Functional indefinites: Skolemization As Alienable Possession

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Introduction

- Indefinites can scope out of islands (Fodor & Sag, 1982), as shown in (1).

(1) Each teacher overheard the rumor that a student of mine had been called before the dean.
'There is a student of mine, say Mary, and each teacher overheard the rumor that Mary was called before the dean.' ✓ a student ≫ if

- This unique scopal property of indefinites led to approaches that take indefinites as inherently different from generalized quantifiers (Abusch, 1993; Reinhart, 1997; Winter, 1997; Brasoveanu & Farkas, 2011; Charlow, 2014, 2020).

- A successful in-situ account of island-free scope of indefinites, within static semantics, takes indefinites to denote choice functions (Reinhart, 1997; Winter, 1997; Kratzer, 1998; Matthewson, 1999).
- A *choice function* is a function that maps any non-empty set onto an element of that set.
- It is a function of type $\langle \langle$e,t$\rangle$, e$\rangle$ that applies to the property denoted by the nominal predicate of type $\langle$e,t$\rangle$ and returns an individual of type e that has that property.
- A *skolemized choice function* is a function of type $\langle e, \langle \langle$e,t$\rangle$, e$\rangle\rangle$ that when applied to n individuals of type e returns a choice function.

(Kratzer, 1998)

- There are two approaches to capture the intermediate and the narrow scope of indefinites.
  - According to the choice functional analysis proposed by Reinhart (1997) and Winter (1997), a *choice function* variable introduced by an indefinite determiner can be bound by an existential quantifier at any level of the compositional derivation.
  - According to Kratzer (1998), choice functions are interpreted as free variables, with values to be provided by the context.
- Both approaches generate unattested readings for indefinites in non-monotonic contexts (Chierchia, 2001; Schwarz, 2001, 2011).

In this talk:

- I propose a formalization of functional interpretation of indefinites which separates the functional dependency from the semantics of indefinite determiners.
- Indefinite determiners uniformly introduce skolem functions f of type $\langle\langle e,t\rangle,e\rangle$ that are existentially closed in the topmost level of the derivation (Matthewson, 1999).
- The differences between *some/a* and *a certain indefinites* are derived pragmatically, without a need for stipulations.

Non-monotonic contexts

NON-MONOTONIC CONTEXTS

- Let us consider the sentences in (2-a) and (2-b) in the following scenario:

  Sue wrote two papers SP={S_1,S_2}, only submitted S_1, and Mary wrote two papers MP={M_1,M_2}, only submitted M_2.

(2) a. No candidate$_1$ submitted *a* paper they$_1$ had written.

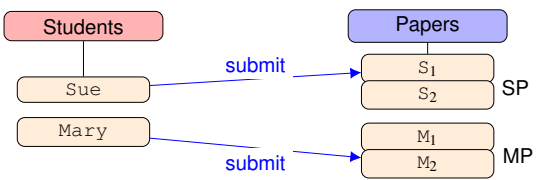
b. No candidate$_1$ submitted *a certain* paper they$_1$ had written.

- (2-a) is judged false.
- (2-b) is judged true.

- According to the choice functional analysis proposed by Reinhart (1997) and Winter (1997), a *choice function* variable introduced by an indefinite determiner can be bound by an existential quantifier at any level of the compositional derivation.
- Given the free scope of existential closure, two LFs in can be assigned to the sentences containing indefinites in (2-a) and (2-b).

(3) a. No candidate$_1$ λ_1 [$\exists f$[t_1 submitted f [paper they$_1$ had written.]]]
b. $\exists f$[No candidate$_1$ λ_1[t_1 submitted f [paper they$_1$ had written.]]]

- None of these sentences is ambiguous.
- The sentence (2-a) only means that for no candidate there is a paper they wrote that they submitted. →the LF in (3-a)
- The sentence (2-b) is equivalent to saying that no candidate submitted *every* paper they had written. →the LF in (3-b)
- The LF in (3-b) conveys that there's a way of choosing among papers that each candidate wrote such that no candidate submitted whatever paper is selected for them, namely a function that picks S_2 for Sue, and M_1 for Mary.



NON-MONOTONIC CONTEXTS

- An existentially closed choice functional account has to be equipped with some constraints to exclude the LF (3-b) for the sentence containing *a/some* in (2-a), and the LF (3-a) for the sentence containing *a certain* in (2-b).

NON-MONOTONIC CONTEXTS: INDEXICAL CHOICE FUNCTIONS (KRATZER, 1998)

- According to the choice functional analysis proposed by Kratzer (1998), a *choice function* variable introduced by an indefinite determiner remains free and gets its value from the context of utterance.
- This account assigns the same LF, given in , to both (2-a) and (2-b).

  (4) [No candidate$_1$ λ_1[t_1 submitted f [paper they$_1$ had written.]]]
- The resulting truth-conditions are weak, and cannot account for the interpretation of the sentence containing *a/some*, in (2-a).

NON-MONOTONIC CONTEXTS

- Let us consider the sentences in (5-a) and (5-b) in the following scenario:

  Smith and Baker are the teachers, both Sue and Mary (the students) read every book Smith praised, but only Sue read every book Baker praised.

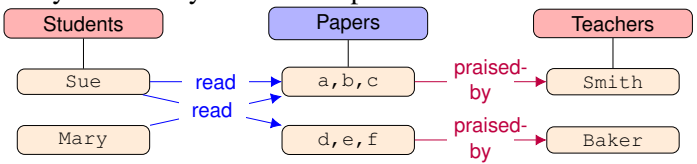
(5) a. Not every student read every book *some* teacher had praised.
b. Not every student read every book *a certain* teacher had praised.

- (5-a) is judged false.
- (5-b) is judged true.

- Given the free scope of existential closure under the choice functional approach of Reinhart (1997) and Winter (1997), two LFs in (6) can be assigned to the sentences containing indefinites in (5-a) and (5-b).

(6) a. $\neg\forall$x[student'(x) $\rightarrow \exists f \forall$z[praised'(z, f(book')) $\rightarrow$ read' (x,z)]]
b. $\exists f \neg\forall$x[read'(x) $\rightarrow \forall$z[praised'(z, f(x, book')) $\rightarrow$ student' (x,z)]]

- None of these sentences is ambiguous.
- The sentence (5-a) is only true when there is a student who didn't read every book any teacher had praised. →the LF in (6-a)
- The sentence (5-b) is equivalent to saying that not every student read every book every teacher had praised.. →the LF in (6-b)



- a choice functional account has to be equipped with some constraints to exclude the LF (6-b) for the sentence containing *a/some* in (5-a), and the LF (6-a) for the sentence containing *a certain* in (5-b).

NON-MONOTONIC CONTEXTS: INDEXICAL CHOICE FUNCTIONS (KRATZER, 1998)

- The indexical choice functional account (Kratzer, 1998) assigns the same LF, given in (7), to both (5-a) and (5-b).

  (7) $\neg\forall$x[read'(x) $\rightarrow \forall$z[praised'(z, f(x, book')) $\rightarrow$ student' (x,z)]]

- The resulting truth-conditions are weak, and cannot account for the interpretation of the sentence containing *a/some*, in (5-a).

NON-MONOTONIC CONTEXTS

- Skolemized choice functions can *arbitrarily* map members of two sets.
- This leads to the over-generation of unattested readings in non-monotonic contexts.

NON-MONOTONIC CONTEXTS

- To capture the behavior of *some/a* indefinites in non-monotonic contexts, we need some constraints to rule out LFs with the wide scope existential closure over choice function.
- The choice function variable associated with *a certain* indefinites either has to be obligatorily closed on the topmost level or alternatively stay free as proposed by Kratzer (1998).
- Given the cost associated with such stipulative constraints, it has been doubted whether or not the semantics of indefinites involves choice functions (Schwarz, 2001, 2011).

Proposal

PROPOSAL

- The functional dependency between a DP and a higher quantifier is built in the NP level.
- Both *some/a* and *a certain* indefinites uniformly introduce skolem functions f of type $\langle\langle e,t\rangle,e\rangle$ that are existentially closed in the topmost level of the derivation (Matthewson, 1999).

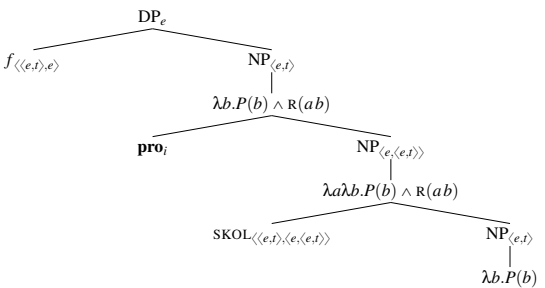
BUILDING A FUNCTIONAL DEPENDENCY

- Common nouns which are of type ⟨e,t⟩ are shifted to $\langle e, \langle e, t \rangle \rangle$ via a type-shifter SKOL.
  (8) SKOL P= $\lambda a \in$A. $\lambda b \in \beta$. [$P(b) \wedge$ R(a, b)], where R is a total function.
- A functional variable R, and an individual variable x_i are introduced.
- R is free variable whose referent is contextually determined.
- The variable x_i has to be bound by a higher quantifier in the structure.

INDEFINITE DETERMINER

- The indefinite determiner is a skolem function of type $\langle\langle e,t\rangle,e\rangle$
- It takes the functional NP, which is fed an individual pronoun a co-indexed with other bound variables in the larger structure, as argument and chooses a unique witness for every value of a.

(9)



DIFFERENCE BETWEEN *some/a* AND *a certain* INDEFINITES

- The implicit functional variable R is subject to a strong contextual felicity condition (Tonhauser et al., 2013; King, 2018) such that it can only be felicitously used in linguistic contexts that already entail them.
- The reference implication of the functional variable cannot be accommodated. In the case of *a certain* indefinites, the reference implication can be locally accommodated.
- The presence of the NP modifier "*certain*" makes the accommodation strategy, which is otherwise unavailable, possible.

Difference between *some/a* and *a certain* indefinites

- As *certain* indefinites can locally accommodate the existence of a function R, this type of indefinites are predicted to always yield functional readings.
- *some/a* indefinites can only give rise to functional readings iff the existence of R is entailed in **the linguistic context**.

Revisiting non-monotonic contexts

NON-MONOTONIC CONTEXTS

- Consider (2-a) and (2-b), repeated here as (10-a) and (10-b), in the same context.

  Sue wrote two papers SP={S_1,S_2}, only submitted S_1, and Mary wrote two papers MP={M_1,M_2}, only submitted M_2.

(10) a. No candidate$_1$ submitted *a* paper they$_1$ had written.
b. No candidate$_1$ submitted *a certain* paper they$_1$ had written.

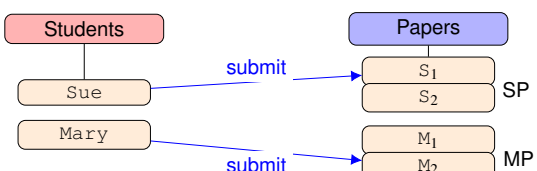
- The new approach assigns the LF (11) to both (10-a) and (10-b).

(11) $\exists f$[No candidate(**x**) λ_1[t_1 submitted f [λz.paper(z)$\wedge$R(**x**, z)$\wedge$write(**x**, z)]]]

NON-MONOTONIC CONTEXTS

- The sentence containing *a certain* indefinite in (10-b) is predicted to be true, as R can be easily accommodated.
- The sentence (10-a) is only predicted to be true if R has a referent the linguistic context.

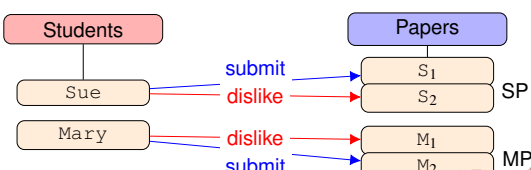
- The relation *write* can serve as the referent of R if it is taken to be a total function. That is only the case when the function *write* outputs the unique *set* of papers each candidate wrote.
  (12) R=$\{\langle Sue, \{S_1, S_2\}\rangle, \langle Mary, \{M_1, M_2\}\rangle\}$.
- The output of the skolem function which takes this R as argument does not verify (11). Therefore, the sentence is correctly predicted to be false in the scenario.



NON-MONOTONIC CONTEXTS

- If the linguistic context entails the existence of a referent for the function R, the functional reading becomes available. Assume Sue and Mary disliked the papers that they didn't submit.(13-a) is judged true, as predicted.

(13) a. No candidate$_1$ submitted **a** paper they$_1$ wrote but disliked.
b. $\exists f$[No candidate(**x**) λ_1[t$_1$ submitted f [λz.paper(z)$\wedge$R(**x**, z)$\wedge$write(**x**, z)$\wedge$dislike(**x**, z)]]]



NON-MONOTONIC CONTEXTS

- Consider (5-a) and (5-b), repeated here as (14-a) and (14-b), in the same context.
  Smith and Baker are the teachers, both Sue and Mary (the students) read every book Smith praised, but only Sue read every book Baker praised.

(14) a. Not every student read every book *some* teacher had praised.

b. Not every student read every book *a certain* teacher had praised.

- Under the new approach, both (14-a) and (14-b) are assigned the LF in (15).

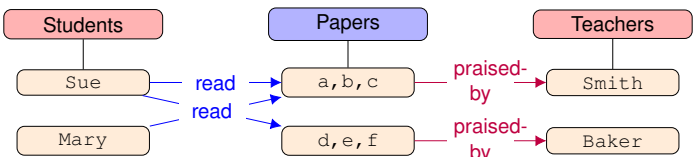
(15) $\exists f \neg \forall x$ [Student($\mathbf{x}$) $\rightarrow \forall y$ [book (y) $\wedge$ **praised-by**$_2$ (y, f(λ z.teacher(z) $\wedge$R($\mathbf{x}$, z))) $\rightarrow$ **Read**$_1$($\mathbf{x}$, y)]]

NON-MONOTONIC CONTEXTS

- The sentence containing *a certain* indefinite in (14-b) is predicted to be true, as R can be easily accommodated.
- The sentence (14-a) is only predicted to be true if R has a referent the linguistic context.

- Computing R(x,teacher) $\subseteq$ $R_{praised-by}$(y, teacher) $\circ$ R_{read}(x,y) from the information in the linguistic context, there are two possible total functions that can serve as a referent for R:

  (16) R_1=$\{\langle Sue, Smith\rangle, \langle Mary, Smith\rangle\}$
  R_2=$\{\langle Sue, Baker\rangle, \langle Mary, Smith\rangle\}$

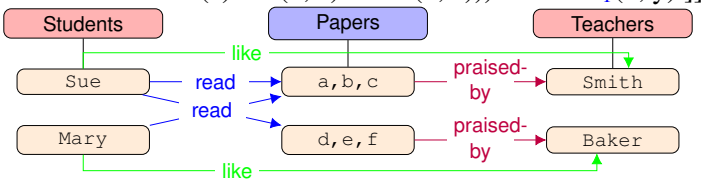


- As none of these options verifies (15), The sentence containing *some* indefinite (14-a) is correctly predicted to be false by this approach.

- If the linguistic context provides a suitable referent for R, sentences containing *some* indefinites are also predicted to render a functional reading.
- In the same scenario, further assume that Sue likes Smith and Mary likes Baker. (17-a) is judged true in this context, as predicted.

(17) a. Not every student$_i$ read every book **some** teacher they$_i$ like had praised.

b. $\exists f \neg \forall x$ [Student(**x**) $\rightarrow \forall y$ [book (y) $\wedge$ **praised-by**$_2$ (y, f(λ z.teacher(z) $\wedge$R(**x**, z)$\wedge$ like(**x**, z))) $\rightarrow$ **Read**$_1$(**x**, y)]]



Conclusion

- The functional dependency between a DP and a higher quantifier is built in the NP level.
- Both *a/some* and *a certain* indefinite determiners denote skolem functions which are existentially closed in the topmost level.
- The dependency between the indefinite and a higher quantifier is a result of the type-shifting operator SKOL that shift the type of an NP from $\langle e,t\rangle$ to $\langle e,\langle e,t\rangle\rangle$.
- SKOL introduces a free functional variable whose referent is subject to a strong contextual felicity constraint such that the **linguistic context** should entail that the functional variable has a referent
- The difference between *a, some* and *a certain* indefinites is the availability of the accommodation strategy.
- Their different behavior in non-monotonic contexts follows from this pragmatic difference.

OTHER TYPES OF FUNCTIONAL DEPENDENCY

- The account of functional interpretation of indefinites presented in this paper is similar to the analysis of possessive description (Partee, 1986; Barker, 1995; Vikner & Jensen, 2002) and E-type pronouns (Kratzer & Heim, 1998) in containing a relational/functional noun which introduces a free relation/function variable whose referent is determined in the context.
- This is welcome, because they all seem to share two properties:
  - ***Narrowing***: a possessor DP or an E-type pronoun does not quantify over all individuals in the extension of NP, but only over those individuals which have a relation to another element.
  - ***Maximality effect***: a possessor DP or an E-type pronoun have maximal references. The requirement that the referent of R is a total function, also predicts that functional indefinites should also give rise to a similar effect.

OTHER TYPES OF FUNCTIONAL DEPENDENCY

Functional dependency	**narrowing**	**maximality effect**	**accommodation**	**SFC**	**DE**
E-type pronouns	✓	✓	✗	✓	✓
a/some indefinites	✓	✓	✗	✓	✓
a certain indefinites	✓	✓	✓	✗	✗
Possessives	✓	✓	✓	✗	✗

- Functional dependencies whose functional variable needs a referent in the linguistic context show restrictions in Non-monotonic contexts.

Thank you!

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