Definiteness Theory of Distributivity: Non-local Floating Quantifiers

Overview While the status of floating quantifiers is controversial, some of them are argued to be adverbial. In this paper, I focus on one of such cases: non-local floating numeral quantifiers (FNQ) in Japanese. Those adverbial FNQs always induce distributive readings and require a unique mapping from the participants of events to individuals. I propose that they involve *definiteness over mapping* from events to individuals: distributivity follows from its maximality and unique mapping follows from its uniqueness presupposition.

Data Japanese allows numeral quantifiers (numeral+classifier) to float before the object as in (2).

(1)san-nin-no kodomo-ga hon-o ka-tta.
3-CL_{Person}-no child-Nom book-Acc buy-Past
"Three students bought a book."

(2)**kodomo**-ga san-nin hon-o ka-tta.
child-Nom 3-CL_{Person} book-Acc buy-Past
"Three students bought a book."

Movement analyses impose a locality condition on the distribution of FNQs. Miyagawa (1989), for example, proposes that FNQs (underlined) and their hosts (**boldfaced**) must c-command each other. It precludes FNQs in the following environments.

(3)***kodomo**-ga hon-o san-nin ka-tta.
child-Nom book-Acc 3-CL_{Person} buy-Past
"Three children bought a book (each)."
(4)*sono-sensei-ga [**kodomo**-no huku]-o sanjuu-nin ka-tta. (NP-internal)
that-teacher-Nom [child-Gen cloth]-Acc 30-CL_{Person} buy-Past
"The teacher bought clothes of thirty children (each)."
(5)*Maki-ga omiyage-o [**tomodachi**-kara] san-nin mora-tta. (adjunct PP)
Maki-Nom souvenir-Acc [friend-from] 3-CL_{Person} get-Past
"Maki got souvenirs from three friends of her (each)."

However, later works found some counterexamples for this locality generalisation.

(6)**gakusei**-ga naihu-de koremade-ni huta-ri te-o kegasi-ta.
student-Nom knife-with so_far-at 2-CL_{Person} hand-Acc injure-Past
"So far, (each of the) two students injured their hands with the knife." (Fukushima 1991)
(7)ano-isya-ga [**jidoo**-no me]-o sanjuu-nin shirabe-ta. (NP-internal)
that-doctor-Nom [pupil-Gen eye]-Acc 30-CL_{Person} examine-Past
"That doctor examined (each of the) thirty pupil's eyes." (Kikuchi 1994)
(8)gantan-ni, [**osiego**-kara] go-nin nengajoo-o mora-tta. (adjunct PP)
New_year's_day-on [my_student-from] 5-CL_{Person} postcard-Acc receive-Past
"(I) received a card from (each of the) five students of mine on New Year's Day." (Takami 2001)

Ishii (1999) proposes a hybrid analysis: if an FNQ occurs non-locally, it is adverbial and induces a distributive reading. To show this, he uses Kitagawa and Kuroda's (1992) test: distributive readings disallow non-durative temporal modifiers. Non-local FNQs cannot occur with non-durative temporal modifiers (*italicised*), e.g., "ima soko-de" (now, there), while local FNQs allow them.

(9)Non-local FNQ: a distributive reading only (Ishii 1999)
?*Hora, *ima soko-de*, isya-ga [**jidoo**-no me]-o sanjuu-nin shirabe-te-imasuyo.
See, now there-at, doctor-Nom [pupil-Gen eye]-Acc 30-CL_{Person} examine-Prog-Pres
"Hey, now a doctor is examining thirty pupil's eyes there."
(10)Local FNQ: a non-distributive is available (Kitagawa and Kuroda 1992)
Sono-toki tostuzen, **shuujin**-ga san-nin abaredashi-ta.
That-time suddenly, prisoner-Nom 3-CL_{Person} start_to_act_violently-Past
"Then, a group of three prisoners suddenly started acting violently."

Nakanishi (2008) proposes a compositional analysis of adverbial FNQs: they measure events and requires one-to-one correspondence between events and individuals. However, if FNQs can be adverbial, why are (3-5) unacceptable, unlike (5-6)? These analyses nicely explain distributive

readings of adverbial FNQs, but the difference between (3-5) and (6-7) is not yet explained.

Unique Mapping The crucial difference between (3-5) and (6-8) is that only the latter three have a context in which the participants of events and individuals are in one-to-one correspondence. In (6)-(7) the participants are hands and eyes, which are inalienable possessees. In (8), the participants are New Year's postcards and, conventionally, these are sent just once per person in a year. So, these have a unique mapping from the participants of events to some individuals. Adopting Neo-Davidsonian event semantics (Parsons 1990, Schein 1993), thematic relations, e.g., Agent (e, x), provide event-to-participant mappings. Now, there are two functions: a thematic relation and contextually given function from the participants of events to individuals. The composite function of these two is a unique mapping from events to individuals. This is summarised in (11), in which $e_{1,\ldots n}$ are events, $x_{1,\ldots,n}$ are their participants and $y_{1,\ldots n}$ are corresponding individuals. For example, in (8), $e_{1,\ldots n}$ are receiving events, $x_{1,\ldots,n}$ are postcard and $y_{1,\ldots n}$ are the writers of the postcards.

(11)a. Function from events to their participants (thematic role): $\{\langle e_1, x_1\rangle, \langle e_2, x_2\rangle,\ldots,\langle e_n, x_n\rangle\}$
b. Function from participants to individuals (contextual) : $\{\langle x_1, y_1\rangle, \langle x_2, y_2\rangle,\ldots,\langle x_n, y_n\rangle\}$
c. Function from events to individuals (composite function): $\{\langle e_1, y_1\rangle, \langle e_2, y_2\rangle,\ldots,\langle e_n, y_n\rangle\}$

However, in (3-5), mapping from the participants of events to individuals is arbitrary and non-unique, e.g., nothing guarantees a one-to-one mapping from clothes to their owners. So, the composite function (11c) is not given. This is the difference between (3-5) and (6-8).

Definite Mapping I propose that adverbial FNQs involve *definite mapping*. I borrow Cable's (2014) *binary maximality operator* to define a binary maximality operator for mapping M as in (12).

(12)Binary maximality operator for mapping M from a domain D
a. Pair addition: $\langle x_1, x_2\rangle+\langle y_1, y_2\rangle =_{df} \langle x_1+y_1, x_2+y_2\rangle$
b. $[\sigma_{\langle ve\rangle}\text{: M}](e) = x$ such that $\langle e, x\rangle \in {}^*\{\langle e, x\rangle\text{: M}(e) = x)\}$, $\exists e', y\ [e' \in \text{D} \ \&\ e' \sqsubset e \ \&\ y \sqsubset x]$ and $\forall e'', z\ [[e'' \sqsubseteq e \ \&\ z \sqsubseteq x] \rightarrow \langle e'', z\rangle \in {}^*\{\langle e, x\rangle\text{: M}(e) = x)\}]$

Maximal mapping picks up the maximal set of pairs which is closed under pair addition. Then, I define μ as a definiteness operator over mapping as in (13).

(13)$[[\mu]] = \lambda S_{\langle vt\rangle}\ \lambda K_{\langle dt\rangle}\text{: } \exists M\ \forall F\ [K(F(e)) \leftrightarrow F=M].\ \lambda e\ [S(e) \ \&\ K([\sigma_{\langle ve\rangle}.M](e))]$

It takes a verbal predicate (S-term) and an FNQ (K-term). The denotation of the VP "go-nin moratta" (5-CL_{Person} receive) in (8) is given in (14a). The content of the maximal mapping is given in (14b).

(14)a. $\lambda e\text{: } \exists M\ \forall F\ [K(F(e)) \leftrightarrow F=M].\ \exists x\ [\text{receive}^*(e, x) \ \&\ \text{postcard}^*(x) \ \&\ \text{5-Person}([\sigma_{\langle ve\rangle}.M](e))]$
b. $[\sigma_{\langle ed\rangle}.M] = \{\langle e_1, y_1\rangle, \langle e_2, y_2\rangle,\ldots,\langle e_n, y_n\rangle, \langle e_1+e_2, y_1+y_2\rangle,\ldots, \langle e_1+\ldots+e_n, y_1+\ldots+y_n\rangle\}$

$[\sigma_{\langle ed\rangle}.M]$ denotes a maximal pair of plural events and plural individuals, which is sub-divisible into pairs of an atomic event and an atomic individual. This mapping is obtained via composite function: mapping from events to postcards are given via [receive* (e, x)] and mapping from postcards to individuals are given via the convention of New Year's postcards. Thus, the uniqueness presupposition of M is satisfied in (14a). However, this is not the case with (3-5): there is no given mapping from the participants of events to individuals and these result in presupposition failure.

Conclusion I discussed non-local FNQs in Japanese. While these suggest that at least some FNQs are adverbial, the existing compositional analyses cannot fully explain the condition for non-local floating. I proposed that adverbial FNQs involve definiteness over mapping. It explains why adverbial FNQs require distributive readings and unique mapping from the participants of events to certain individuals. As a bonus, it opens a possibility of reducing distributivity to definiteness.

Selected References [1] Miyagawa, S. 1989. *Structure and case marking in Japanese* [2] Ishii, Yasuo. 1999. "A note on floating quantifiers in Japanese." [3] Nakanishi, K. 2008. *Formal Properties of Measurement Constructions* [4] Cable, S. 2014. "Distributive numerals and distance distributivity in Tlingit (and beyond)"