Abstract. The aim of this paper is to provide formalization of Japanese sentence-final particles in the framework of Combinatory Categorial Grammar (CCG) (Steedman 1996, 2000, Szabolcsi 1987). While certain amount of literature has discussed the descriptive meaning of Japanese sentence-final particles (Takubo and Kinsui 1997, Chino 2001), little formal account has been provided except for McCready (2007)’s analysis from the viewpoint of dynamic semantics and relevance theory. I analyze particles such as yo and ne as verum focus operators (Höhle 1992, Romero and Han 2004).

Keywords: verum focus, questions, focus semantic value

1 Research Questions

The questions to be addressed in this paper are:

– What are the lexical categories and meaning of Japanese sentence-final particles?
– Is subcategorization, e.g., $S_{FOC}$, $S_Q$, the right way to go?
– Should semantics of questions and focus be reflected in types and categories (Hamblin 1973, Rooth 1996)? What about direct compositionality (Barker and Jacobson 2007)?

Section 3 answers the first question and provides lexical entries in CCG for Japanese sentence-final particles, which has not be discussed much so far (Steedman 1996, 2000). Regarding the second question, the subcategorization adopted in the literature as in Steedman (2000) is introduced in the following section 2. Even though the categories given in section 3 use subcategorization, the semantics avoids any subcategories and reflect the theories on questions and focus in Hamblin (1973) and Rooth (1985, 1992), which leads to the third question discussed in section 4.

2 Steedman (2000): Prosodically Annotated Categories

In CCG, a transitive verb eat would have a following lexical category, which is a function from a noun phrase (NP) to another function from NP to a sentence (S).

(1) $ate := (NP\ S)/NP: ate'$

Steedman (2000,112) further uses prosodically annotated categories and defines the category INFORMATION for theme and rhyme values of focused elements.

(2) a. theme:

\[
ate := (NP_\theta\ S_\theta)/NP_\theta: *ate' \\
L+H^*
\]
b. rheme:
\[
\text{ate} := (\text{NP}_p \setminus S_p)/\text{NP}_p \vdash \text{ate'}
\]

In this framework, categories without these features as in (1) are unspecified as to the value of the feature INFORMATION so that they can combine with any of the specified categories and return the same unspecified value.

Following such pattern, the categories for Japanese sentence-final particles given in the following section also uses subcategorized categories such as $S_Q$ and $S_{FOC}$. The semantics, however, attempts to account for the meaning of questions and focus.

3 Categories of Sentence-final Particles in Japanese

3.1 Syntactic Behavior

Given that Japanese is a SOV language, sentence-final particles may attach either to a verb as in (3), a modal in (4) or a tense marker in (5) which fall in the end of sentences. These particles are generally ungrammatical elsewhere, except for *ne and *na which may attach to case markers as well as shown in (4d).

These particles often convey subtle nuances although many appear to be question or exclamative markers which turn the sentences into questions or exclamatives.

(3) a. So-da-yo.
   so-be-PAR
   “That’s right, isn’t it?”

b. *So-yo-da.
   so-PAR-be
   “That’s right, isn’t it?”

c. *Yo-so-da.
   PAR-so-be
   “That’s right, isn’t it?”

(4) a. Ken-ga hanashi-ta-rashii-ne.
   Ken-NOM speak-PAST-EVI-PAR
   “It seems Ken has spoken, hasn’t he?”

b. *Ken-ga hanashi-ta-ne-rashii.
   Ken-NOM speak-PAST-EVI
   “It seems Ken has spoken, hasn’t he?”

c. *Ken-ga hanashi-ne-ta-rashii.
   Ken-NOM speak-PAR-PAST-EVI
   “It seems Ken has spoken, hasn’t he?”

d. Ken-ga-ne hanashi-ta-rashii.
   Ken-NOM-PAR speak-PAST-EVI
   “It seems Ken has spoken, hasn’t he?”

(5) a. O-namae-wa nan-deshi-tak-ke.
   HON-name-TOP what-HON-PAST-PAR
   “What was your name?”

b. *O-namae-wa nan-deshi-ke-ta.
   HON-name-TOP what-HON-PAR-PAST
   “What was your name?”
c. *O-namae-wa nan-ke-deshi-ta.
   HON-name-TOP what-PAR-HON-PAST
   “What was your name?”

d. *O-namae-wa-ke nan-deshi-ta.
   HON-name-TOP what-HON-PAST
   “What was your name?”

3.2 Meaning of Sentence-final Particles

While Takubo and Kinsui (1997) provide descriptive meaning of sentence-final particles, there has not been much formal descriptions of these sentence-final particles so far in my knowledge. The literature from the pedagogical viewpoint, such as Chino (2001), lists Japanese sentence-final particles such as no, ne, yo, na, ke, mono, and others and describe their meanings. Only McCready (2007) presents an analysis from the viewpoint of dynamic semantics and relevance theory.

In harmony with their syntactic position as sentence-final particles, semantically speaking, all Japanese sentence-final particles, in common, take the entire proposition in its scope. The sentence-final particles take a proposition as the argument and returns a set of propositions. Below I define them as functions from a proposition to another proposition.

1. no: a question marker or a polarity focus operator (Höhle 1992, Romero and Han 2004).
   \[ S\mid S_Q: \lambda S_{<st>}\cdot \lambda \mathcal{T}_{<st>}, \mathcal{\varphi}_{<st,t>}(\mathcal{T}_{<st>}) \]

2. ne: a tag question marker
   \[ S\mid S_Q: \lambda S. \lambda \mathcal{T}. \mathcal{\varphi}(\mathcal{T}) \]

3. yo: a polarity focus marker
   \[ S\mid S_{FOC}: \lambda S. \lambda \mathcal{T}. \mathcal{\varphi}(\mathcal{T}) \]

4. na: a question marker or an exclamative marker
   \[ S\mid S_Q: \quad S\mid S_{FOC}: \quad \lambda S. \lambda \mathcal{T}. \mathcal{\varphi}(\mathcal{T}) \]

5. ke: a question marker
   \[ S\mid S_Q: \quad \lambda S. \lambda \mathcal{T}. \mathcal{\varphi}(\mathcal{T}) \]

6. kashira: a question marker
   \[ S\mid S_Q: \quad \lambda S. \lambda \mathcal{T}. \mathcal{\varphi}(\mathcal{T}) \]

3.2.1 No No can be either a question marker or a polarity (verum) focus marker such as really or indeed in English, with which the speaker assures the affirmative answer (Höhle 1992, Romero and Han 2004).

(6) a. Nani-o shi-teru-no?
   what-ACC do-PROG-Q
   “What are you doing?”

b. Hon-o yon-deru-no.
   book-ACC read-PROG-FOC
   “I am reading a book.”
3.2.2 **Yo** Kinsui (1993) defines two usages of *yo* as the following:

1. **Kyoji** (teaching/notifying):
   A, hankachi-ga ochi-mashi-ta-yo.
   "Oh, you have dropped your handkerchief."

2. **Chui** (alerting):
   Omae-wa jukensei-da-yo. Terebi-o keshite benkyo-shi-nasai.
   "You are preparing for an entrance exam. Turn off the TV and study."

   I would like to point out that, in both usages, *yo* strengthens affirmativeness of the proposition so that the addition of *yo* informs the addressee what he has not known.

   (9) a. Notifying *yo*:
   ~Past(Believe(p)(s)) ∧ Now(Believe(p)(s))

   b. Alerting *yo*:
   Past(Believe(p)(s)) ∧ Now(Believe(p)(s))

   (10) *yo*: $S \backslash S_{FOC}$:
   $\lambda S.\lambda T.\mathcal{P}(T)$

3.2.3 **Na** *Na* can be either an exclamative marker or a question marker.

   **Exclamative:**
   (11) Sugoi ie-da-na.
   "What a gorgeous house!"

   **Question:**
   (12) Muri-ka-na.
   "Will it be impossible?"
Chino (2001) observes that some kind of *no* softens the effect of an assertion.

(13) 8-ji-kara 11-ji-da-na.
     8-o’clock-from 11-o’clock-be-PAR
     “From eight o’clock to 11 o’clock.”

(BCCWJ 2009, oc sentence ID 64)

### 4 Categories of Questions and Focused Sentences

There exists a mismatch between syntactic categories and semantics of Japanese sentence-final particles. Semantically speaking, these particles are functions from a proposition to a set of propositions. For example, *no* as a question marker is a function from a proposition to a set of possible answers in a given context (Hamblin 1973). The meaning of (14a) is a set of propositions as in (14b).

(14) a. Arisu-o mi-ta-no.
    Alice-ACC watch-PAST-PAR
    “Did you see Alice?”

b. \[ \{ \text{Did you see Alice?} \} = \{ \text{you saw Alice, you did not see Alice} \} \]

Since a proposition is a set of possible worlds which is of type \( <s,t> \), the set of possible answers is a set of sets of possible worlds, namely, type \( <st,t> \).

However, syntactically speaking, sentence-final particles are functions from a sentence to a question or a focused sentence. Therefore, their categories remain \( S \setminus S_Q \) or \( S \setminus S_{foc} \) and cannot be \( S \setminus (S \setminus S) \) which seems to reflect their semantics better.

The hypothesis of direct compositionality assumes that the syntax and the semantics work together in tandem. Every expression that is computed in syntax has meaning (Jacobson 2002, Barker and Jacobson 2007). Direct compositionality advocates a rule-to-rule view–each syntactic rule is a semantic rule specifying how the meaning of the larger expression is derived from the meanings of the smaller expressions.

Our dilemma is that the semantic type of sentence-final particles \( <st,<st,t>> \) more straightforwardly correspond to type \( S \setminus (S \setminus S) \) rather than \( S \setminus S_Q \) or \( S \setminus S_{foc} \) even though there is no syntactic composition with two sentences.

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