Japanese modalized questions

their prosody and levels of meaning

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Outline

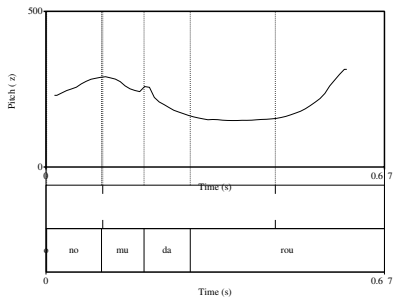
Falling Declaratives: *daroo*↓

- a sentence-final auxiliary that has a modal-flavor.
- *daroo* in a plain declarative → the speaker's bias

(1) John-ga kuru daroo↓
Jonn-NOM come DAROO
'John is coming, I bet.'
'Probably, John is coming.'

Rising Declaratives: *daroo*↑

(2) Yurie-wa wain-o nomu daroo↑
Yurie-TOP wine-ACC drink DAROO
'Yurie drinks wine, right?'

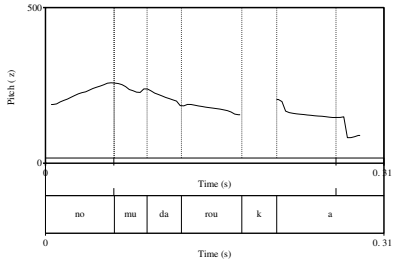


Play rising declarative

Figure: Rising Declarative

Falling Interrogatives: *daroo ka*↓

(3) Yurie-wa wain-o nomu daroo ka↓
Yurie-TOP wine-ACC drink DAROO Q
'I wonder if Yurie drinks wine.'

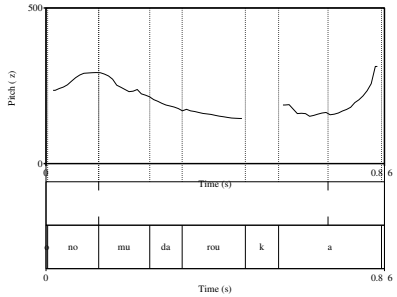


Play falling interrogative

Figure: Falling Interrogative

Rising Interrogatives: *daroo ka*↑

(4) #Yurie-wa wain-o nomu daroo ka↑
Yurie-TOP wine-ACC drink DAROO Q



Play rising interrogative

Figure: Rising Interrogative

Summary

	Falling	Rising
Declarative	*daroo*↓ statement ('I bet')	*daroo*↑ tag/confirmation Q ('... right?')
Interrogative	*daroo ka*↓ self-addressing Q ('I wonder')	*daroo ka*↑ *

Table: Meaning of *daroo* according to sentence type and intonation

Outline

Proposal 1

Daroo is a root-level/expressive entertain modal E_{SPKR} in inquisitive epistemic logic (IEL), which expresses epistemic issues associated to the speaker, SPKR.

Proposal 2

- There are three kinds of question operators in Japanese that take an at-issue declaratives and render it to an interrogative, $C_{[Q]}$, $C_{[Q]}\uparrow$ and $\uparrow$.
- The question feature [Q] is realized by the particle *ka*, the *wh* word in Spec CP or both.

$C_{[Q]}$	morpho-syntactic integrated at-issue interrogativizer
$C_{[Q]}\uparrow$	morpho-syntactically integrated expressive interrogativizer
$\uparrow$	paratactically associated expressive interrogativizer

Outline

Inquisitive epistemic logic (IEL)

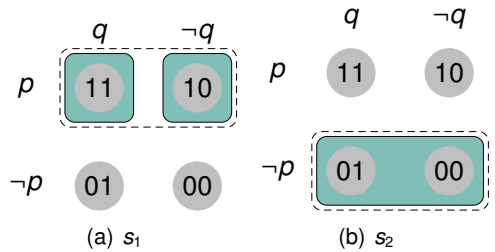
Ciardelli & Roelofsen (2015)

Inquisitive epistemic logic (IEL) can model:

- the information available to a set of agents
- the issues that the agents entertain

(5) a. An information state s is a set of possible worlds ($s \subseteq \mathcal{W}$).
b. An *issue* $I \subseteq \wp(\mathcal{W})$ is a non-empty, downward closed set of information states.

Information and Issue



- At $s_1 = \{w_{11}, w_{10}\}$
  - the agent's issue: $\{\{w_{11}\}, \{w_{10}\}\}$
  - the agent knows that p.
  - the agent is interested in whether q or $\neg q$
- At $s_2 = \{w_{01}, w_{00}\}$
  - the agent's issue: $\{\{w_{01}, w_{00}\}, \{w_{01}\}, \{w_{00}\}\}$
  - the agent knows that $\neg p$
  - the agent doesn't care whether q or $\neg q$

The meanings of a sentence

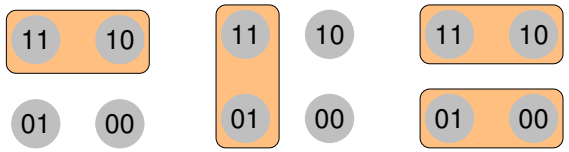
- The meaning of a sentence: a proposition.
- A propositions is also an issue, a downward-closed set of information states.

Definition (Propositions)

$[\![\varphi]\!] := \{s \subseteq \mathcal{W} | s \models \varphi\}$

- Both declaratives and interrogatives denote propositions
- $[\![\varphi]\!] \in D_{\langle\langle s,t\rangle,t\rangle}$
- $[\![\varphi]\!] \in D_T$

Example



(a) p (b) q (c) $?\{p, \neg p\}$

- $[\![p]\!] = \{\{w_{11}, w_{10}\}, \{w_{11}\}, \{w_{10}\}\}$
- $[\![q]\!] = \{\{w_{11}, w_{01}\}, \{w_{11}\}, \{w_{01}\}\}$
- $[\![?\{p, \neg p\}]\!] = \{\{w_{11}, w_{01}\}, \{w_{11}\}, \{w_{10}\}, \{w_{01}, w_{00}\}, \{w_{01}\}, \{w_{00}\}\}$

Question Operator $\langle ? \rangle$

(6) (Possibilities for a sentence φ)
$\textsc{possibility}(\varphi) := \{s | s \models \varphi$ and there is no $t \supset s$ such that $t \models \varphi\}$.

(7) $\langle ? \rangle \varphi := \begin{cases} ?\{\varphi, \neg\varphi\}, & \text{if } |\textsc{possibility}(\varphi)| = 1 \\ \varphi, & \text{if } |\textsc{possibility}(\varphi)| \geq 2 \end{cases}$

Knowledge and Entertain

- There are two modal operators
  Knowledge operator K an agent's information state
  Entertain operator E an agent's inquisitive state
  the issues that the agent entertain.

(8) $[\![\varphi \text{ daroo}]\!] = E_{\text{SPKR}}\varphi$

Example 1: $\langle \mathcal{M}, s \rangle \models K_a p$

Support condition for $K_a\varphi$

$\langle M, s \rangle \models K_a\varphi \iff$ for any $w \in s$, $\langle M, \sigma_a(w) \rangle \models \varphi$

The agent knows that p.

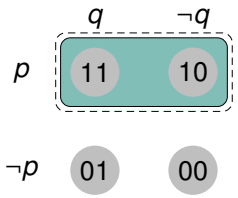


Figure: $\langle \mathcal{M}, s \rangle \models K_a p$

Example 2: $\langle \mathcal{M}, s \rangle \not\models K_a ?p$

The agent doesn't knows the answer to $?p$

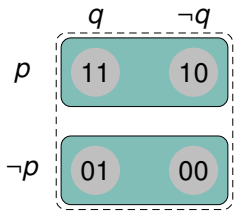


Figure: $\langle \mathcal{M}, s \rangle \not\models K_a ?p$

Example 3: $\langle \mathcal{M}, s \rangle \models E_a ?p$

Support condition for $E_a\varphi$

$\langle M, s \rangle \models E_a\varphi \iff$ for any $w \in s$ and for any $t \in \Sigma_a(w)$, $\langle M, t \rangle \models \varphi$

- The agent entertains an issue $?p$.

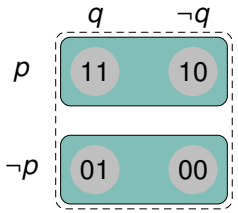


Figure: $\langle \mathcal{M}, s \rangle \models E_a ?p$

Fact

For any declarative α, $K_a\alpha \equiv E_a\alpha$

(Ciardelli & Roelofsen, 2015, 1659)

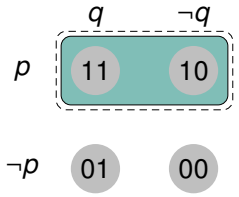


Figure: $\langle \mathcal{M}, s \rangle \models K_a p$, $\langle \mathcal{M}, s \rangle \models E_a p$

Key Points

- Both declaratives and interrogatives denote propositions $[\![\varphi]\!] \in D_T$, where $T = \langle\langle s, t\rangle, t\rangle$
- E can embed both declaraties and interrogatives.
- For any declarative α, $K_a\alpha \equiv E_a\alpha$

Outline

(9) Potts' (2005) CI application

$$\begin{array}{c} \beta : \sigma^a \bullet \alpha(\beta) : \tau^c \\ \alpha : \langle \sigma^a, \tau^c \rangle \quad \beta : \sigma^a \end{array}$$

(10) McCready's (2010) Shunting-type application

$$\begin{array}{c} \alpha(\beta) : \tau^s \\ \alpha : \langle \sigma^a, \tau^s \rangle \quad \beta : \sigma^a \end{array}$$

Question Operators

(11) a. $[\![\mathrm{C}_{[Q]}]\!] \in D_{\langle T^a, T^a \rangle}$
b. $[\![\mathrm{C}_{[Q]}]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(12) a. $[\![\mathrm{C}_{[Q]} \uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\mathrm{C}_{[Q]} \uparrow]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(13) a. $[\![\uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(14) a. $[\![\textbf{daroo}]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\textbf{daroo}]\!] = \lambda\varphi.E_{\mathrm{SPKR}}\varphi$

Outline

(15) $[\![\textbf{daroo}]\!] = \lambda\varphi.E_{\text{SPKR}}\varphi$

(16) Ashita hareru daroo ka. Zenzen wakar-anai.
tomorrow sunny DAROO Q at.all understand-NEG
'I wonder if it will be sunny tomorrow. I have no idea.'

- Fact: For any declarative α, $K_a\alpha \equiv E_a\alpha$

(17) LFs of (falling) *daroo*-sentences

Declarative	α-*daroo* $E_{\text{SPKR}}\alpha \equiv K_{\text{SPKR}}p$
Interrogative	α-*daroo ka* $E_{\text{SPKR}}\langle ? \rangle\alpha$

How do we derive the LF $E_{\text{SPKR}}\langle ? \rangle\alpha$ from α-*daroo ka*?

daroo ka cannot be embedded

(18) Emi-ga igirisu-ni itta nichigainai/kamoshirenai ka douka kiite mita.
Emi-NOM England-DAT went must/may Q or.not to.ask tried
'I asked whether Emi must/may have left for England or not.'

(19) *Emi-ga igirisu-ni itta daroo ka douka kiite mita.
Emi-NOM England-DAT went DAROO Q or.not to.ask tried
Intended: 'I asked whether Emi probably left for England or not.'

Speaker-orientation

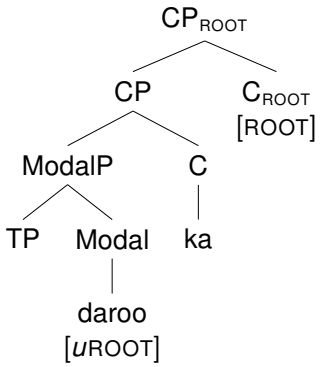
(20) Boku-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
I-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), I took an umbrella with me.'

(21) #John-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
John-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), John took an umbrella with him.'

Surface form

Syntax of *daroo*

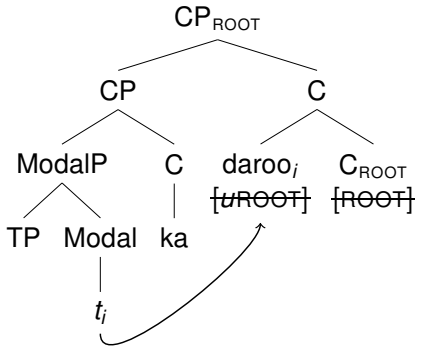
daroo is a root-level expressive operator, which adjoins to C_{ROOT} to check off its uninterpretable feature, [uROOT].



LF

Syntax of *daroo*

daroo is a root-level expressive operator, which adjoins to C_{ROOT} to check off its uninterpretable feature, [uROOT].



(22) LFs of (falling) *daroo*-sentences

Declarative	α-*daroo* $E_{SPKR}\alpha \equiv K_{SPKR}p$
Interrogative	α-*daroo ka* $E_{SPKR}\langle ? \rangle \alpha$

What is the contribution of ↑?

Outline

(23) a. $[\![\mathrm{C}_{[\mathrm{Q}]}]\!] \in D_{\langle T^a, T^a \rangle}$
b. $[\![\mathrm{C}_{[\mathrm{Q}]}]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(24) a. $[\![\mathrm{C}_{[\mathrm{Q}]} \uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\mathrm{C}_{[\mathrm{Q}]} \uparrow]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(25) a. $[\![\uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\langle ? \rangle\varphi$

(26) Syntactic rules of paratactic association

a. Paratactic Association

$$\begin{array}{c} \mathrm{C}_{\mathrm{ROOT}} \\ | \\ \alpha \otimes \beta \end{array}$$

b. Paratactic Association with a null head

$$\begin{array}{c} \mathrm{C}_{\mathrm{ROOT}} \\ | \\ \varnothing \otimes \beta \end{array} \quad \rightarrow \quad \begin{array}{c} \mathrm{C}_{\mathrm{ROOT}} \\ | \\ \beta \end{array}$$

Composition Rule

(27) Paratactic Association (R10)

$$\lambda\chi.\alpha(\chi) \blacklozenge \beta(\chi) : \langle \sigma, \tau \times \tau \rangle$$

$$\lambda\chi.\alpha(\chi) : \langle \sigma, \tau \rangle \quad \lambda\chi.\beta(\chi) : \langle \sigma, \tau \rangle$$

(28) Example: *daroo*$\otimes \uparrow$

$$\begin{array}{c} \mathrm{C}_{\mathrm{ROOT}} \\ | \\ \text{daroo} \otimes \uparrow \end{array} \qquad \begin{array}{c} \lambda\varphi.E_{\mathrm{SPKR}}\varphi \blacklozenge \langle ? \rangle\varphi : \langle T^a, T^s \times T^s \rangle \\ \lambda\varphi.E_{\mathrm{SPKR}}\varphi : \langle T^a, T^s \rangle \quad \lambda\varphi.\langle ? \rangle\varphi : \langle T^a, T^s \rangle \end{array}$$

Falling (non-rising) interrogative

(29) Marie-wa wain-o nomu ka.
Marie-TOP wine-ACC drink Q
'whether Marie drink wine'

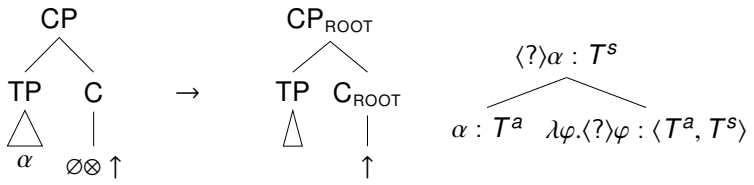
(30)

$$\begin{array}{c} \mathrm{CP} \\ \mathrm{TP} \quad \mathrm{C} \\ \triangle \quad | \\ \alpha \quad \mathrm{ka} \end{array} \qquad \begin{array}{c} \langle ? \rangle\alpha : T^a \\ \alpha : T^a \quad \lambda\varphi.\langle ? \rangle\varphi : \langle T^a, T^a \rangle \end{array}$$

Rising declarative

(31) Marie-wa wain-o nomu↑
Marie-TOP wine-ACC drink
'Does Marie drink wine?'

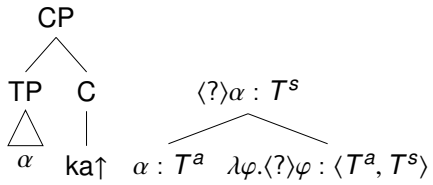
(32)



Rising interrogative

(33) Marie-wa wain-o nomu ka↑
Marie-TOP wine-ACC drink
'Does Marie drink wine?'

(34)



At-issue and expressive

(35) a. Marie-ga wain-o nomu ka Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q Takeshi-TOP know
'Takeshi knows whether Marie drinks wine.'

b. *Marie-ga wain-o nomu ↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink ↑ Takeshi-TOP know
'Takeshi knows Marie drinks wine↑.'

c. *Marie-ga wain-o nomu ka↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q↑ Takeshi-TOP know
'Takeshi knows whether Marie drinks wine↑.'

English rising declaratives

(36) Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters. Robin says to the newcomer:

a. Is it raining?
b. #It's raining↑ (Gunlogson, 2003, 95)

(37) Robin is sitting, as before, in a windowless computer room when another person enters. The newcomer is wearing a wet raincoat and boots. Robin says:

a. Is it raining?
b. It's raining↑ (Gunlogson, 2003, 96)

English rising declaratives are deviant assertions.

Japanese rising declaratives

(38) Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters. Robin says to the newcomer:

a. Ame-futte masu ka↑ 'Is it raining?'
b. Ame-futte masu↑ 'Is it raining?'

(39) Robin is sitting, as before, in a windowless computer room when another person enters. The newcomer is wearing a wet raincoat and boots. Robin says:

a. Ame-futte masu ka↑ 'Is it raining?'
b. Ame-futte masu↑ 'Is it raining?

- $\alpha\uparrow$ and α-*ka*↑ have the same semantics $\langle ? \rangle \alpha$.
- Japanese Final Rise ↑ is an interrogative operator.

(40)

	Falling	Rising
Declarative	α $\alpha : T^a$	$\alpha\uparrow$ $\langle ? \rangle \alpha : T^s$
Interrogative	α-*ka* $\langle ? \rangle \alpha : T^a$	α-*ka*↑ $\langle ? \rangle \alpha : T^s$

Outline

Proposals

Semantics of *daroo*

- $[\![\textbf{daroo}]\!] \in D_{\langle T^a, T^s \rangle}$
- $[\![\varphi\ \textbf{daroo}]\!] = E_{\text{SPKR}}\varphi$

Semantics of interrogative operators

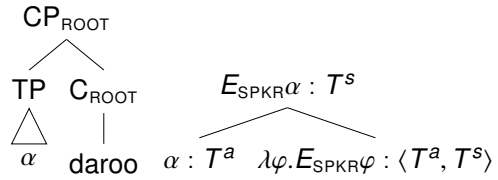
(41) a. $[\![\text{C}_{[\text{Q}]}]\!] \in D_{\langle T^a, T^a \rangle}$
b. $[\![\text{C}_{[\text{Q}]}]\!] = \lambda\varphi.?\varphi$

(42) a. $[\![\text{C}_{[\text{Q}]}\uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\text{C}_{[\text{Q}]}\uparrow]\!] = \lambda\varphi.?\varphi$

(43) a. $[\![\uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.?\varphi$

Falling *daroo*-declarative

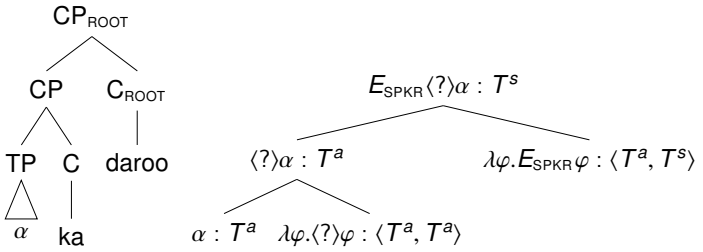
(44) Marie-wa wain-o nomu daroo↓
Marie-TOP wine-acc drink DAROO
'Marie drinks wine, I bet./Probably, Marie drinks wine.'



$E_{\text{SPKR}}\alpha = K_{\text{SPKR}}\alpha$

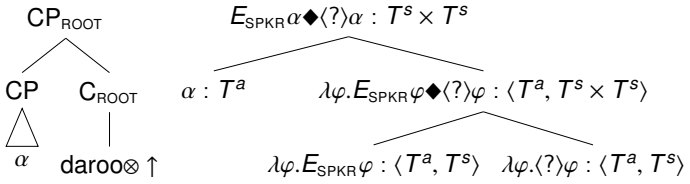
Falling *daroo*-interrogative

(45) Marie-wa wain-o nomu daroo ka↓
Marie-TOP wine-ACC drink DAROO Q
'I wonder if Marie drinks wine.'



Rising *daroo*-declarative

(46) Marie-wa wain-o nomu daroo↑
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, right?'

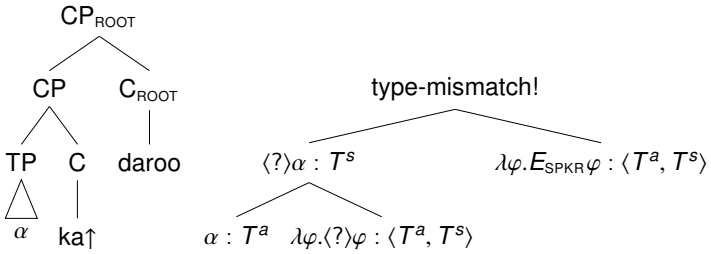


Combined Speech Acts

- $E_{\text{SPKR}}\alpha = K_{\text{SPKR}}\alpha$
- $\langle ? \rangle \alpha$

Rising *daroo*-interrogative

(47) *Marie-wa wain-o nomu daroo ka↑
Marie-TOP wine-ACC drink DAROO Q



Summary

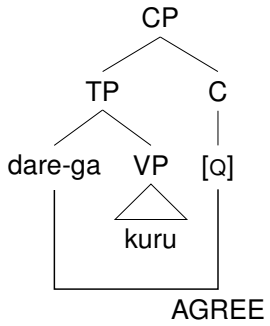
	Falling	Rising
Declarative	α-*daroo*↓ $K_{\text{SPKR}}\alpha : T^s$	α-*daroo*↑ $K_{\text{SPKR}}\alpha\blacklozenge\langle ? \rangle\alpha : T^s \times T^s$
Polar Interrogative	α-*daroo ka*↓ $E_{\text{SPKR}}\langle ? \rangle\alpha : T^s$	$^*\alpha$-*daroo ka*↑ Type-mismatch

Outline

wh-questions

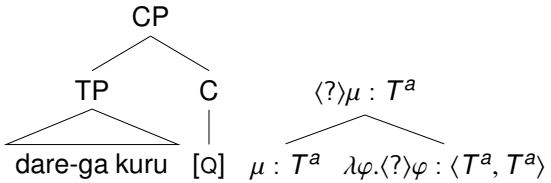
(48) Dare-ga kuru (ka)?
who-nom come Q
'Who is coming?'

(49)



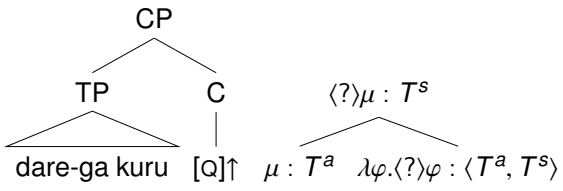
falling wh-questions

(50) a. $[\![\text{Dare-ga kuru}]\!] \in D_{\langle\langle s,t\rangle,t\rangle}$
b. $[\![\text{Dare-ga kuru}]\!] =$
$\{p | \exists x \in D.x \text{ is human} \& p = |x \text{ is coming}|\} = [\![\mu]\!]$



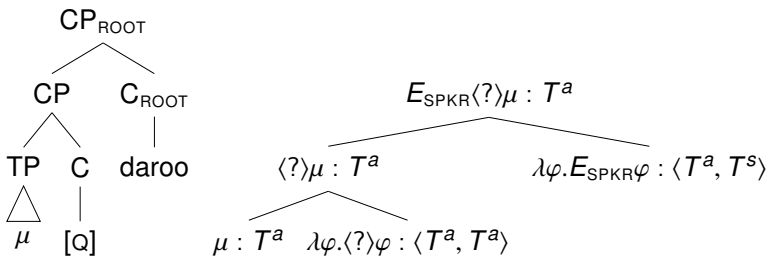
rising wh-questions

(51) Dare-ga kuru (ka)↑
who-NOM come Q
'Who is coming?'



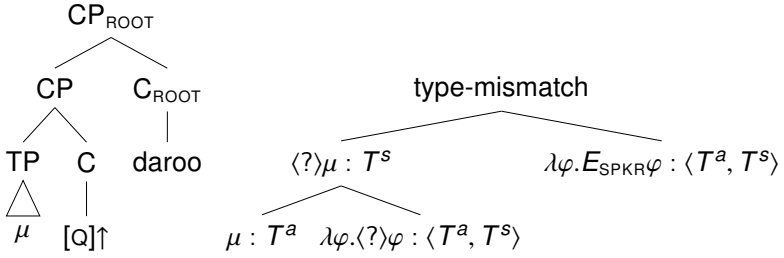
falling wh-questions with *daroo*

(52) Dare-ga kuru daroo (ka)↓
who-NOM come daroo Q
'I wonder who is coming.'



rising wh-questions with *daroo*

(53) *Dare-ga kuru daroo (ka)↑
who-NOM come daroo Q



Summary

	Falling	Rising
Declarative	α-*daroo*↓ $K_{SPKR}\alpha : T^s$	α-*daroo*↑ $K_{SPKR}\alpha \blacklozenge \langle ? \rangle \alpha : T^s \times T^s$
Polar Interrogative	α-*daroo ka*↓ $E_{SPKR}\langle ? \rangle \alpha : T^s$	$^*\alpha$-*daroo ka*↑ Type-mismatch
Wh-interrogative	μ-*daroo (ka)*↓ $E_{SPKR}\langle ? \rangle \mu : T^s$	$^*\mu$-*daroo (ka)*↑ Type-mismatch

Concluding Remarks

- *daroo* is a root-level modal
  → moves to C_{ROOT}
- *daroo* can embed both declaratives and interrogatives
  daroo as entertain modal in IEL
  declarative $E_{SPKR}\alpha \equiv K_{SPKR}\alpha$
  interrogative $E_{SPKR}\mu$

- α-*daroo*, α-*ka*↑ and α↑ are not embeddable
  → they are expressives.
- Final Rise ↑ is a prosodic morpheme that is paratactically associated to the sentence.
  → yield a pair of speech acts, $K_{SPKR}\alpha\blacklozenge\langle ? \rangle\alpha$ for α-*daroo*↑

Daroo ka↑

The interplay of deictic modality, sentence type, prosody and tier of meaning

Acknowledgement

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References I

Ciardelli, Ivano A. & Floris Roelofsen. 2015. Inquisitive dynamic epistemic logic. *Synthese* 192(6). 1643–1687.

Gunlogson, Christine. 2003. *True to Form: Rising and Falling Declaratives as Questions in English*. New York: Routledge.

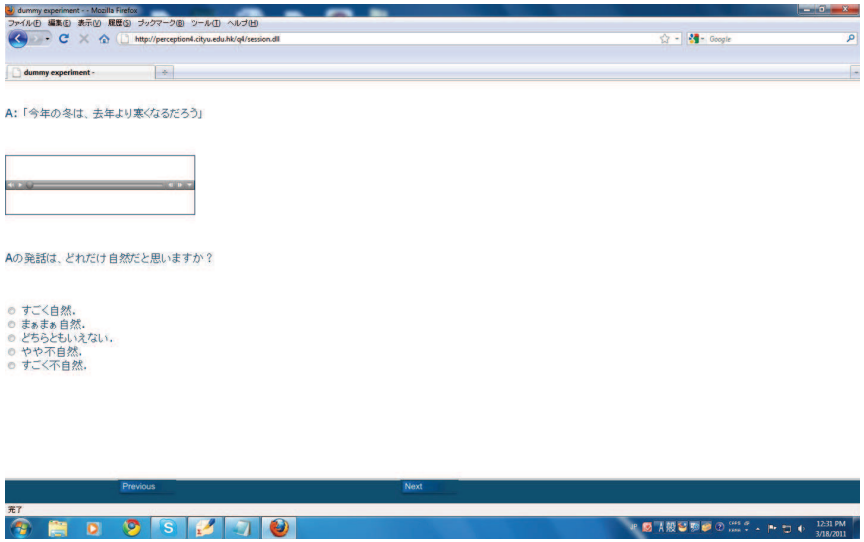
Hara, Yurie. 2006. *Japanese Discourse Items at Interfaces*. Newark, DE: University of Delaware dissertation.

McCready, E. 2010. Varieties of conventional implicature. *Semantics and Pragmatics* 3(8). 1–57. doi:10.3765/sp.3.8.

Potts, Christopher. 2005. *The Logic of Conventional Implicatures* Oxford Studies in Theoretical Linguistics. Oxford: Oxford University Press. [Revised 2003 UC Santa Cruz PhD thesis].

Outline

Experiment I



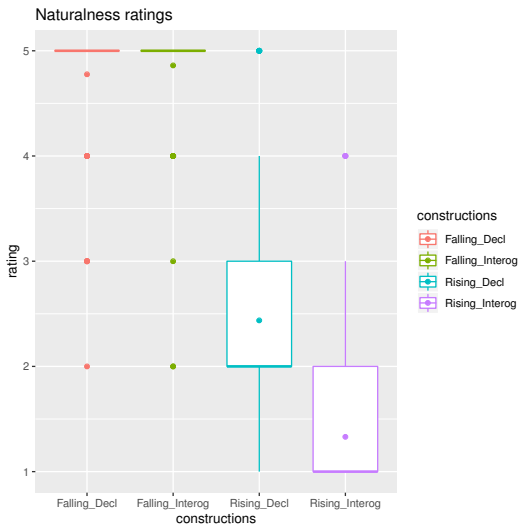
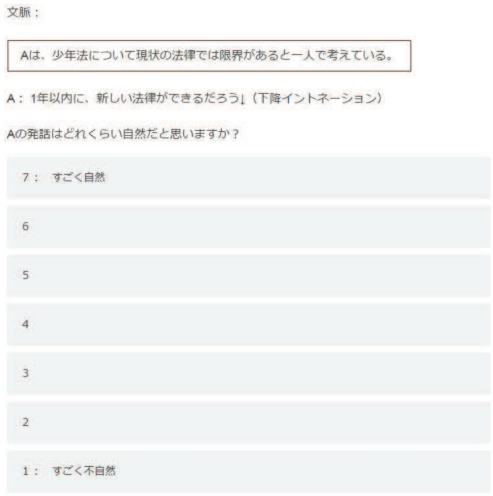


Figure: Average Naturalness Ratings of Experiment I

Experiment II



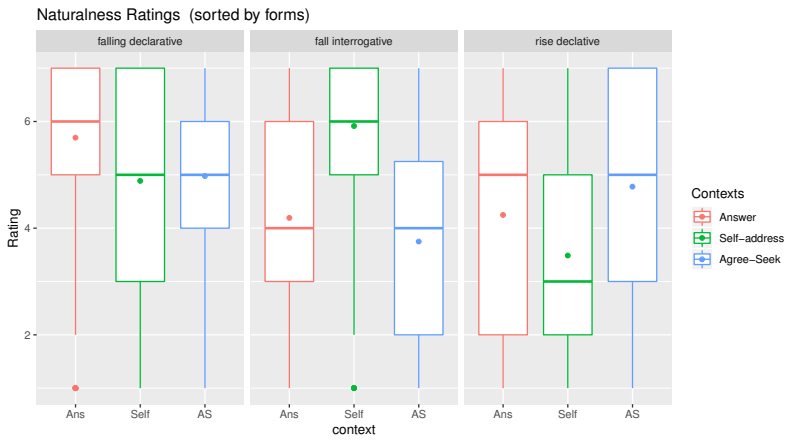


Figure: Average Naturalness Ratings of Experiment II

Outline

Uegaki and Roelfsen (2018)

(54) a. $[\![\varphi \text{ daroo}]\!] = [\![\langle ? \rangle ! \varphi]\!]$
b. $[\![\varphi \text{ daroo}]\!]^{\bullet} = [\![E_{\text{SPKR}}\varphi]\!] \cap [\![\varphi]\!]^{\bullet}$

(55) a. $[\![\varphi \downarrow]\!] = [\![!\varphi]\!]$
b. $[\![\varphi \downarrow]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

(56) a. $[\![\varphi \uparrow]\!] = [\![\langle ? \rangle \varphi]\!]$
b. $[\![\varphi \uparrow]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

(57) a. $[\![\varphi \text{ ka}]\!] = [\![\langle ? \rangle \varphi]\!]$
b. $[\![\varphi \text{ ka}]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

(58) U&R's Interpretations of *daroo*-sentences

	Falling	Rising
Declarative	α-*daroo*$\downarrow$	α-*daroo*$\uparrow$
at-issue	$!\langle ? \rangle \alpha$	$\langle ? \rangle \langle ? \rangle \alpha$
non-at-issue	$K_{\text{SPKR}}\alpha$	$K_{\text{SPKR}}\alpha$
Polar Interrogative	α-*daroo ka*$\downarrow$	$^{*}\alpha$-*daroo ka*$\uparrow$
at-issue	$!\langle ? \rangle !\langle ? \rangle \alpha$	$\cancel{\langle ? \rangle \langle ? \rangle !\langle ? \rangle \alpha}$
non-at-issue	$E_{\text{SPKR}}\langle ? \rangle \alpha$	$\cancel{E_{\text{SPKR}}\langle ? \rangle \alpha}$
Wh-interrogative	μ-*daroo (ka)*$\downarrow$	$^{*}\mu$-*daroo (ka)*$\uparrow$
at-issue	$!\langle ? \rangle !\mu$	$\cancel{\langle ? \rangle \langle ? \rangle !\mu}$
non-at-issue	$E_{\text{SPKR}}\mu$	$\cancel{E_{\text{SPKR}}\mu}$

(59) U&R's interpretations of sentences without *daroo*

	Falling	Rising
Declarative	$\alpha \downarrow$	$\alpha \uparrow$
at-issue non-at-issue	$!\alpha$ $[\![\alpha]\!]^{\bullet}$	$\langle ? \rangle \alpha$ $[\![\alpha]\!]^{\bullet}$
Interrogative	α-*ka*$\downarrow$	α-*ka*$\uparrow$
at-issue non-at-issue	$!\langle ? \rangle \alpha$ $[\![\alpha]\!]^{\bullet}$	$\langle ? \rangle \langle ? \rangle \alpha$ $[\![\alpha]\!]^{\bullet}$

Outline

- Speaker → Subject of the attitude predicate

(60) a. Mary-wa John-ga kuru daroo to omot-teiru.
Mary-TOP John-NOM come DAROO COMP think-PROG
'Mary thinks that probably, John will come.'

b. Boku-wa sou-wa omow-anai-kedo.
I-TOP so-TOP think-NEG-though
'I don't think so (that he will come), though.' (Hara, 2006, 128-129)