particle. Since the Japanese particle *yo* conventionally encodes a relevance relation between the content of an utterance and some decision facing the addressee, failure to use *yo* tends to indicate a lack of such a relationship. The system of particles provides scaffolding supporting the pragmatics of communicative intent, in the same way that the system of honorifics provides scaffolding for the pragmatics of politeness.

The current account embodies an intuition about the contribution of particles expressed by Zeevat (2003):

> A proper analysis of the particles requires . . . an analysis of speech acts in terms of the conditions under which it can be carried out, the effects that are achieved if the act is taken seriously by the hearer together with the effects that the speaker intends to achieve. Discourse particles are means for indicating that these are not the normal ones and that other conditions or intended effects apply.

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The present account gives a denotation of *yo* which indicates 'the effects that are achieved if the act is taken seriously by the hearer'; *yo* tells the hearer that, if he accepts the update to his commitment set encoded by *yo*'s intonational associate ↑/↓, then there will be some action in a contextually salient decision problem that is optimal in all worlds consistent with the updated common ground relative to some contextually supplied ordering. The use of *yo* thus provides a kind of glue linking the conventional semantics of an utterance with its pragmatics and intended role in discourse. This link is explicitly connected to a representation of the discourse participants' beliefs, intentions and goals, giving the present account a strong conceptual connection to Belief-Desire-Intentions models of practical reasoning (Bratman 1987), and related proposals for the intentional structure of discourse (Grosz & Sidner 1986; Lochbaum 1998). The meaning contributed by *yo* helps the hearer understand the speaker's intended discourse contribution in saying what he said. The computation involved is pragmatic; the hearer must deduce the speaker's intent on the basis of the sentence's propositional content, the content contributed by particles and other non-assertive elements, and the discourse context. Using *yo* helps to narrow the range of possible speaker intentions.

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CHRISTOPHER DAVIS
Department of Linguistics
University of Massachusetts Amherst
225 South College
150 Hicks Way
Amherst, MA 01003
e-mail: cmdavis@linguist.umass.edu

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