Darou as an entertain modal with a shiftable deictic agent: an inquisitive approach

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This study examines the interaction of the Japanese modal particle *darou* with different sentence types and intonation and proposes that *darou* is an entertain modality $E$ in Ciardelli & Roelofsen’s inquisitive dynamic epistemic logic (IDEL) with a shiftable deictic agent $\ominus$.

**Paradigm:** When *darou* occurs in a falling declarative (1), it expresses the speaker’s bias toward the embedded proposition. In a falling interrogative (2), the sentence acts as a self-addressing question. In a rising declarative (3), the sentence functions as a tag-question. A rising interrogative with *darou* in an out-of-blue context (4) is perceived as infelicitous, while it is acceptable in a quiz-show context (5) (*deshou* is a polite form of *darou*). The paradigm is summarized in (6).

**Proposal:** *Darou* is an entertain modal $E_{\ominus}$ as defined in (7).

**Deriving LFs:** *Darou* is a root-level modal. Unlike “normal” modals such as *nichigainai* ‘must’, it cannot occur inside an embedded question (8). Furthermore, the seat of knowledge is always the speaker unless it is embedded under attitude predicates (examples omitted for space reasons) or intonational morphemes (see below). The current paper implements this root-orientedness of *darou* by assigning an uninterpretable feature, [$u$ROOT] to the morpheme. The derivations and translations are given in (9) and (10), respectively. Note that *darou* can embed both a declarative $p$ and an interrogative $?p$.

↑ **As a Deictic Shifter:** Rising intonation (↑) modifies the assignment $g$ so that $\ominus$ is mapped to the addressee as in (11), (12) and (13) (see McCready, Shklovsky & Sudo, a.o.).

**Semantics of $E$:** In IDEL, an information state is identified with a set of possible worlds, $s \subseteq \mathcal{W}$, just like standard epistemic logic. IDEL introduces another dimension which can characterize the issues that are entertained by the agents. An issue is defined as a set of information states: $I \subseteq \mathcal{I}(\mathcal{W})$. Other relevant definitions and facts of the framework are given in (14)-(19). $K_\alpha \varphi$ is concurrent with the knowledge modality in standard epistemic logic (20). $E_\alpha \varphi$ states that once the issues entertained by $\alpha$ are resolved, $\varphi$ will be supported (21). The important fact is that for a declarative $\varphi$, $E_\alpha \varphi$ is equivalent to $K_\alpha \varphi$ (22).

**Darou-Utterance as CCP:** In understanding the effects of *darou*-sentences, this paper employs the notion of context change potential (CCP) (Stalnaker, Heim). $[\varphi]^{M,g,w}_{\ominus}$ is a CCP with a presupposition (23). Let us derive the interpretations of the four combinations in (6). First, in the falling declarative (1), given (22), $E_\ominus p \equiv K_\ominus p$ and $g$ is unmodified, so we obtain a CCP (24a). After the update, $p$ is established in the speaker’s information state. The falling interrogative (2) is interpreted as (24b). That is, $?p$ is supported as soon as the issues of $\text{SPKR}$ are resolved. In the rising declarative (3), $E_\ominus p \equiv K_\ominus p$ and $g$ is modified, so we obtain (24c). The speaker proposes to update the addressee’s information state, resulting in a meaning similar to English tag questions. Finally, in the rising interrogatives, $g$ is modified, so we obtain (24d). The speaker attempts to control the addressee’s inquisitive state. This is a pragmatically loaded move, thus (4) is infelicitous, but in a quiz-show situation where the questioner/speaker indeed has such a control, it is acceptable (5).

**Why IDEL?** Let us clarify the motivations to adopt IDEL to analyze *darou*. First, both *darou* and $E$ can embed both a declarative $p$ and an interrogative $?p$. Second, it is straightforward to implement the shifting process from the default agent to the addressee, since IDEL models the inquisitive state of some agent. Third, *darou* appears to denote different modals depending on which clause type it embeds. Thanks to the semantics of IDEL, however, we can maintain the uniform semantics of *darou* as $E_\ominus$ and correctly derive $K_\ominus$ using the equivalence (22).

**Conclusion:** By defining *darou* as the entertain modality with the shiftable agent, $E_\ominus$, we account for the interaction of clause types and intonation and derive the interpretations of *darou*.
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(1) John-ga kuru darou↓
Jon-nom come DAROU
‘John is coming, I bet./Probably, John is coming.’

(2) John-ga kuru darou ka↓
Jon-nom come DAROU Q
‘I wonder if John is coming.’

(3) John-ga kuru darou↑
Jon-nom come DAROU
‘John is coming, right?’

(4) #John-ga kuru darou ka↑
Jon-nom come DAROU Q

(5) Doitsu-no shuto-wa doko deshou ka↑
Germany-gen capital-top where DAROU.POLITE Q
‘Where is the capital of Germany?’

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<th>Declarative ((\varnothing_{\text{DECL}}))</th>
<th>Interrogative (ka(_{\text{INTEROG}}))</th>
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<tr>
<td>Falling (\downarrow)</td>
<td>biased statement (‘I bet’)</td>
</tr>
<tr>
<td>Rising (\uparrow)</td>
<td>tag/confirmation Q (‘... right?’)</td>
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(6) Proposal: Darou is an entertain modal which expresses epistemic issues associated to the deictic center \(\varnothing\): \(\text{darou} \sim E_{\varnothing}\)

(7) Emi-ga igirisu-ni itta \(\nichigainai/\) darou ka douka kiite mita.
‘I asked whether Emi must have left for England or not.’

(8) [CP\(_1\) [CP\(_2\) darou/\(\text{darou root}\) [CP\(_2\) TP [ \(t_i\varnothing_{\text{DECL}}/\text{ka}_{\text{INTEROG}}\) ] ] C1{\text{root}} ]

(9) a. declarative (\(\varnothing_{\text{DECL}}\)): \(p\)-darou\(\sim E_{\varnothing}p\)
    b. interrogative (ka\(_{\text{INTEROG}}\)): \(p\)-darou ka\(\sim E_{\varnothing}q\)

(10) By default, the assignment function \(g\) maps the deictic variable \(\varnothing\) to the speaker, SPKR:
    \(g = [\varnothing \mapsto \text{SPKR}]\)

(11) \([\varphi]_{M,g} = [\varphi]_{M,g,\varnothing \mapsto \text{ADDR}}\)

(12) a. Falling \(\downarrow\): \(g(\varnothing) = \text{SPKR}\)
    b. Rising \(\uparrow\): \(g^{\text{ADDR}/\varnothing}(\varnothing) = \text{ADDR}\)

(13) An inquisitive epistemic model is a tuple \(M = (\text{Var}, \mathcal{W}, V, g, \Sigma_{\mathcal{A}})\), where \(\mathcal{A}\) is a set of agents, \(\text{Var}\) a set of variables, \(\mathcal{P}\) a set of atomic sentences, \(\Pi\) a set of issues, \(V\) a valuation map, \(g : \text{Var} \rightarrow \mathcal{A}\) an assignment function, and \(\Sigma_{\mathcal{A}}\) a set of state maps \(\Sigma_{\mathcal{A}} : \mathcal{W} \rightarrow \Pi\).

(14) a. An inquisitive state \(\sigma_a(w)\) encodes the issues that are entertained by \(a\) at \(w\).
    b. The information state \(\sigma_a(w)\) is a union of the inquisitive state: \(\sigma_a(w) := \bigcup \Sigma_a(w)\).

(15) A state \(s\) supports (notation: \(\vdash\)) an atomic declarative \(p\) when \(p\) is true in all worlds in \(s\).

(16) \(?p\) is an abbreviation of \(p \lor \neg p\): \((M, g, s) \vdash ?p \iff (M, g, s) \vdash p \lor (M, g, s) \vdash \neg p\).

(17) The proposition expressed by a sentence \(\varphi\): \([\varphi]_{M,g} := \{s \in \mathcal{W} | (g, s) \equiv \varphi\}\).

(18) Two modal operators, \(K\) and \(E\), can embed both declaratives \(L_1\) and interrogatives \(L_2\):
    If \(\varphi \in \mathcal{L}_o\) for \(\varnothing \in \{!, ?\}, a \in \mathcal{A}\), and \(x \in \text{Var}\), then \(K_a \varphi, E_a \varphi, K_x \varphi, E_x \varphi \in \mathcal{L}_1\)

(19) For any declarative \(\alpha\), \(K_\alpha \alpha \equiv E_\alpha \alpha\)

(20) a. \([\varphi(C)]_{M,g,w} = \lambda C.C \cap [\varphi]_{M,g}\)
    b. If defined, \([\varphi]_{M,g,w} = \lambda C.C \cap [\varphi]_{M,g}\)

(24) | Declarative darou \(p\) | Interrogative darou \(?p\) |
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<td>(\downarrow) a. ([K_\varnothing p]<em>{M,g,w} = \lambda C.C \cap [K</em>{\text{SPKR}}p]_{M,g})</td>
<td>b. ([E_\varnothing ?p]<em>{M,g,w} = \lambda C.C \cap [E</em>{\text{SPKR}?p}]_{M,g})</td>
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<td>(\uparrow) c. ([K_\varnothing p]<em>{M,g^{\text{ADDR}/\varnothing},w} = \lambda C.C \cap [K</em>{\text{ADDR}p}]_{M,g^{\text{ADDR}/\varnothing}})</td>
<td>d. ([E_\varnothing ?p]<em>{M,g^{\text{ADDR}/\varnothing},w} = \lambda C.C \cap [E</em>{\text{ADDR}?p}]_{M,g^{\text{ADDR}/\varnothing}})</td>
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