Responsive modal particles: the case of Japanese *darou*

Introduction: This paper investigates the puzzling behaviour of the Japanese modal particle *darou* (Hara & Davis 2013; Hara 2015). The particle is *responsive* in the sense that it can combine with both declaratives and interrogatives. Furthermore, its semantic contribution is modulated by intonation. Capturing the behaviour of such responsive modal particles is problematic under the standard assumption that modal particles apply to propositions. In particular, the interrogative-embedding use of *darou* cannot be 'reduced' to its declarative-embedding use, an approach that has been prominent in the analysis of verbal responsive modals such as *know* (e.g., Karttunen 1977, Spector & Egré 2015). We develop an analysis in inquisitive semantics, where declaratives and interrogatives are taken to be of the same semantic type. We suggest that this framework is well-suited for the analysis of responsive modal particles. In particular, we show that the various uses of *darou* can be given a uniform account.

The puzzle: With a declarative prejacent, *darou* translates as 'I expect', as seen in (1a). In contrast, with the Q(uestion)-particle *ka* to the right, it translates as 'I wonder', as in (1b)-(1c).

(1) a. Taro-wa utau-**darou**.
Taro-TOP sing-DAROU
'I expect Taro will sing.'

b. Taro-wa utau-**darou**-ka.
Taro-TOP sing-DAROU-Q
'I wonder if Taro will sing.'

c. Dare-ga utau-**darou**-ka.
who-NOM sing-DAROU-Q
'I wonder who will sing.'

Sentences of the form *p-darou-ka*, such as (1b)-(1c), do not behave like interrogatives. In particular, they cannot be embedded under predicates that take only interrogative (no declarative) complements, such as *saguru* 'investigate' and *tazuneru* 'ask'. For this reason, it is assumed that *ka* does not apply to the matrix clause in such constructions, but is part of the prejacent of *darou* (Hara & Davis 2013; Hara 2015). This means that *darou* is a responsive modal particle that is compatible with both declarative and interrogative prejacents, just like verbal responsive modals like *know*. Note, however, that the interrogative-embedding use of *darou* cannot be reduced to its declarative-embedding use: 'I wonder Q' does not mean that for some answer A to Q, 'I expect A'.

What makes *darou* even more problematic is its interaction with intonation (Hara 2015). As seen in (2a), with final rising intonation, *darou* with a declarative prejacent expresses a biased question, similar to English tag-questions. On the other hand, rising intonation is incompatible with *darou-ka*, as in (2b)-(2c).

(2) a. Taro-wa utau-**darou**↑.
'John will sing, won't he?'

b. *Taro-wa utau-**darou**-ka↑.

c. *Dare-ga utau-**darou**-ka↑.

Theoretical background: Our account is cast in inquisitive epistemic logic (IEL) (Ciardelli & Roelofsen 2015). A basic IEL MODEL for a set $\mathcal{P}$ of atomic sentences and a set $\mathcal{A}$ of agents is a triple $M = \langle \mathcal{W}, V, \Sigma_{\mathcal{A}} \rangle$, where $\mathcal{W}$ is a set of POSSIBLE WORLDS, $V : \mathcal{W} \mapsto \wp(\mathcal{P})$ is a VALUATION MAP, and $\Sigma_{\mathcal{A}} = \{\Sigma_a \mid a \in \mathcal{A}\}$ is a set of INQUISITIVE STATE MAPS, one for each agent $a \in \mathcal{A}$, mapping every world $w \in \mathcal{W}$ to a downward-closed set of information states $\Sigma_a(w)$, namely those information states that settle the issues that a entertains in w. $\Sigma_a(w)$ is called the INQUISITIVE STATE of a in w, and its union, $\bigcup \Sigma_a(w)$, represents the current information state of a in w. For our purposes, it is necessary to enrich such a basic IEL model with a set of EXPECTATION STATE MAPS, $\{\epsilon_a \mid a \in \mathcal{A}\}$, one for each agent $a \in \mathcal{A}$, mapping every world $w \in \mathcal{W}$ to the set of possible worlds $\epsilon_a(w)$ compatible with the expectations of a in w.

The semantic value of a sentence φ in IEL, $[\![\varphi]\!]$, is a downward-closed set of information states, namely those information states that resolve the issue that φ expresses. The truth-conditions of φ are derivable from $[\![\varphi]\!]$: φ is true in w iff $\{w\} \in [\![\varphi]\!]$. The informative content of φ, $\mathsf{info}(\varphi)$, is the set of all worlds where φ is true, $\bigcup [\![\varphi]\!]$. The semantics of the relevant expressions in IEL is given below: p stands for an arbitrary atomic sentence, K_a for 'a knows',

W_a for 'a wonders', E_a for 'a expects', ? is an operator that trivializes informative content, and ! one that trivializes inquisitive content, leaving informative content intact.

(3) a. $[\![p]\!] := \{s \mid \forall w \in s : p \in V(w)\}$
b. $[\![\neg\varphi]\!] := \{s \mid \forall t \in [\![\varphi]\!] : s \cap t = \varnothing\}$
c. $[\![\varphi \wedge \psi]\!] := [\![\varphi]\!] \cap [\![\psi]\!]$
d. $[\![K_a\varphi]\!] := \{s \mid \forall w \in s : \sigma_a(w) \in [\![\varphi]\!]\}$
e. $[\![W_a\varphi]\!] := \{s \mid \forall w \in s : \sigma_a(w) \notin [\![\varphi]\!] \text{ and } \Sigma_a(w) \subseteq [\![\varphi]\!]\}$
f. $[\![E_a\varphi]\!] := \{s \mid \forall w \in s : \epsilon_a(w) \subseteq \mathsf{info}(\varphi)\}$
g. $[\![!\varphi]\!] := \{s \mid s \subseteq \mathsf{info}(\varphi)\}$
h. $[\![?\varphi]\!] := [\![\varphi]\!] \cup [\![\neg\varphi]\!]$

Account: We treat *darou* as in (4) and *ka* and the final rise as in (5), where $[\![\varphi]\!]$ is the at-issue meaning of φ, $[\![\varphi]\!]^\bullet$ its non-at-issue meaning, and $\odot$ the contextually determined deictic center (which for our purposes here is the speaker; the case of deictic shifting will be discussed in the full paper; Hara & Davis 2013).

(4) a. $[\![\varphi \text{ darou}]\!] = [\![!\varphi]\!]$
b. $[\![\varphi \text{ darou}]\!]^\bullet = [\![E_\odot!\varphi \wedge W_\odot?\varphi]\!] \cap [\![\varphi]\!]^\bullet$

(5) a. $[\![\varphi \text{ ka}]\!] = [\![\varphi\uparrow]\!] = [\![?\varphi]\!]$
b. $[\![\varphi \text{ ka}]\!]^\bullet = [\![\varphi\uparrow]\!]^\bullet = [\![\varphi]\!]^\bullet$

We assume that in uttering a sentence φ, a speaker always commits herself to $\mathsf{info}(\varphi)$, unless the non-at-issue meaning of φ signals that the speaker does not believe $\mathsf{info}(\varphi)$. Further, we assume that a sentence that is marked as a question by a final rise is degraded if it is necessarily non-inquisitive (both at-issue and non-at-issue), i.e., no matter what its prejacent is, and that a sentence which is marked as an assertion by a final fall is degraded if it is necessarily non-informative (both at-issue and non-at-issue) (cf., Gajewski 2002).

Predictions: The following semantic values are derived for the crucial examples. (In the derivation, we use the fact that for any atomic p, $!p$ is equivalent to p, $??p$ equivalent to $?p$, and $E_\odot!?p$ trivial.)

(6) a. $[\![p \text{ darou}]\!] = [\![p]\!]$
b. $[\![p \text{ darou}]\!]^\bullet = [\![E_\odot p \wedge W_\odot?p]\!]$

(7) a. $[\![p \text{ darou-ka}]\!] = [\![!?p]\!]$ (tautologous)
b. $[\![p \text{ darou-ka}]\!]^\bullet = [\![W_\odot?p]\!]$

(8) a. $[\![p \text{ darou } \uparrow]\!] = [\![?p]\!]$
b. $[\![p \text{ darou } \uparrow]\!]^\bullet = [\![E_\odot p \wedge W_\odot?p]\!]$

(9) a. $[\![p \text{ darou-ka } \uparrow]\!] = [\![!?p]\!]$ (tautologous)
b. $[\![p \text{ darou-ka } \uparrow]\!]^\bullet = [\![W_\odot?p]\!]$

As seen in (6), the non-at-issue meaning of *p darou* conveys that the speaker expects p, and wonders whether p is indeed the case. The first conjunct captures the most salient intuitive implication of (1a), described in its translation above. The second conjunct implies that the speaker does not know whether p (by definition (3e), wondering implies lack of knowledge), which means that we correctly predict that in uttering (1a) the speaker does not commit to the at-issue informative content, $\mathsf{info}(p)$. Turning now to (7), we predict that *p darou-ka* has trivial at-issue content but carries a non-at-issue implication that the speaker is wondering whether p. This matches the intuitive translation of (1b) above. The fact that the at-issue content of *p darou-ka* is always trivial makes a further prediction: it would be pointless for other operators to take scope over *p darou-ka*. This prediction is borne out; *p darou-ka* cannot be embedded under sentential operators such as modals, negation or clause-embedding predicates without direct quotation (cf. Hara 2015).

The analysis also accounts for the final rise cases. As seen in (8), the at-issue meaning of *p-darou-ka*↑ is that of a polar question, *whether p*, while its non-at-issue meaning conveys a bias toward p. Finally, we predict the degradedness of *p-darou-ka*↑ since, as seen in (9), both its at-issue and its non-at-issue content are necessarily non-inquisitive, even though the sentence is marked as a question by the final rise, and thus requires inquisitiveness, as discussed in **Account** above.

References

Gajewski, Jon. 2002. L-analyticity and natural language. Manuscript, MIT.

Hara, Yurie. 2015. *Darou ka*: an interplay of bias, sentence types, and prosody. Ms., City University of Hong Kong, available online at http://semanticsarchive.net/Archive/TA0MmVkM/.

Hara, Yurie and Chris Davis. 2013. *Darou* as a deictic context shifter. In K. Yatsushiro and U. Sauerland, eds., *Formal Approaches to Japanese Linguistics 6*, 41–56. MITWPL.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1:3–44.

Spector, Benjamin and Paul Egré. 2015. A uniform semantics for embedded interrogatives: An answer, not necessarily the answer. *Synthese* 192(6):1729–1784.