

Decisions and Discourse Particles: A Case Study from a Large Japanese Sentiment Corpus

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Discourse Particles

Discourse particles give rise to an interesting tension in the study of semantics and pragmatics.

- A class of items whose meaning might best be thought of in terms of *lexical pragmatics*, rather than *lexical semantics*.
- Under the standard Gricean picture, this is a contradiction in terms: Conventional meaning is semantic, and pragmatic meaning is derived on the basis of general pressures that are not coded in the grammar.
- Discourse particles seem to be of a kind with those items whose meaning can, following Kaplan, best be analyzed in terms of their *use*: To know what a discourse particle *means* is to know how it is *used*.

Theoretical Issues

The primary issues that discourse particles and other conventionalized pragmatic elements raise for the theorist are:

- What kind of formal models are appropriate for capturing this kind of meaning,
- How can lexical pragmatic meaning be incorporated with more “standard” (i.e. truth-conditional) aspects of conventional meanings, and
- How does conventional pragmatic meaning help shape the general pragmatic pressures identified by Grice and others as a crucial feature of natural language interpretation?

Empirical Issues

The kind of meaning contributed by pragmatic particles requires new empirical techniques for getting at those aspects of language use that these particles impact.

- What kind of data should we look for?
- What analytic tools can be brought to bear on the data we get?
- How can this data and its analysis be wedded with theoretical models of lexical pragmatics?

Overview

In this talk, I look at the Japanese sentence final discourse particle *yo*, combining three perspectives:

- 1 *A formal analysis* of its meaning, derived from that in [Davis(2009)].
- 2 *Informant-based intuitionistic* data supporting the analysis, along with
- 3 *Quantitative corpus data* that further supports the analysis.

Basic Data

The analysis is built on the basis of examples like (1).

(1) 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 8-ji
 already 7-o'clock past right movie-TOP 8-o'clock
 kara hajimaru #(yo)
 from starts #(yo)
 “It’s already 7, right? The movie starts at 8 #(yo).”
 [Davis(2009)]

Generalization: *yo* as a Guide to Action

- Examples like that in (1) suggest that *yo* is used as a *guide to action* for the addressee.
- This is captured in a *dynamic semantic model* that incorporates a *contextually salient decision problem*.

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Component 1: Common Ground

Following [Stalnaker(1978)], each context c has a *common ground*, representing the set of common public commitments (beliefs) of the discourse participants in c .

Common Ground: Formal Model

$$CG(c) = \{p \mid p \text{ is a public belief of all participants in } c.\}$$

Component 2: Decision Problem

Following [van Rooy(2003)] and others, contexts also contain a set of *alternative actions*, which define a contextually salient *decision problem*.

- $\mathcal{A}(c) = \{a \mid a \text{ is a contextually salient choice/action in } c\}$
- Alternative actions are *properties*, so that for a given world x , action a , and agent x :
 - $a(x)(w) = 1$ iff x chooses action a in w
 - $a(x)(w) = 0$ iff x does not choose action a in w

Optimal Actions

A decision problem is resolved in terms of an *optimality metric*.
This metric relies on an *ordering of worlds*.

Partial Ordering of Worlds $<_c$ [modified from [?]]

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)]

Definition of Optimality

$OPT(p, c) = 1$ iff $\forall w_i, w_j \in \cap CG(c) [(p(w_i) \wedge w_i <_c w_j) \rightarrow p(w_j)]$

Dynamic Semantics of Assertion

An assertion is interpreted in terms of a *context change potential*, which provides a guide to how the speaker intends the context to evolve in response to his utterance.

- Assertive sentences are assumed to be headed by an abstract force head ASSERT.
- The combination of ASSERT with a propositional radical returns a *relation over contexts*.

Assertion

$$\llbracket \text{ASSERT } p \rrbracket = \left\{ \langle c, c' \rangle \mid \text{CG}(c') = \text{CG}(c) \cup \{ \llbracket p \rrbracket \} \right\}$$

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Denotation: A Pragmatic Presupposition about a Decision Problem

The use of *yo*, according to [Davis(2009)], contributes a *pragmatic presupposition* about a contextually salient *decision problem*.

- This can be spelled out as an additional condition on the update encoded by the CCP of the sentence to which *yo* attaches.

Denotation of *yo*

$$\llbracket yo \rrbracket(\text{CCP}) = \left\{ \langle c, c' \rangle \mid \langle c, c' \rangle \in \text{CCP} \wedge \exists a \in \mathcal{A}(c') : \neg \text{OPT}(a(\text{addr}), c) \wedge \text{OPT}(a(\text{addr}), c') \right\}$$

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- Use of *yo* requires a *salient action* in the *output context*.
- This action is *optimal in the output context*, but *not in the input context*.

Assertions with *yo*

I focus attention on the use of *yo* in assertions. The above semantics gives the following denotation for an assertion with *yo*:

$\llbracket \text{ASSERT } p \text{ yo} \rrbracket =$

$$\left\{ \langle c, c' \rangle \mid \begin{array}{l} \text{CG}(c') = \text{CG}(c) \cup \{ \llbracket p \rrbracket \} \wedge \exists a \in \mathcal{A}(c') : \\ \neg \text{OPT}(a(\text{addr}), c) \wedge \text{OPT}(a(\text{addr}), c') \end{array} \right\}$$

- The proposition denoted by p must be added to the output context, and
- There must be a salient action that is *optimal for the addressee* in the output context that is *not* optimal in the input context.

Application to an Example

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Application to an Example

- A's utterance creates a context c in which there is a salient decision problem: Whether or not to eat before going to the movies.

$$\mathcal{A}(c) = \{\text{eat}, \neg\text{eat}\}$$

- B's assertion places a new fact in the common ground of the output context c' :
 $CG(c') = CG(c) \cup \{\text{"The movie starts at 7."}\}$
- The bare assertion says nothing else about the output context, and native speakers report infelicity in this context.
- The use of *yo* indicates that some salient action is optimal in the output context as well:
 $\exists a \in \{\text{eat}, \neg\text{eat}\} : \neg\text{OPT}(a(\text{addr}), c) \wedge \text{OPT}(a(\text{addr}), c')$

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Further Evidence: Distribution in a Large Sentiment Corpus

The analysis developed on the basis of constructed examples receives further support from quantitative corpus data.

Sentiment Corpus

- Recently expanded version of the publicly available UMass Amherst Sentiment Corpora ([Potts and Schwarz(2008)], [Constant et al.(2008)Constant, Davis, Potts, and Schwarz]).
- The Japanese portion of this corpus contains approximately 33 million words of review 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 and Evaluative Stance

- The ratings data provide an objective scale along which the author's *sentiment* or *evaluation* of the target product can be estimated.
- 1 and 5 star reviews are extremely negative and positive.
- 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.

Ratings and Optimality

- The context for a product i has a salient decision problem in the background: Whether to buy i or not to buy i :
 $\mathcal{A} = \{\lambda x.\text{buy}(i)(x), \lambda x.\neg\text{buy}(i)(x)\}$
- Extreme ratings (1 and 5) are associated with stronger recommendations, while moderate ratings are associated with more ambivalence.
- The semantics of yo makes a clear prediction: yo should be used more in reviews in which the author is making a strong recommendation for one action or the other, and hence should be more common in reviews with extreme ratings.

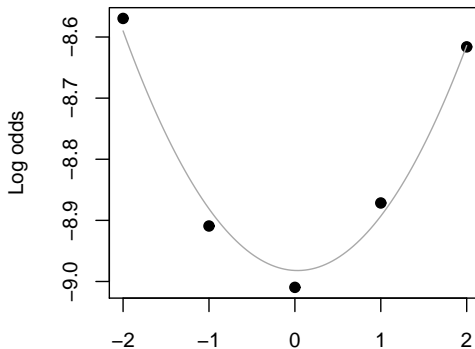
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'yo' in Amazon review (Japanese)



Rating (centered around 0)
quad coef=0.095; quad p<0.001

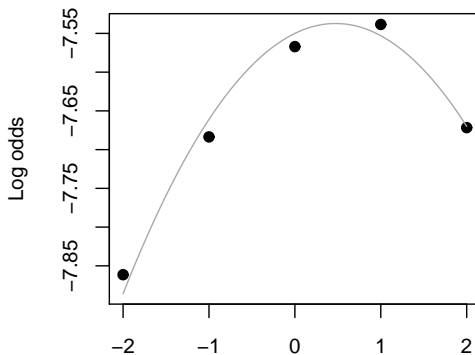
- There is a **U-Shaped** distribution of *yo* across rating categories.
- The significance of the pattern is confirmed by the quadratic term of the associated logistic regression model.
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- Other discourse particles exhibit drastically different patterns; for example, the sentence-final particle *ne*:

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- Other discourse particles exhibit drastically different patterns; for example, the sentence-final particle *ne*:

'ne' in Amazon review (Japanese)



Rating (centered around 0)
quad coef=-0.057; quad p<0.001

Expressive?

While I have shown how the distribution of *yo* in our sentiment corpus is consistent with the decision-theoretic account of *yo* presented in the last section, the data do not distinguish this account from an expressive one in which *yo* serves to index speaker emotionality.

- Expressive meaning directly indexes *heightened speaker emotionality*, whether positive or negative.
- Rating category is a proxy for emotional state.
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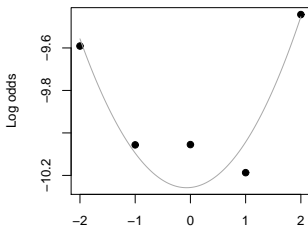
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Expressive Profiles

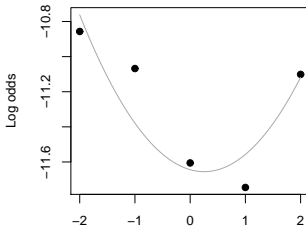
The U-shaped distribution exhibited by *yo* is also characteristic of *expressive* items.

'wow' in Amazon review (English)



Rating (centered around 0)
quad coef=0.188; quad p<0.001

'damn' in Amazon review (English)



Rating (centered around 0)
quad coef=0.176; quad p=0.014

Expressive Repeatability

[Potts(2007)] posits *repeatability* as one of the characteristics of expressive items:

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Explanation

Rough characterization of Potts' analysis:

- Expressives target a contextual index registering *speaker emotionality*.
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- Repeated uses correspond to repeated “bumps” to the index, and hence to relatively stronger emotional states.

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Non-Repeatability of *yo*

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.

kyou-wa uni-ga oishii desu *yo*
today-TOP sea.urchin-NOM delicious be *yo*

“We have good sea urchin today *yo*.”

kesa Hokkaido-de toreta mono desu *yo*
this.morning Hokkaido-at caught thing be (#*yo*)

“It was caught in Hokkaido this morning (#*yo*).”

Non-Repeatability

Generalization

When *yo* 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.

- In the previous example, the action suggested to the customer by both sentences is ordering the sea urchin.
- It is fine to mark the first sentence with *yo*, but then the second one cannot also be so marked.
- The use of *yo* is thus *not* repeatable, and contrasts in this respect with an expressive item like *damn*.

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$$\left\{ \langle c, c' \rangle \mid \begin{array}{l} \text{CG}(c') = \text{CG}(c) \cup \{\llbracket p \rrbracket\} \wedge \exists a \in \mathcal{A}(c') : \\ \neg \text{OPT}(a(\text{addr}), c) \wedge \text{OPT}(a(\text{addr}), c') \end{array} \right\}$$

- The first utterance suggests that buying sea urchin becomes optimal for the addressee in the post-update context.
- The second utterance with *yo* makes the same suggestion: That buying sea urchin is optimal in the post-update context, *but not in the pre-update context*.
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One Profile, Two Sources

The non-repeatability facts support the decision-theoretic analysis account of *yo*'s corpus distribution.

- The usage profile of *yo* matches that of a canonical expressive like *wow* or *damn*, but (non-)repeatability provides some reason to think that this profile is generated in a distinct way.
- Expressive like *damn* index speaker emotionality directly, and rating category correlates (by hypothesis) with this emotional index.
- The particle *yo*, by contrast, serves as a guide to optimal action, and this is also reflected systematically in the rating category of the review.

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Text Finality

Two empirical generalizations follow from the semantics of *yo* so far:

- 1 U-shaped distribution in the sentiment corpus.
- 2 Non-repeatability.

One final corpus-based generalization:

Text/Discourse Finality

The use of *yo* tends to appear near the end of a review text in the sentiment corpus.

Text Finality

Two empirical generalizations follow from the semantics of *yo* so far:

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Text Finality

Relative frequency of *yo* in different textual positions:

- 4,486 reviews containing *yo*, containing a total of 5,283 tokens.
- Textual position of each token of *yo* calculated by counting the number of characters that preceded *yo* in the text.
- Textual position corrected to eliminate the bias introduced by sentence-finality.
- Estimated density of *yo* across textual positions compared with that of two other sentence-final particles: *ne* and *ka*.

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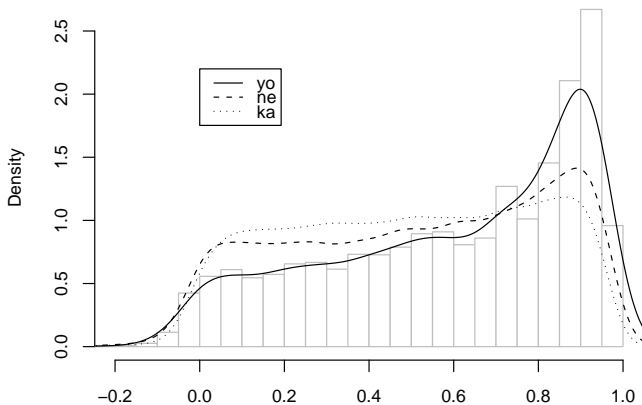
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Corrected Textual Position of *yo*, Compared to *ne* and *ka*



(Position in Text – (Avg Sentence Length / 2)) / Length of Text

Text Finality: Explanation

- As an author builds a case for a position, the common ground becomes more supportive of that position.
- Since *yo* 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*, 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.

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Summary

The semantics of *yo* was shown to predict three patterns:

- 1 Resolution of decision problems by suggesting actions to the addressee.
- 2 Non-Repeatability.
- 3 Tendency for text-finality.

Summary

These generalizations are based on a combination of corpus and traditional intuitionistic data.

- Quantitative corpus data, in conjunction with more traditional data, can help to test and refine formal theories of lexical pragmatic meaning, and
- Formal theories can help us to interpret the data collected from corpora, and suggest interesting questions on the basis of which new corpus-based tools can be developed.

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Thank you!

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