Wh-antecedents & compositionality in inqSem
Wh-words as antecedents

Composing alternatives
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Composing alternatives
Wh-terms as antecedents

Example 1: cross-sentential anaphora

(1)   a.  Who\textsuperscript{i} won this year’s Masters? What was his\textsubscript{i} score?
   b.  [Which writer]\textsuperscript{i} won the Nobel Prize in Literature in 1969? To give you a hint: He\textsubscript{i} was Irish.
   c.  A: Who\textsuperscript{i} did John marry?
        B: I don’t think you know her\textsubscript{i}.  
Wh-terms as antecedents

Example 2: intra-sentential anaphora

(2) a. Wer belegte welchen\textsuperscript{2} Kurs und schloss ihn\textsubscript{2} erfolgreich ab?
   who took which\textsuperscript{2} course and finished him successfully up
   ‘Who\textsuperscript{1} took which\textsuperscript{2} course and finished it\textsubscript{2} successfully?’

   b. [Q [who\textsuperscript{1} owns what\textsuperscript{2} and likes it\textsubscript{2}]]
Intra-clausal anaphora

(3) \([Q [\text{who}^1 \text{ owns what}^2 \text{ and likes it}^2]]\)

(4) a. own \(\mapsto \lambda Q_{ssett} \lambda v_e. Q(i)(\lambda i_s \lambda v'_e.[|\text{own}_{et}(i, v, v')|])\)
    b. it\(n \mapsto \lambda P_{s\langle et\rangle}. P(i)(u_n)\)
    c. and \(\mapsto \lambda p \lambda q.p(i); q(i)\)
    d. who\(n \mapsto \lambda P_{set}.[\exists u_n(P(i)(u_n))\]
    \(\mapsto \lambda P_{set}.[u_n|]; P(i)(u_n)\)
    e. Q \(\mapsto \lambda p_t \lambda j.[|p(i) \Leftrightarrow p(j)|]\)

(5) \(\lambda j.[u_1, u_2|\text{own}\{i, u_1, u_2\}, \text{like}\{i, u_1, u_2\}] \Leftrightarrow [u_1, u_2|\text{own}\{j, u_1, u_2\}, \text{like}\{j, u_1, u_2\}]\)
Intra-clausal anaphora

(6) \[Q [\text{who}^1 \text{ owns } \text{what}^2 \text{ and likes } \text{it}_2]]

(7) a. John – a bike
b. Mary – a computer, headphones
c. Bill – a book, a dvd
Cross-clausal anaphora

(8)  a. Who$^i$ was at the party? Did he$_i$ dance?
b. Mary knows who$^i$ was at the party and that he$_i$
danced.
   ‘There is a single person who was at the party and Mary knows who it was and that he danced.’
Cross-clausal anaphora

(9) Mary knows who\textsuperscript{i} was at the party and that he\textsubscript{i} danced.

(10) \lambda j([[u_1 | at-party\{i, u_1\}]] \Leftrightarrow [[u_1 | at-party\{j, u_1\}]]; [[dance\{j, u_1\}]]}
Two issues in cross-sentential anaphora

(11) Mary knows who \(i\) was at the party and that he \(i\) danced.

1. Wh-questions are dynamic beyond the questions
2. Anaphoric pronouns restrict the cardinality of wh-words
Solving issue 1 – wh-questions extend contexts

(12) A: Who won?
    B: #Somebody won.
Solving issue 1 – wh-questions extend contexts

(12)  A: Who won?
     B: #Somebody won.

(13)  Modified translation of Q
     a.  Q ⊨ λp t λj.[|p(i) ≡ p(j)]; p(i)
Solving issue 2 – cardinality

(14) A: Who was at the party and did he/they dance?

We will assume that discourse referents can have both singular and plural individuals as their value.
A note on singular and plural entities

Both singular and plural entities in the domain of $D_e$

(15) a. We will use $a \sqcup b$ (the sum of $a$ and $b$) to represent the plural individual that has $a$ and $b$ as its parts.

b. We will use $\sqsubseteq$ as the part-of relation:
   \[ a \sqsubseteq b : \iff a \sqcup b = b \]

c. We will use $\text{Atom}$ as a predicate that checks whether an entity is atomic:
   \[ \text{Atom}(x) := \lambda x. \forall y [y \sqsubseteq x \rightarrow y = x]. \]
A note on singular and plural entities
Cross-clausal anaphora

(16) Some people left. They were tired.

Anaphora picks up the maximal entity
Cross-clausal anaphora

(17) a. $Q \leadsto \lambda p_t \lambda j. [[p(i) \iff p(j)]; p(i)]$
    b. $\text{who}^n \leadsto \lambda P_{set}. \text{max}^n(P(i)(u_n))$
    c. $\text{max}^n(D) := \lambda kk'. ([u_n]; D)kk' \land$
        $\forall k''(([u_n]; D)kk'' \rightarrow u_nk'' \sqsubseteq u_nk')$
    d. $\text{he}_n \leadsto \lambda P_{s<et}>. [\text{Atom}\{u_n\}; P(i)(u_n)]$
    e. $\text{they}_n \leadsto \lambda P_{s<et}>. [\lnot \text{Atom}\{u_n\}; P(i)(u_n)]$
Cross-clausal anaphora

(18) Mary knows who\textsuperscript{i} won and that he\textsubscript{i} danced.
Cross-clausal anaphora

(18) Mary knows who\(^i\) won and that he\(^i\) danced.

(19) \[ \lambda j[\text{max}^1([|\text{win}\{i, u_1\}])] \Leftrightarrow \text{max}^1([|\text{win}\{j, u_1\}])]; \]
\[ \text{max}^1([|\text{win}\{i, u_1\}]); \]
\[ [|\text{Atom}\{u_1\}, \text{dance}\{j, u_1\}] \]
Open issues

Wh-questions with quantifiers

(20) What did every student read?
   a. What was the thing that every student read?
   b. For every student $x$, what did $x$ read?
Open issues

Yes-no questions

(21) Mary knows whether John danced.

(22) \( \lambda j[[[\text{\textit{dance}}\{i, J\}] \leftrightarrow [\text{\textit{dance}}\{j, J\}]]] \)

(23) Mary knows whether somebody danced and that he wore a scarf.

(24) A: Did somebody dance?  
    B: Yes.
Wh-words as antecedents

Composing alternatives
Composing alternatives

1. the semantic value of a complete sentence is a set of propositions;
2. other expressions receive corresponding types
# Types, examples

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Abbreviations

(25) a. \( \lbrack p \rbrack := \lambda \rho'. \forall i(p'(i) \rightarrow p(i)) \)
\[ = \lambda \rho'. \rho' \subseteq |p| = \{|p|\} \]
b. \( q \lor q' := \lambda p. q(p) \lor q'(p) \)
c. \( q \land q' := \lambda p. q(p) \land q'(p) \)
d. \( \sim q := \lambda p. \forall p' \in q[\neg \exists i[p'(i) \land p(i)]] \)
e. \( \sqcap_{\tau \langle \tau \tau \rangle} = \land \) if \( \tau = T \) or
\[ \lambda X \lambda Y \lambda Z_{\sigma_1}. X(Z) \sqcap Y(Z) \) if \( \tau = \sigma_1\sigma_2 \) and \( \tau \) ends in \( T \)
Interpretations, examples

(26) a. $\llbracket \text{walk} \rrbracket = \lambda x./Wx/$
b. $\llbracket \text{man} \rrbracket = \lambda x./Mx/$
c. $\llbracket \text{see} \rrbracket = \lambda y\lambda x./S(x, y)/$

(27) $\llbracket \text{john} \rrbracket = j$

(28) Connectives
a. $\llbracket \text{or} \rrbracket = \lambda X\lambda Y.X \sqcup Y$
b. $\llbracket \text{and} \rrbracket = \lambda X\lambda Y.X \sqcap Y$
c. $\llbracket \text{not}_{TT} \rrbracket = \lambda q. \sim q$
Example

(29) John danced or sang.
Abbreviations and interpretations, quantifiers

(30)  
\[ \exists x \phi := \lambda p. \exists x[\phi(p)] \]
\[ \forall x \phi := \lambda p. \forall x[\phi(p)] \]

(31)  
Quantifiers

\[ \text{[somebody]} = \lambda P e T. \exists x(Px) \]
\[ \text{[who]} = \lambda P e T. \exists x(Px) \]
\[ \text{[everyone]} = \lambda P e T. \forall x[P(x)] \]
Example

(32) Somebody danced.