Modification and quantification

Ling233B, Resource accounting at the syntax-semantics interface
Monday, January 28, 2002

Quantification: The aim

Every student yawns.

$$\begin{bmatrix} \text{PRED} & \text{`yawn'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`student'} \\ \text{SPEC} & \text{`every'} \end{bmatrix} \end{bmatrix}$$

$$\mathit{every}(X, \mathit{student}(X), \mathit{yawn}(X))$$

- *every* is a *quantifier*
- *student* is its *restriction*
- *yawn* is its *scope*

A simpler example

Everyone yawns.

$$\begin{bmatrix} \text{PRED} & \text{`yawn'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`everyone'} \end{bmatrix} \end{bmatrix}$$

$$\mathit{every}(X, \mathit{person}(X), \mathit{yawn}(X))$$

Meaning contribution of *everyone*: $\lambda S.\mathit{every}(X, \mathit{person}(X), S(X))$

Meaning contribution of *yawns*: $\lambda x.\mathit{yawn}(x)$

Goal: combine *everyone* and *yawns* appropriately.

Quantification in glue

$\forall H.[e_\sigma \multimap H] \multimap H$	Given a resource $e_\sigma \multimap H$ for some semantic structure H, we can produce a resource for H.
$e_\sigma \multimap y_\sigma$	Given a resource e_σ corresponding to the SUBJ, we can produce a resource y_σ for the entire sentence.

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y_σ	We have produced a resource y_σ for the full sentence.

$\lambda S.\mathit{every}(X, \mathit{person}(X), S(X)) : \forall H.[e_\sigma \multimap H] \multimap H$

Glue: given a resource $e_\sigma \multimap H$ for some semantic structure H, we can produce a resource for H. Meaning: apply the predicate $\lambda S.\mathit{every}(X, \mathit{person}(X), S(X))$ to the meaning corresponding to the resource $e_\sigma \multimap H$.

$\lambda Y.\mathit{yawn}(Y) : e_\sigma \multimap y_\sigma$

Glue: given a resource e_σ corresponding to the SUBJ, we can produce a resource y_σ for the entire sentence. Meaning: $\lambda Y.\mathit{yawn}(Y)$.

$\mathit{every}(X, \mathit{person}(X), \mathit{yawn}(X)) : y_\sigma$

We have produced a resource y_σ corresponding to $\mathit{every}(X, \mathit{person}(X)\mathit{yawn}(X))$, by assuming that H is the semantic structure y_σ.

We have seen:

- Combining *everyone* with its scope

Next:

- Combining *every* with *student* to form a meaning constructor like the one for *everyone*

F-structure of a quantified NP, *every student*:

$$f\!:\!\begin{bmatrix}\text{SPEC} & \text{‘every’} \\ \text{PRED} & \text{‘student’}\end{bmatrix}$$

restr-arg and *restr* are contributed by ‘student’ and its arguments and modifiers, if any; this does not correspond to a syntactically well-motivated f-structure constituent.

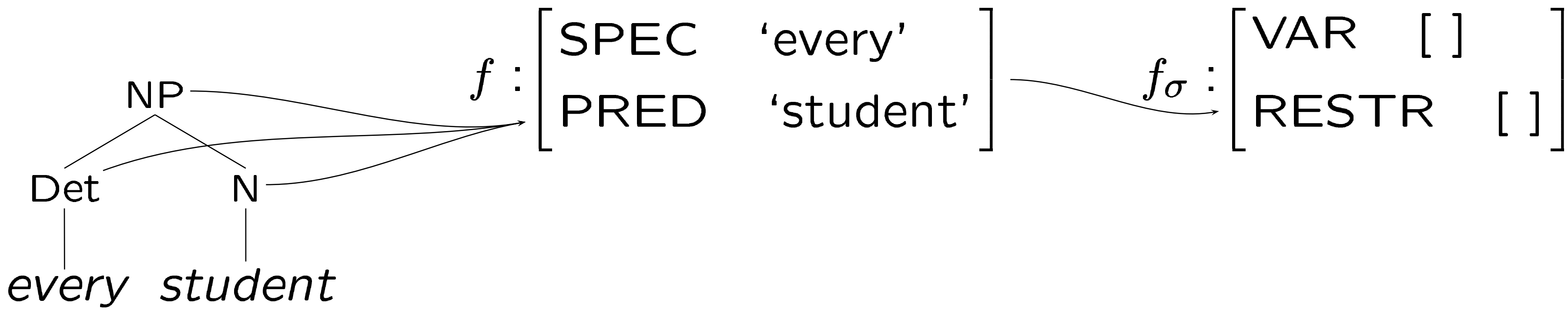
F-structure and semantic structure for determiners:

Det

every

$$f : \begin{bmatrix} \text{SPEC} & \text{‘every’} \end{bmatrix} \qquad f_\sigma : \begin{bmatrix} \text{VAR} & [\ ] \\ \text{RESTR} & [\ ] \end{bmatrix}$$

C-structure, f-structure, and semantic structures for *every student*:



every $\lambda R.\lambda S.\mathit{every}(X, R(X), S(X)) \ : \ [v \multimap r] \multimap [\forall H.[e_\sigma \multimap H] \multimap H]$

student $\lambda X.\mathit{student}(X) \ : \ v \multimap r$

$\lambda R.\lambda S.\mathit{every}(X, R(X), S(X)) : [v \multimap r] \multimap [\forall H.[e_\sigma \multimap H] \multimap H]$

every requires a resource $v \multimap r$ corresponding to its restriction meaning R, and a resource $e_\sigma \multimap H$ corresponding to its scope meaning S, to produce a resource H.

$\lambda X.\mathit{student}(X) : v \multimap r$

This meaning constructor provides an implicational resource $v \multimap r$ and meaning $\lambda X.\mathit{student}(X)$.

$\lambda S.\mathit{every}(X, \mathit{student}(X), S(X)) : \forall H.[e_\sigma \multimap H] \multimap H$

The result is like the meaning constructor for *everyone*, except that the restriction of the quantifier *every* is specified to involve students.

Every student yawned:

$$y\left[\begin{array}{ll}\text{PRED} & \text{`yawn'} \\ \text{SUBJ} & e\left[\begin{array}{ll}\text{SPEC} & \left[\begin{array}{ll}\text{PRED} & \text{`every'}\end{array}\right] \\ \text{PRED} & \text{`student'}\end{array}\right]\end{array}\right]$$

every $\lambda R.\lambda S.\mathit{every}(X, R(X), S(X))$:
$[(e_\sigma\ \text{VAR}) \multimap (e_\sigma\ \text{RESTR})] \multimap [\forall H.[e_\sigma \multimap H] \multimap H]$

student $\lambda X.\mathit{student}(X)\ :\ (e_\sigma\ \text{VAR}) \multimap (e_\sigma\ \text{RESTR})$

yawn $\lambda X.\mathit{yawn}(X)\ :\ e_\sigma \multimap y_\sigma$

$$\textbf{every}, \textbf{student}, \textbf{yawn} \vdash \mathit{every}(X, \mathit{student}(X), \mathit{yawn}(X)) : y_\sigma$$

Modification

Nouns: Syntax and semantics

man

$$m\begin{bmatrix}\text{PRED} & \text{`man'}\end{bmatrix} \longrightarrow m_\sigma\begin{bmatrix}\text{VAR} & v[\;] \\ \text{RESTR} & r[\;]\end{bmatrix}$$

$$\lambda X.\mathit{man}(X) : v \multimap r$$

Noun modification by intersective adjective

Swedish man

$$\begin{bmatrix} \text{PRED} & \text{`man'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Swedish'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{VAR} & v[\;] \\ \text{RESTR} & r[\;] \end{bmatrix}$$

$$\lambda X.\textit{Swedish}(X) \wedge \textit{man}(X) : v \multimap r$$

Intersective modification:
X is in the intersection of men and Swedish things.

Noun modification by gradable adjective
(Montague 1974; Kamp 1975; Kennedy 1997)

big mouse

$$\begin{bmatrix} \textsf{PRED} & \textsf{`mouse'} \\ \textsf{ADJ} & \left\{ \begin{bmatrix} \textsf{PRED} & \textsf{`big'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \textsf{VAR} & v[\,] \\ \textsf{RESTR} & r[\,] \end{bmatrix}$$

$$\lambda X.\textit{big}(X, \mathcal{P}) \wedge \textit{mouse}(X) : v \multimap r$$

X is a mouse, and is big relative to individuals that have the property $\mathcal{P}$; here $\mathcal{P}$ is the property of being a mouse.

$$\lambda X.\mathit{big}(X, \mathcal{P}) \wedge \mathit{mouse}(X) : v \multimap r$$

What is $\mathcal{P}$? – A contextually-salient property of X
(McConnell-Ginet 1979; Pollard and Sag 1994; Kennedy 1997)

The Linguistics Department has an important volleyball game coming up against the Philosophy Department. I see the Phils have recruited Julius to play with them, which means we are in real trouble unless we can find a <u>good linguist</u> to add to our team in time for the game. (Pollard and Sag 1994)

Noun modification by intensional adjective
(Kamp 1975; Siegel 1976)

former senator

$$\begin{bmatrix} \text{PRED} & \text{`senator'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`former'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{VAR} & v[\;] \\ \text{RESTR} & r[\;] \end{bmatrix}$$

$$\lambda X.\mathit{former}(\mathit{senator}, X) : v \multimap r$$

X is an individual that stands in the *former* relation to the property of being a senator.

We have seen:

- Noun modifiers: Syntax and semantics

Next:

- How modified noun meanings are obtained by semantic deduction

Swedish man

$$\begin{bmatrix} \text{PRED} & \text{`man'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Swedish'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{VAR} & v[\ ] \\ \text{RESTR} & r[\ ] \end{bmatrix}$$

man	$\lambda X.\mathit{man}(X)$	$: \ v \multimap r$
Swedish	$\lambda P.\lambda X.\mathit{Swedish}(X) \wedge P(X)$	$: \ [v \multimap r] \multimap [v \multimap r]$

General form of modifiers: $\mathcal{M} : S \multimap S$

$\lambda X.man(X) : v \multimap r$

The meaning $\lambda X.man(X)$ is associated with the implicational contribution $v \multimap r$.

$\lambda P.\lambda X.Swedish(X) \wedge P(X) : [v \multimap r] \multimap [v \multimap r]$

Glue: The meaning constructor consumes the noun contribution $v \multimap r$ and produces a new modified meaning which is also associated with $v \multimap r$. Meaning: apply the function $\lambda P.Swedish(X) \wedge P(X)$ to the unmodified meaning contributed by *man*, $\lambda X.man(X)$.

$\lambda X.Swedish(X) \wedge man(X) : v \multimap r$

We have produced a modified meaning $\lambda X.Swedish(X) \wedge man(X)$ associated with the implicational contribution $v \multimap r$.

big mouse

$$\begin{bmatrix} \text{PRED} & \text{`mouse'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`big'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{VAR} & v[\ ] \\ \text{RESTR} & r[\ ] \end{bmatrix}$$

$$\textbf{mouse} \quad \lambda X.\mathit{mouse}(X) \ : \ v \multimap r$$

$$\textbf{big} \quad \lambda R.\lambda X.\mathit{big}(X, \mathcal{P}) \wedge R(X) \ : \ [v \multimap r] \multimap [v \multimap r]$$

$$\textbf{big}, \textbf{mouse} \vdash \ \lambda X.\mathit{big}(X, \mathcal{P}) \wedge \mathit{mouse}(X) : v \multimap r$$

former senator

$$\begin{bmatrix} \text{PRED} & \text{`senator'} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`former'} \end{bmatrix} \right\} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{VAR} & v[\ ] \\ \text{RESTR} & r[\ ] \end{bmatrix}$$

$$\textbf{senator} \quad \lambda X.\textit{senator}(X) \ : \ v \multimap r$$

$$\textbf{former} \quad \lambda P.\lambda X.\textit{former}(P, X) \ : \ [v \multimap r] \multimap [v \multimap r]$$

$$\textbf{former}, \textbf{senator} \vdash \lambda X.\textit{former}(\textit{senator}, X) : v \multimap r$$

Scope ambiguity = Different deductions from the same premises

alleged criminal from London

$$\left[\begin{array}{ll}\text{PRED} & \text{`criminal'} \\ \text{ADJ} & \left\{\begin{array}{l}\left[\begin{array}{ll}\text{PRED} & \text{`alleged'}\end{array}\right] \\ \left[\begin{array}{ll}\text{PRED} & \text{`from'} \\ \text{OBJ} & \left[\begin{array}{ll}\text{PRED} & \text{`London'}\end{array}\right]\end{array}\right]\end{array}\right\}\end{array}\right] \rightsquigarrow \left[\begin{array}{ll}\text{VAR} & v[\ ] \\ \text{RESTR} & r[\ ]\end{array}\right]$$

criminal	$\lambda X.\mathit{criminal}(X)$	$: \ v \multimap r$
alleged	$\lambda P.\lambda X.\mathit{alleged}(P, X)$	$: \ [v \multimap r] \multimap [v \multimap r]$
from-London	$\lambda R.\lambda X.\mathit{from}(X, \mathit{London}) \wedge R(X)$	$: \ [v \multimap r] \multimap [v \multimap r]$

Two deductions from the same premises:

$$\textbf{alleged}, \textbf{criminal}, \textbf{from-London} \vdash$$
$$\lambda X.\textit{alleged}(\lambda Y.\textit{criminal}(Y) \wedge \textit{from}(Y, \textit{London}), X) : v \multimap r$$

$$\textbf{alleged}, \textbf{criminal}, \textbf{from-London} \vdash$$
$$\lambda X.\textit{alleged}(\textit{criminal}, X) \wedge \textit{from}(X, \textit{London}) : v \multimap r$$

We have seen:

- Nouns and their modifiers at the syntax-semantics interface: How modified meanings are obtained

Next:

- A puzzle: Modifying a modifier

‘Recursive modification’ (Kasper 1995)

Swedish

$$\lambda P.\lambda X.\mathit{Swedish}(X) \wedge P(X) : [v \multimap r] \multimap [v \multimap r]$$

apparently Swedish

$$\lambda P.\lambda X.\mathit{apparently}(\mathit{Swedish}(X)) \wedge P(X) : [v \multimap r] \multimap [v \multimap r]$$

General problem for categorial-style analyses.

Solution: Decomposition of meaning of modifiers.

$$m\begin{bmatrix}\text{ADJ} & \left\{ s\begin{bmatrix}\text{PRED} & \text{`Swedish'}\end{bmatrix} \right\}\end{bmatrix} \qquad m_\sigma\begin{bmatrix}\text{VAR} & v[\,] \\ \text{RESTR} & r[\,]\end{bmatrix} \qquad s_\sigma\begin{bmatrix}\text{VAR} & sv[\,]\end{bmatrix}$$

Swedish1 $\lambda X.\textit{Swedish}(X) \;:\; [sv \multimap s_\sigma]$

Swedish2 $\lambda Q.\lambda P.\lambda X.Q(X) \wedge P(X) \;:\; [sv \multimap s_\sigma] \multimap [[v \multimap r] \multimap [v \multimap r]]$

Original adjective meaning **Swedish**
deducible from **Swedish1** and **Swedish2**

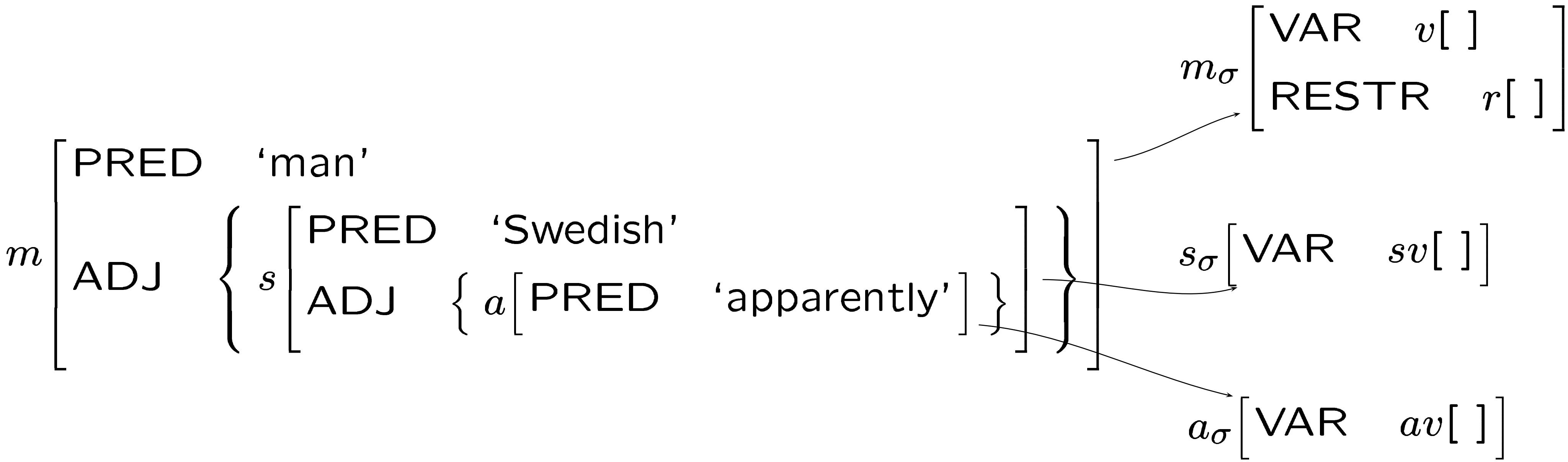
Swedish1 $\lambda X.\textit{Swedish}(X)$: $[sv \multimap s_\sigma]$

Swedish2 $\lambda Q.\lambda P.\lambda X.Q(X) \wedge P(X)$: $[sv \multimap s_\sigma] \multimap [[v \multimap r] \multimap [v \multimap r]]$

$\textbf{Swedish1}, \textbf{Swedish2} \vdash$

$$\lambda P.\lambda X.\textit{Swedish}(X) \wedge P(X) : [v \multimap r] \multimap [v \multimap r]$$

[[apparently Swedish] man]



$$\lambda X.\textit{apparently}(\textit{Swedish}(X)) \wedge \textit{man}(X) : v \multimap r$$

Combining **apparently** with **Swedish1**

apparently	$\lambda R.\lambda X.\textit{apparently}(R(X))$	:	$[sv \multimap s_\sigma] \multimap [sv \multimap s_\sigma]$
Swedish1	$\lambda X.\textit{Swedish}(X)$	:	$[sv \multimap s_\sigma]$

$$\textbf{apparently}, \textbf{Swedish1} \vdash$$
$$\lambda X.\textit{apparently}(\textit{Swedish}(X)) : [sv \multimap s_\sigma]$$

Combining **app-Sw**, **Swedish2**, and **man**

app-Sw $\lambda X.\textit{apparently}(\textit{Swedish}(X)) \;:\; [sv \multimap s_\sigma]$

Swedish2 $\lambda Q.\lambda P.\lambda X.Q(X) \wedge P(X) \;:$
$[sv \multimap s_\sigma] \multimap [[v \multimap r] \multimap [v \multimap r]]$

man $\lambda X.\textit{man}(X) \;:\; v \multimap r$

app-Sw, **Swedish2**, **man** $\vdash$
$\lambda X.\textit{apparently}(\textit{Swedish}(X)) \wedge \textit{man}(X) : v \multimap r$

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