Lecture #3

24.979 Topics in Semantics

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Preview

Today:

- Modified numeral quantifiers
- Strawson entailment

Future lectures:

- Definite descriptions
- So-called free choice occurrences of *any*
- Explanation of the Condition

Operators vs. environments

(1) **The Condition** (operators-based, preliminary)
A DP headed by *any* is acceptable (if and) only if it is c-commanded by an expression that denotes an ER function.

(2) a. [Every] [student who λx [**any books** λy [x read y]]] [arrived].

b. Every prince VP ⇒ Every prince from Spain VP, etc.

(3) **The Condition** (environments-based, preliminary)
A DP headed by *any* is acceptable (if and) only if it is dominated by a constituent that is ER with respect to it.

(4) a. [Every [student who$_x$ [**any books**$_y$ [x read y]]]] [took notes]

b. Every student who read any books took notes ⇒
Every student who read any long books took notes

(all on the assumption that *every* is not presuppositional)

A contrast with modified numeral quantifiers

Are the two generalizations distinguishable? Is one of them more adequate? How do they tie in with explanatory approaches to *any*?

(5) Fewer than 10 students <u>read</u> any book.

(6) *Fewer than 10 soldiers <u>surrounded</u> any fort.

Buccola & Spector 2016 note that acceptability contrast in (5)-(6) correlates with the nature of the main predicatesdicate of the sentence (I assume that the facts with *few*, etc., are the same, though this needs to be checked). Can an argument for an environments-based approach be devised on this basis?

Yes.

First attempt: distributive predicates ✓

(7) Fewer than 10 soldiers read *War and Peace*.

(8) $[\![$fewer than 10 soldiers$]\!] = \lambda P.\ \neg\exists x(\text{soldiers}(x) \wedge \text{card}(x) \geq 10 \wedge P(x))$

(where predicates are closed under sum-formation, the domain of individuals is partially ordered by a part-of relation, $\sqsubseteq$, and card(x) = the number of atomic* elements that are part of x)

(9) $\neg\exists x(\text{soldiers}(x) \wedge \text{card}(x) \geq 10 \wedge \text{read}(wp)(x))$

Desirable consequences

(10) a. ✗ There may be 10 students or more who read WP.
b. $\not\Rightarrow$ WP was read by some students.

(11) Fewer than 10 soldiers read any book.

(12) a. $[\![$fewer than 10 students$]\!]$ is an ER function.
b. (11) is ER with respect to *any book*.

First attempt: collective predicates ✗

(13) Fewer than 10 soldiers surrounded the fort.

(14) $\neg\exists x(\text{soldiers}(x) \wedge \text{card}(x) \geq 10 \wedge \text{surround}(f)(x))$

Undesirable consequences (Buccola & Spector 2016)

(15) a. ✗ There may be 10 students or more who surrounded the fort.
b. $\not\Rightarrow$ The fort was surrounded by some students.

(16) *Fewer than 10 soldiers surrounded any fort.

(17) a. ⟦fewer than 10 students⟧ is an ER function.
b. (16) is ER with respect to *any book*.

Target truth-conditions and environments

Target truth-conditions: distributive vs. collective predicates

(18) ιmax(λd. $\exists$x(card(x)=d $\wedge$ students(x) $\wedge$ read(wp)(x)) $<$10
(where max(D)={d | D(d)$\wedge\forall$d'(D(d')$\rightarrow$d'$\leq$d)} if $\exists$d(D(d)), ={0} otherwise)

(19) $\exists$d($\exists$x(card(x)=d $\wedge$ soldiers(x) $\wedge$ surround(f)(x)) $\wedge$ d$<$10)

Environments-based version of the Condition: correct predictions

(20) Fewer than 10 students read any book.

(21) For any Q $\Rightarrow$ $[\![$any book$]\!]$:
ιmax(λd.$\exists$x(card(x)=d$\wedge$students(x)$\wedge[\![$any book$]\!]$(λy. x read y)))$<$10
$\Rightarrow$ ιmax(λd.$\exists$x(card(x)=d$\wedge$students(x)$\wedge$Q(λy. x read y)))$<$10

(22) *Fewer than 10 students surrounded any fort.

(23) $\exists$d($\exists$x(card(x)=d$\wedge$soldiers(x)$\wedge[\![$any fort$]\!]$(λy.surround(y)(x)))$\wedge$d$<$10)$\wedge$
$\neg\exists$d($\exists$x(card(x)=d$\wedge$soldiers(x)$\wedge[\![$any huge fort$]\!]$(λy.surround(y)(x)))$\wedge$d$<$10)

Deriving target truth-conditions: maximal informativity

Target truth-conditions – but how does the composition look like?

(24) $\iota\text{max}(\lambda d.\ \exists x(\text{card}(x)=d \wedge \text{students}(x) \wedge \text{read}(wp)(x)) < 10$

(25) $\exists d(\exists x(\text{card}(x)=d \wedge \text{soldiers}(x) \wedge \text{surround}(f)(x)) \wedge d<10)$

Target truth-conditions restated, with a 'black box' (we switch to intensions)

(26) $\lambda w.\ \exists d(\text{max}_i(\lambda d'.\lambda w.\ \exists x(\text{card}(x)=d' \wedge \text{students}(x) \wedge \text{read}(w)(wp)(x))(d)(w) \wedge d<10)$

(27) $\lambda w.\ \exists d(\text{max}_i(\lambda d'.\lambda w.\ \exists x(\text{card}(x)=d' \wedge \text{students}(x) \wedge \text{surround}(w)(f)(x))(d)(w) \wedge d<10)$

Operator abstracted away

(28) a. [fewer than 10] [λd [[$\exists$ d-many NP] VP]]
b. $[\![\text{fewer than } 10]\!] = \lambda D_{(d(st))}.\lambda w.\ \exists d(\text{max}_i(D)(d)(w) \wedge d<10)$

Maximal informativity spelled out

(29) λw. $\exists$d(max$_i$(λd'. λw. $\exists$x(card(x)=d' $\wedge$ students(x) $\wedge$ read(w)(wp)(x))(d)(w) $\wedge$ d<10)

Buccola & Spector's definition of maximal informativity:

(30) max$_i$(D)(d)(w) = 1 iff

a. D(d)(w) $\wedge$ $\forall$d'(D(d')(w)$\wedge$d$\neq$d' $\rightarrow$ D(d') $\not\Rightarrow$ D(d))

or

b. $\neg\exists$d'(D(d')(w)) $\wedge$ d = 0.

Recall the previous notion of maximality:

(31) max(D)(d) = 1 iff

D(d) $\wedge$ $\forall$d'(D(d') $\rightarrow$ d'$\leq$d) or $\neg\exists$d'(D(d')) $\wedge$ d = 0.

Maximal informativity and distributive predicates

(32) For any d, d' such that $(0<)d'<d$:

a. $\lambda w.\ \exists x(card(x)=d \wedge students(x) \wedge read(w)(wp)(x))$

b. $\overset{\Rightarrow}{\not\Leftarrow}$ $\lambda w.\ \exists x(card(x)=d' \wedge students(x) \wedge read(w)(wp)(x))$

Therefore max_i coincides with max in any w for such predicates:

(33) For any w, $\lambda d.max_i(D)(d)(w) = max(\lambda d.D(d)(w))$

Derivation of the target truth conditions

(34) a. Fewer than 10 students read War and Peace.

b. $\lambda w.\ \iota max(\lambda d'.\exists x(card(x)=d' \wedge students(x) \wedge read(w)(wp)(x))) < 10$

Maximal informativity and collective predicates

(35) For any d, d' such that $d' \neq d$:

a. $\lambda w.\ \exists x(\text{card}(x)=d \wedge \text{students}(x) \wedge \text{surround}(w)(f)(x))$

b. $\overset{\not\Rightarrow}{\not\Leftarrow}\ \lambda w.\ \exists x(\text{card}(x)=d' \wedge \text{students}(x) \wedge \text{surround}(w)(f)(x))$

Therefore $\max_i$ may contain multiple degrees for a w!

(36) $\lambda w.\ \exists d(\exists x(\text{card}(x)=d \wedge \text{soldiers}(x) \wedge \text{surround}(w)(f)(x)) \wedge d<10)$

$\vee \neg\exists x(\text{soldiers}(x) \wedge \text{surround}(w)(f)(x))$

In principle, another modification is needed to strengthen this meaning and get rid of the second disjunct (recall the obligatory existence inference), but ...

(see Buccola & Spector 2016, Sect. 8, for a maneuver)

Fewer than 10 and entailment-reversal

Consider the following D, D' such that $D \Rightarrow D'$:

(37) $D = \lambda d.\lambda w.\ \exists x(\text{card}(x){=}d \wedge \text{soldiers}(x) \wedge \text{surround\_slowly}(w)(f)(x))$

(38) $D' = \lambda d.\lambda w.\ \exists x(\text{card}(x){=}d \wedge \text{soldiers}(x) \wedge \text{surround}(w)(f)(x))$

Scenario: a group of 5 soldiers surrounded the fort quickly in w*, a group of 15 soldiers surrounded the fort slowly in w*

(39) $\exists d \exists x(\text{card}(x){=}d \wedge \text{soldiers}(x) \wedge \text{surround}(w^*)(f)(x) \wedge d<10) \wedge$

$\neg\exists d \exists x(\text{card}(x){=}d \wedge \text{soldiers}(x) \wedge \text{surround\_slowly}(w^*)(f)(x) \wedge d<10)$

$(\wedge\ \exists x(\text{soldiers}(x) \wedge \text{surround}(w^*)(f)(x)))$

Thus, the operators-based approach fails to account for the distribution of *any NP* in the scope of modified numeral quantifiers:

(40) ⟦fewer than 10⟧ is not an ER function.

Some intermediate conclusions

- An environments-based approach to the Condition correctly distinguishes the acceptable occurrences of *any* in the scope of modified numeral quantifiers (✓ distributive predicates, ✗ collective predicates).

- The environments-based approach can remain to some extent agnostic with respect to how precisely the truth-conditions are arrived at. (This would be less of an advantage over the operators-based approach if one could arrive at the above truth-conditions from a structure in which, say, *any* would be c-commanded by negation, etc.)

- An environment that is ER with respect to an occurrence of *any NP* it dominates can be induced in the absence of there being a function in that environment that would be ER with respect to *any NP*.

From non-monotonicity to entailment-reversal

Mitya's question: Is it possible to have a constituent that is non-monotone wrt to a subconstituent but that is dominated by a constituent that is ER with respect to that same subconstituent?

Some assumptions about decomposition (simplification not crucial)

(41) a. $[\![\text{fewer than 10}]\!] = \lambda D_{dt}.\ \exists d(D(d) \wedge d < 10)$
b. $[\![\text{max}]\!] = \lambda d.\ \lambda D.\ \text{max}(D) = d$

(42) a. Fewer that 10 students read any book.
b. [$_\beta$ [fewer than 10] [$_\alpha$ λd [max d] λd' [$\exists$ d'-many students] [λx [any book λy [x read y]]]]]

(43) a. α is non-monotone (neither ER nor EP) wrt *any book*.
b. β is ER wrt *any book*.

Some wrinkles

1. There is no existence inference with collective predicates. (But see Buccola & Spector 2016, Sect. 8, for a remedy.)

2. There is a crucial weakening of the standard characterization of maximal informativity (ignoring mapping to 0), though perhaps this is a feature of the proposal, and the paper constitutes an argument for it.

(44) a. $\text{max}_i^{B\&S}(\text{D})(\text{d})(\text{w}) = 1 \text{ iff } \text{D}(\text{d})(\text{w}) \wedge$
$\forall \text{d'}(\text{D}(\text{d'})(\text{w}) \wedge \text{d'} \neq \text{d} \rightarrow \text{D}(\text{d'}) \not\Rightarrow \text{D}(\text{d}))$

b. $\text{max}_i^{F\&H}(\text{D})(\text{d})(\text{w}) = 1 \text{ iff } \text{D}(\text{d})(\text{w}) \wedge$
$\forall \text{d'}(\text{D}(\text{d'})(\text{w}) \rightarrow \text{D}(\text{d}) \Rightarrow \text{D}(\text{d'}))$

3. What is predicted about the sentence in (46)?

(45) *Fewer than 10 soldiers [surrounded any fort].

(46) $<>$Fewer than 10 soldiers who read any book [surrounded the fort].

Prediction of the environments-based approach

(47) Fewer than 10 soldiers who read any book [surrounded the fort].

(48) [fewer than 10] λd

[$\exists$ d-many soldiers λx [any book] λy [x read y]] [surround the fort]

It holds that (48) is not ER with respect to *any book*:

(49)
$$\exists d(\exists x(card(x){=}d \wedge soldiers(x) \wedge \exists y(book(y) \wedge read(y)(x)) \wedge surround(f)(x)) \wedge d{<}10)$$
$$\wedge \neg\exists d(\exists x(card(x){=}d \wedge soldiers(x) \wedge \exists y(long\_book(y) \wedge read(y)(x)) \wedge surround(f)(x)) \wedge d{<}10)$$

Scenario: A group of 5 soldiers who read Animal Farm surrounded the fort, and a group of 15 soldiers who read War and Peace surrounded the fort. (No other books were read, no other surroundings took place.)

Homework: Another parse of the sentence to the rescue?

DP-internal analysis of *fewer than 10 students* is possible:

(50) [$\exists$ λx [fewer than 10] λd [x d-many soldiers λx any book λy x read y]]

Do we find a constituent that is ER wrt *any book* in such a structure?

Towards an explanation

How does all this connect to an explanatory theory?

Schematic representation of explanatory approaches (Lahiri, Chierchia, Krifka)

(51) $[\mathcal{ASO}$ [... [... any NP ...] ...]]

(52) a. $[\![(51)]\!]$ consistent: *any NP* is acceptable

b. $[\![(51)]\!]$ inconsistent: *any NP* is unacceptable

Direct theory (cf. Lahiri 1998)

- ALT(*any NP*) = $\{Q \mid [\![Q]\!] \Rightarrow [\![\text{any NP}]\!]\}$
- $[\![\mathcal{ASO}\ \phi]\!]$ is defined only if $\forall\phi' \in \text{ALT}(\phi)$: $[\![\phi]\!] \Rightarrow [\![\phi']\!]$. (where $\mathcal{ASO}$ associates solely with the alternatives induced by *any NP*)

Consequence

- The Condition follows immediately: *Any NP* is acceptable (if and) only if it is dominated by a constituent that is ER with respect to it.