SPR4106 – Syntax and semantics in formal terms

Lecture II: Functional structure

12 February 2015

What's in an f-structure?

- The functional structure is where LFG models *grammatical functions*
- Grammatical functions do not correspond one to one to either c-structure or semantics (thematic roles), so they need a separate representation
- The functional structure is modelled in an *attribute-value matrix*, i.e. a set of attributes with certain values
- The attributes are either grammatical functions (subject, object etc.), or syntactically relevant features such as *tense*, *number*, *gender* etc.
- Three types of values:
  - linguistic "atoms" such as *plural*, *singular*, *present* etc.
  - new, embedded feature structures
  - semantic symbols, "predicators"

Sample f-structure

$$\begin{bmatrix} \text{PRED} & \text{'SEE <SUBJ, OBJ>'} \\ \text{TENSE} & \text{PRESENT} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'PETER'} \\ \text{NUMBER} & \text{SG} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'MARY'} \\ \text{NUMBER} & \text{SG} \end{bmatrix} \end{bmatrix}$$

- The value of PRED is always a *semantic symbol*
- Syntactic features such as TENSE and NUMBER take atomic values such as PRESENT
- The values of grammatical functions are feature structures

Features

- There is a "received set" of grammatical functions in LFG, but no corresponding received set of features that are not grammatical functions
- The usual suspects are traditional features like TENSE, NUMBER, GENDER, DEF; there are also less typical features like PCASE
- Will vary with the morphological resources of the language, but should *not* be equated with morphological features
  - Morphological features are only present in the f-structure if they are *syntactically relevant*
  - Words can "speak about their environment": contribute features to other f-structures than their own (agreement)

Semantic symbols

- Semantically contentful words are represented with semantic symbols

saw	‘SEE <SUBJ, OBJ> ’
John	‘JOHN’
him	‘PRO’
rains	‘RAIN < > SUBJ’

- the semantic symbol includes a representation of the meaning (conventionally in English)
- words that require arguments also list these
- semantic arguments are listed inside angular brackets, non-thematic (purely syntactic) arguments outside
- unique to each instance!

Argument functions

SUBJ	subject
OBJ	object
OBJ2	second object (NB: sometimes called OBJ_θ)
OBL_θ	oblique
COMP	complement clause
POSS	(certain) arguments of nouns

Non-argument functions

FOCUS	focus
TOPIC	topic
ADJ	adjunct

Classifying grammatical functions

- In stating generalizations it is often useful to refer to certain classifications of GFs
- SUBJ, OBJ and OBJ_2 are collectively known as core functions or term functions
- Many grammatical process are sensitive to the functional hierarchy
  - $\text{SUBJ} > \text{OBJ} > \text{OBJ}_2 > \text{OBL}_\theta$
- TOPIC, FOCUS and sometimes SUBJ are referred to as grammaticized **discourse functions** or **overlay functions**

Subcategorization

- Our VP rule $\rightarrow$ V DP DP PP* (IP|CP) would seem to allow the following sentences (given that all nodes are optional)

(1) I donated a book to the library.

(2) *I donated to the library.

(3) *I donated the university a book to the library.

- The c-structures are all well-formed. Instead, the ungrammaticality is accounted for at f-structure

(In)completeness

$$\begin{bmatrix} \textsc{pred} & \text{`}\textsc{donate}\ \textsc{<subj, obj, obl}_{goal}\ \textsc{obj>}\text{'} \\ \textsc{subj} & \begin{bmatrix} \text{“I”} \end{bmatrix} \\ \textsc{obl}_{goal} & \begin{bmatrix} \textsc{pcase} & \textsc{obl}_{goal} \\ \textsc{obj} & \begin{bmatrix} \text{“}\textsc{the library}\text{”} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(4) *I donated to the library.

- All argument functions specified in the value of the PRED feature must be present in the local f-structure

(In)coherence

$$\begin{bmatrix} \text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\text{ OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{“I”} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{“A BOOK”} \end{bmatrix} \\ \text{OBJ}_2 & \begin{bmatrix} \text{“THE UNIVERSITY”} \end{bmatrix} \\ \text{OBL}_{goal} & \begin{bmatrix} \text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & \begin{bmatrix} \text{“THE LIBRARY”} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(5) *I donated the university a book to the library.

- All argument functions in an f-structure must be selected by their local PRED

Grammaticality

$$\begin{bmatrix} \text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\text{ OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{“I”} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{“A BOOK”} \end{bmatrix} \\ \text{OBL}_{goal} & \begin{bmatrix} \text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & \begin{bmatrix} \text{“THE LIBRARY”} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Expletives

- Some lexical items – e.g. expletives (*there, it*) and idiom chunks (*keep the tabs on*) – are meaningless; they do not provide a PRED-value
- Some predicates, e.g. *rain*, require purely syntactic (non-thematic) arguments
- We modify completeness and coherence to account for these

Completeness All argument functions specified in the value of the PRED feature must be present in the local f-structure. All functions that receive a thematic role must have a PRED feature.

Coherence All argument functions in an f-structure must be seleected by their local PRED. Any argument function that has its own PRED feature must be assigned a thematic role

What goes wrong here?

(6) *We rain

$$\begin{bmatrix} \text{PRED} & \text{`RAIN} < > \text{SUBJ'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{NUMBER} & \text{PLURAL} \\ \text{PERSON} & 1 \end{bmatrix} \end{bmatrix}$$

- Incoherent!

What goes wrong here?

(7) *I donated there to the library

$$\begin{bmatrix}
\text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\text{ OBJ>'} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{PERSON} & 1 \\ \text{NUMBER} & \text{PL} \end{bmatrix} \\
\text{OBJ} & \begin{bmatrix} \text{PERSON} & 3 \end{bmatrix} \\
\text{OBL}_{goal} & \begin{bmatrix} \text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`LIBRARY'} \\ \text{DEF} & + \\ \text{PERSON} & 3 \end{bmatrix} \end{bmatrix}
\end{bmatrix}$$

Extended coherence

- What about discourse functions and adjuncts?
- There something wrong with these:
  - *It that came rained.
  - *The man who I saw the woman crossed the street.
- Intuitively, meaningless items cannot be modified, and discourse functions (*who*) must not "dangle"

Extended coherence

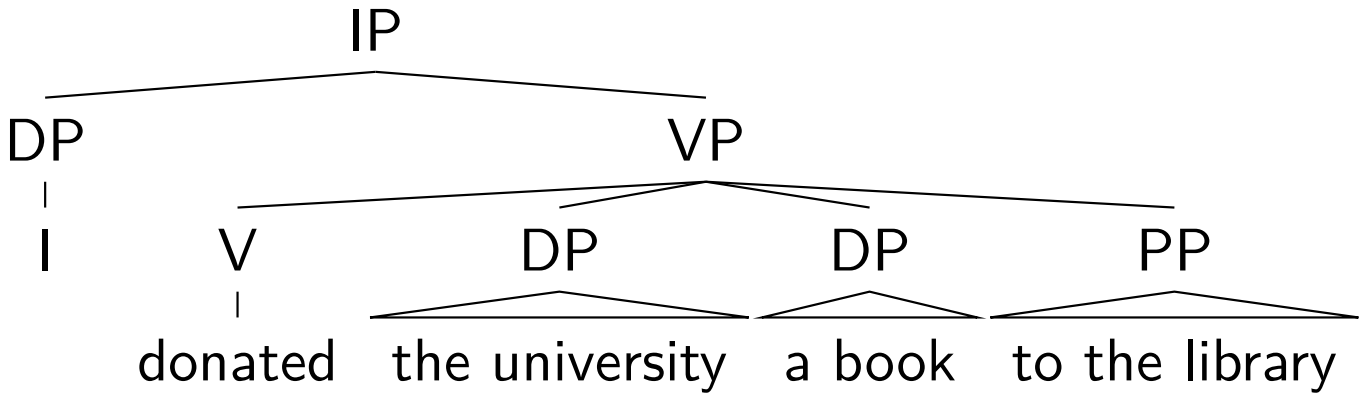
All functions in an f-structure must be incorporated into the semantics. Argument functions are subject to the Coherence condition. Discourse functions must be identified with arguments or adjuncts. Adjuncts must be in f-structures containing PREDs.

Uniqueness

- Every attribute has a single value.
- This falls out of the formal setup of LFG
- So we disallow f-structures with, say, two different tense values or two different objects
- What about adjuncts?

Relating c- and f-structures

(8) *I donated the university a book to the library.



$$\begin{bmatrix} \text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\text{ OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{“I”} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{“A BOOK”} \end{bmatrix} \\ \text{OBJ2} & \begin{bmatrix} \text{“THE UNIVERSITY”} \end{bmatrix} \\ \text{OBL}_{goal} & \begin{bmatrix} \text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & \begin{bmatrix} \text{“THE LIBRARY”} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Relating c- and f-structure

- The c-structure is well-formed by the phrase structure rules and the first f-structure is well-formed by the principles we just saw, and yet something is clearly wrong.
- Informally, the c-structure and the f-structure do not *correspond* in the required way
- The second, incoherent f-structure is intuitively the correct correspondent to the c-structure
- Intuitively, the f-structure that corresponds to the c-structure is the one that contains all the information in the c-structure (and nothing more)
- Technically, we will say that a c-structure and an f-structure correspond iff the f-structure is the minimal solution to the f-description offered by the c-structure

F-structures as functions

$$f_1\begin{bmatrix}
\text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\text{ OBJ>'} \\
\text{SUBJ} & f_2\begin{bmatrix}\text{“I”}\end{bmatrix} \\
\text{OBJ} & f_3\begin{bmatrix}\text{“A BOOK”}\end{bmatrix} \\
\text{OBL}_{goal} & f_4\begin{bmatrix}\text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & f_5\begin{bmatrix}\text{“THE LIBRARY”}\end{bmatrix}\end{bmatrix}
\end{bmatrix}$$

- $f_1(\text{SUBJ}) = f_2$, or in LFG notation $(f_1\ \text{SUBJ}) = f_2$
- $(f_1\ \text{OBJ}) = f_3$, $(f_1\ \text{OBL}_{goal}) = f_4$, $(f_4\ \text{OBJ}) = f_5$
- $(f_1\ \text{PRED}) =$ ‘donate <SUBJ, OBJ, OBL_{goal} OBJ>’
- $(f_4\ \text{PCASE}) = \text{OBL}_{goal}$

F-descriptions

- Equations such as $(f_1\ \text{SUBJ}) = f_2$ are known as functional descriptions
- We extracted f-descriptions from the f-structure, but it works the other way around too: we can build an f-structure from the f-description

$$f_1\begin{bmatrix}
\text{PRED} & \text{`DONATE <SUBJ, OBJ, OBL}_{goal}\ \text{OBJ>'} \\
\text{SUBJ} & f_2\begin{bmatrix}\text{“I”}\end{bmatrix} \\
\text{OBJ} & f_3\begin{bmatrix}\text{“A BOOK”}\end{bmatrix} \\
\text{OBL}_{goal} & f_4\begin{bmatrix}\text{PCASE} & \text{OBL}_{goal} \\ \text{OBJ} & f_5\begin{bmatrix}\text{“THE LIBRARY”}\end{bmatrix}\end{bmatrix}
\end{bmatrix}$$

- $(f_1\ \text{SUBJ}) = f_2$
- $(f_1\ \text{OBJ}) = f_3$
- $(f_1\ \text{OBL}_{goal}) = f_4$
- $(f_4\ \text{OBJ}) = f_5$
- $(f_1\ \text{PRED}) =$ ‘donate $<\text{SUBJ}, \text{OBJ}, \text{OBL}_{goal}\ \text{OBJ}>$’
- $(f_4\ \text{PCASE}) = \text{OBL}_{goal}$

The f-structure contains all and only the information in the f-descriptions

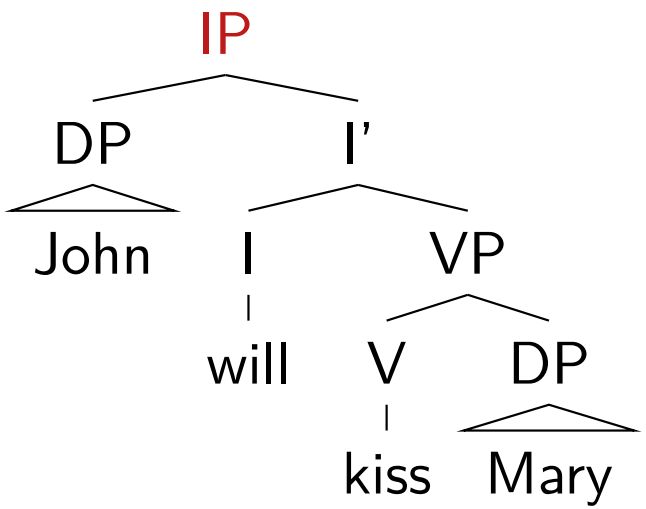
An aside: Identification

- We have several statements about f_1, e.g.
  - $(f_1\ \text{SUBJ}) = f_2$
  - $(f_1\ \text{OBJ}) = f_3$
- We could also state this in the following way:
  - $(f_1\ \text{SUBJ}) = f_2$
  - $(f_5\ \text{OBJ}) = f_3$
  - $f_1 = f_5$
- The minimal solution remains the same, because the labels aren't essential

$$f_1, f_5 \begin{bmatrix} \text{SUBJ} & f_2 \begin{bmatrix} \end{bmatrix} \\ \text{OBJ} & f_3 \begin{bmatrix} \end{bmatrix} \end{bmatrix}$$

Unification

- Why would we want to do such a thing?
- Syntactic information can arise in different places in the c-structure
- We want to be able to *unify* this information in a single f-structure



- The IP node "knows" that *John* is the subject
- The VP node "knows" that *Mary* is the object
- The I node "knows" that the tense is future
- The V node "knows" that PRED is 'kiss <SUBJ, OBJ >'
- We want to *unify* this information

Unification II

- The unification of two f-structures A and B is the f-structure C such that it contains all attribute value-pairs of from A and B
- So we collect all features from both f-structures
- If there are duplicated attribute-value pairs, that is not a problem
- If there are conflicting values for the same attribute, the result will fail uniqueness and hence not be a licit f-structure

Unification III

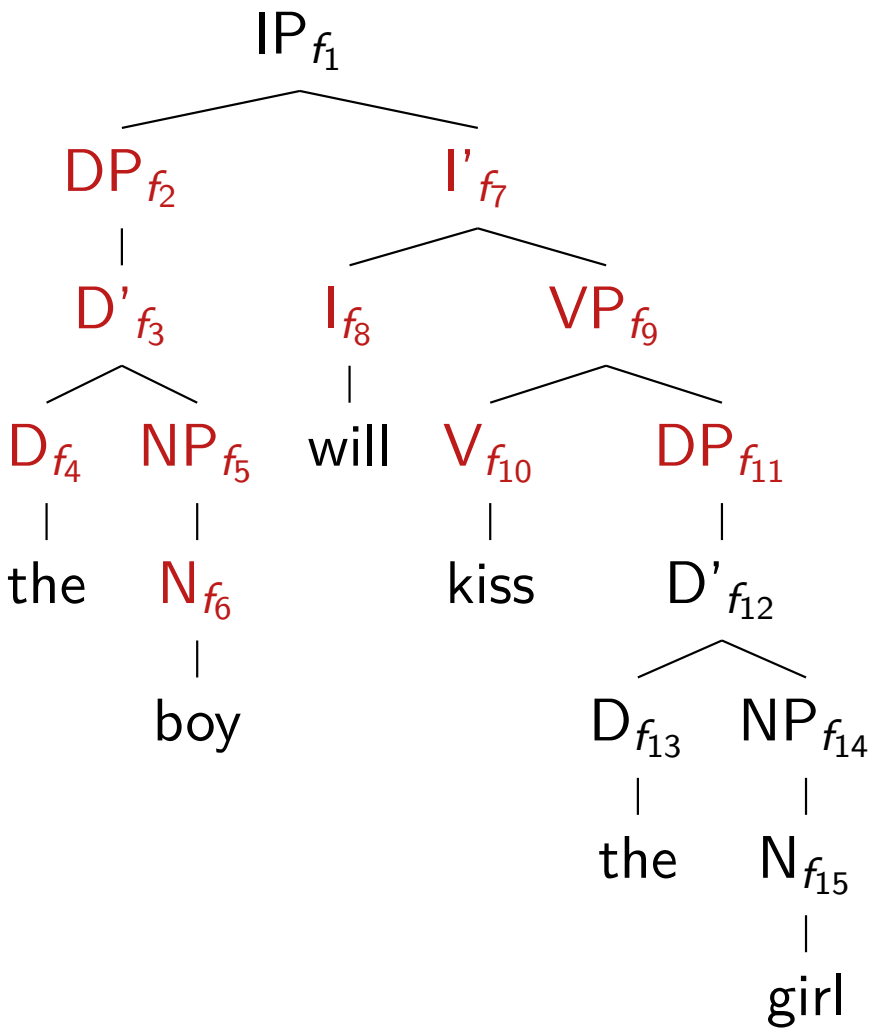
$$\begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \end{bmatrix} + \begin{bmatrix} \text{GENDER} & \text{FEM} \end{bmatrix} = \begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \\ \text{GENDER} & \text{FEM} \end{bmatrix}$$

$$\begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \\ \text{GENDER} & \text{FEM} \end{bmatrix} + \begin{bmatrix} \text{GENDER} & \text{FEM} \end{bmatrix} = \begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \\ \text{GENDER} & \text{FEM} \end{bmatrix}$$

$$\begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \\ \text{GENDER} & \text{FEM} \end{bmatrix} + \begin{bmatrix} \text{GENDER} & \text{MASC} \end{bmatrix} = \begin{bmatrix} \text{NUMBER} & \text{SG} \\ \text{PERSON} & 3 \\ \text{GENDER} & \text{FEM} \\ \text{GENDER} & \text{MASC} \end{bmatrix}$$

$$\begin{bmatrix} \text{PRED} & \text{`RAIN} < > \text{SUBJ'} \end{bmatrix} + \begin{bmatrix} \text{PRED} & \text{`RAIN} < > \text{SUBJ'} \end{bmatrix} = \begin{bmatrix} \text{PRED} & \text{`RAIN} < > \text{SUBJ'}_1 \\ \text{PRED} & \text{`RAIN} < > \text{SUBJ'}_2 \end{bmatrix}$$

Back to the c-/f-structure mapping



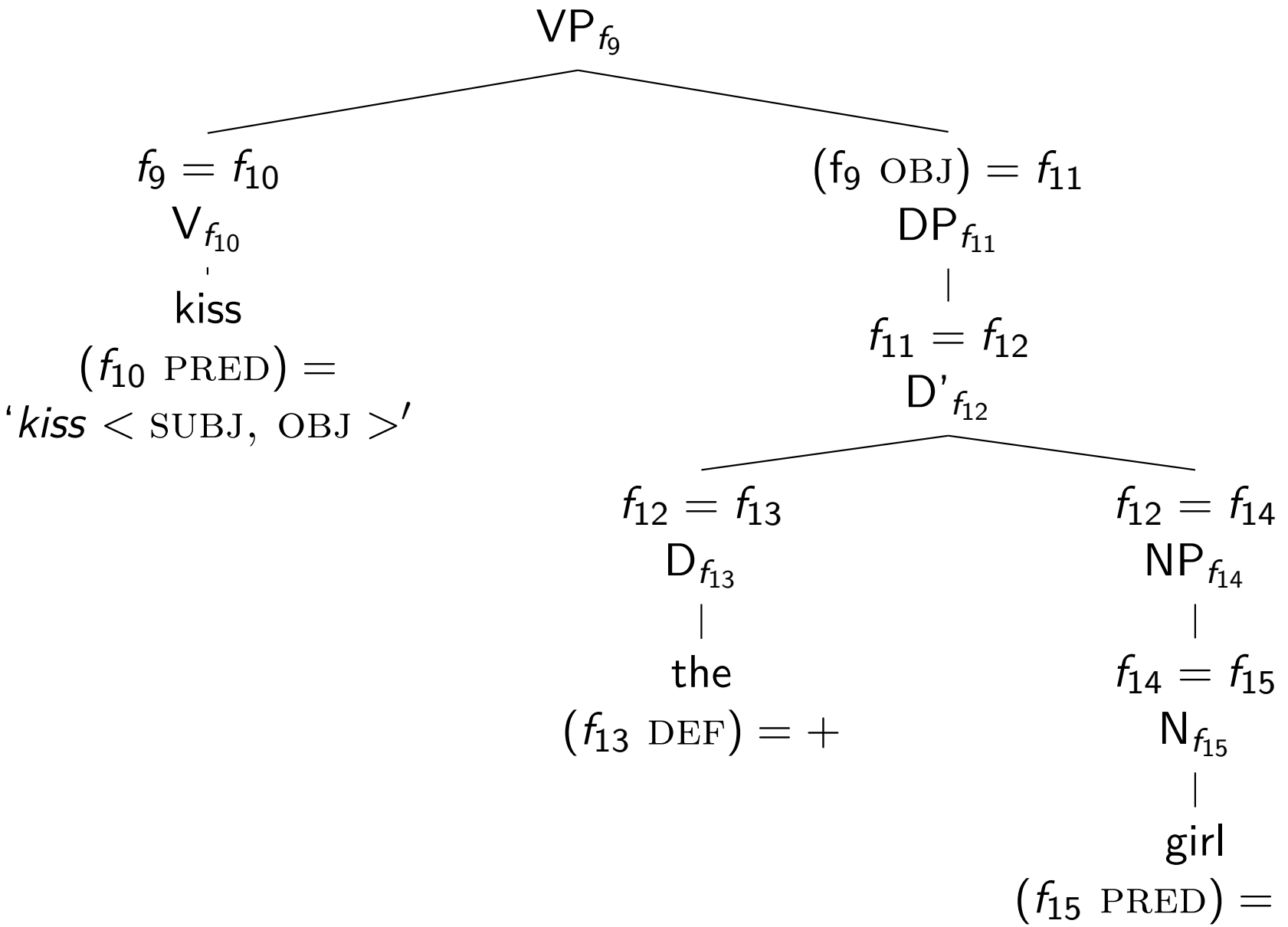
- $(f_1\ \textsc{subj}) = f_2$
- $f_2 = f_3$
- $f_3 = f_4$, $(f_4\ \textsc{def}) = +$
- $f_3 = f_5$
- $f_5 = f_6$, $(f_6\ \textsc{pred}) =$ '*boy*'
- $f_1 = f_7$
- $f_7 = f_8$, $(f_8\ \textsc{tense}) = \textit{fut}$
- $f_7 = f_9$
- $f_9 = f_{10}$, $(f_{10}\ \textsc{pred}) =$ '*kiss* $<$ $\textsc{subj}, \textsc{obj}>$'
- $(f_9\ \textsc{obj}) = f_{11}$

The minimal solution

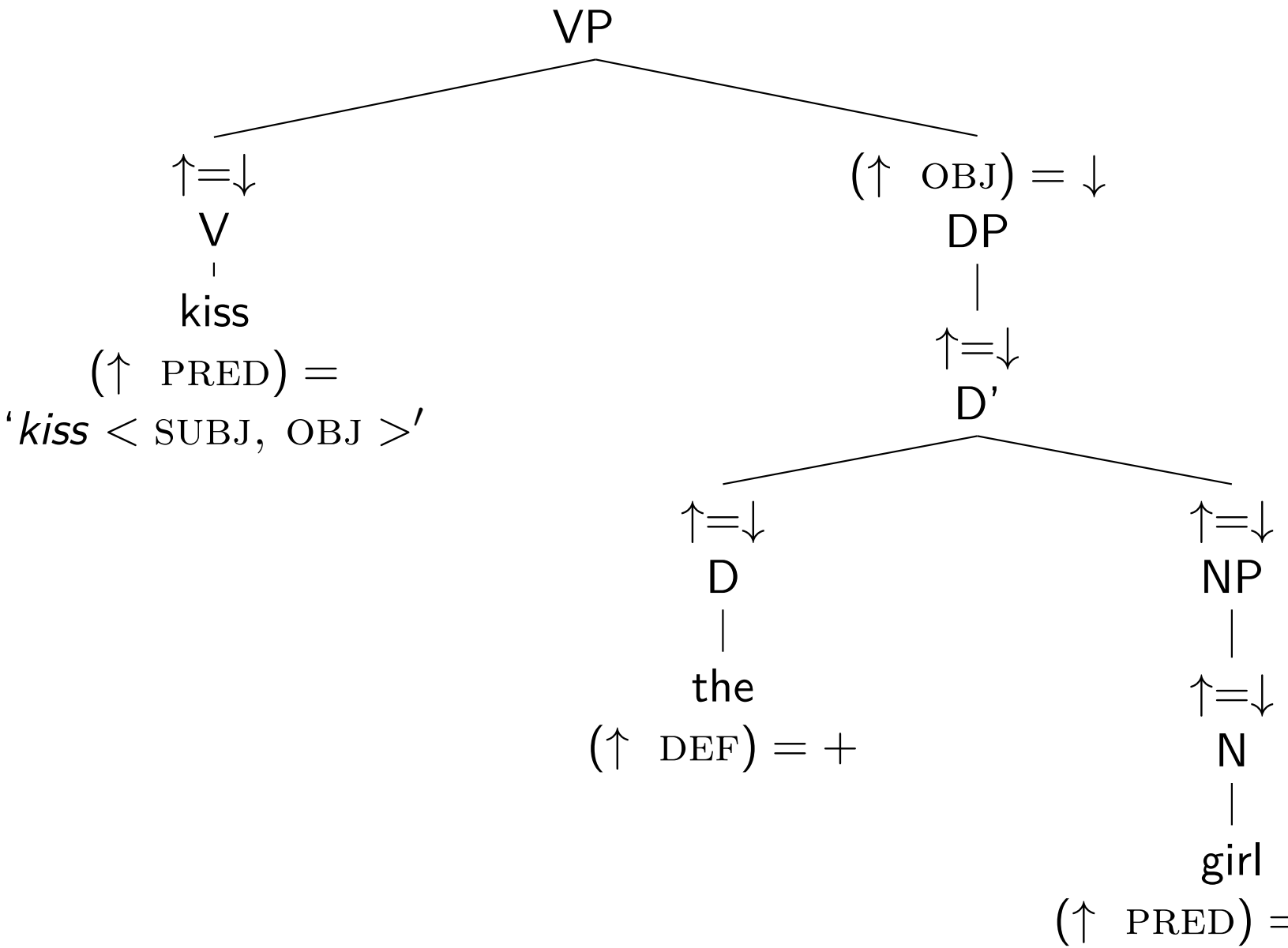
$$
f_{1,7,8,9,10}\begin{bmatrix}
\text{PRED} & \text{`KISS <SUBJ, OBJ>'} \\
\text{TENSE} & \text{FUT} \\
\text{SUBJ} & f_{2,3,4,5,6}\begin{bmatrix}\text{PRED} & \text{`BOY'} \\ \text{DEF} & +\end{bmatrix} \\
\text{OBJ} & f_{11,12,13,14,15}\begin{bmatrix}\text{PRED} & \text{`GIRL'} \\ \text{DEF} & +\end{bmatrix}
\end{bmatrix}
$$

- $(f_1\ \text{SUBJ}) = f_2$
- $f_2 = f_3$
- $f_3 = f_4$, $(f_4\ \text{DEF}) = +$
- $f_3 = f_5$
- $f_5 = f_6$, $(f_6\ \text{PRED}) = \text{`}boy\text{'}$
- $f_1 = f_7$
- $f_7 = f_8$, $(f_8\ \text{TENSE}) = fut$
- $f_7 = f_9$
- $f_9 = f_{10}$, $(f_{10}\ \text{PRED}) = \text{`}kiss < \text{SUBJ, OBJ} >\text{'}$
- $(f_9\ \text{OBJ}) = f_{11}$

The tree revisited



Introducing metavariables

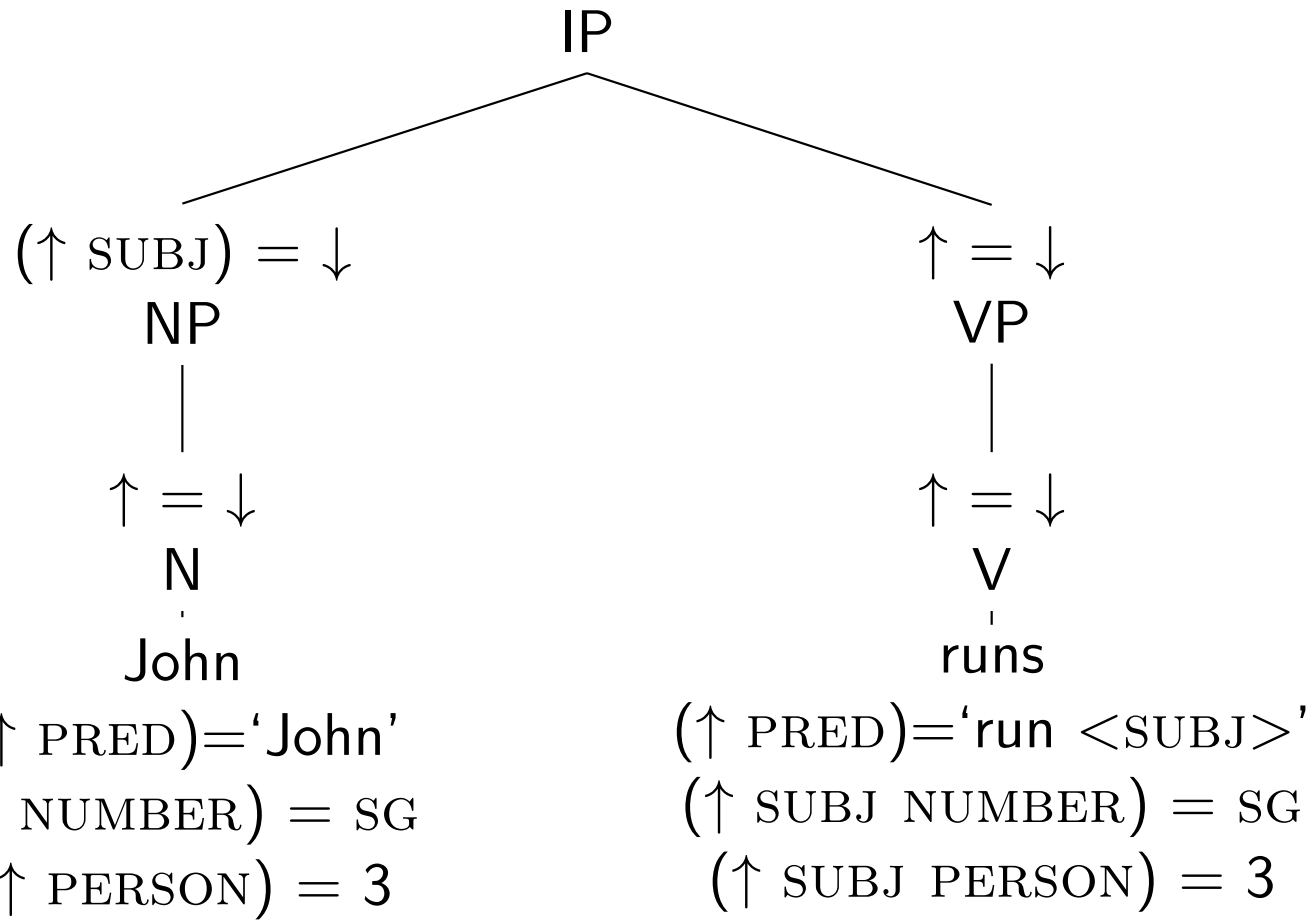


Designators

- $\downarrow$ and $\uparrow$ are metavariables referring to the f-structure of the current node and of the mother of the current node respectively
- We can form complex designators or "paths" through the f-structure
  - $(\uparrow \textsc{subj}) \equiv$ my mother's f-structure's subject
  - $(\uparrow \textsc{comp subj} \equiv$ my mother's f-structure's complement's subject
  - $(\uparrow \textsc{gf}^*) \equiv$ an f-structure arbitrarily embedded under my mother's f-structure
- We can go the other way ("outside-in"):
  - $(\textsc{subj} \uparrow) \equiv$ the f-structure that my mother is the subject of
  - $((\textsc{subj} \uparrow) \textsc{obj}) \equiv$ the object of the f-structure that my mother is the subject of

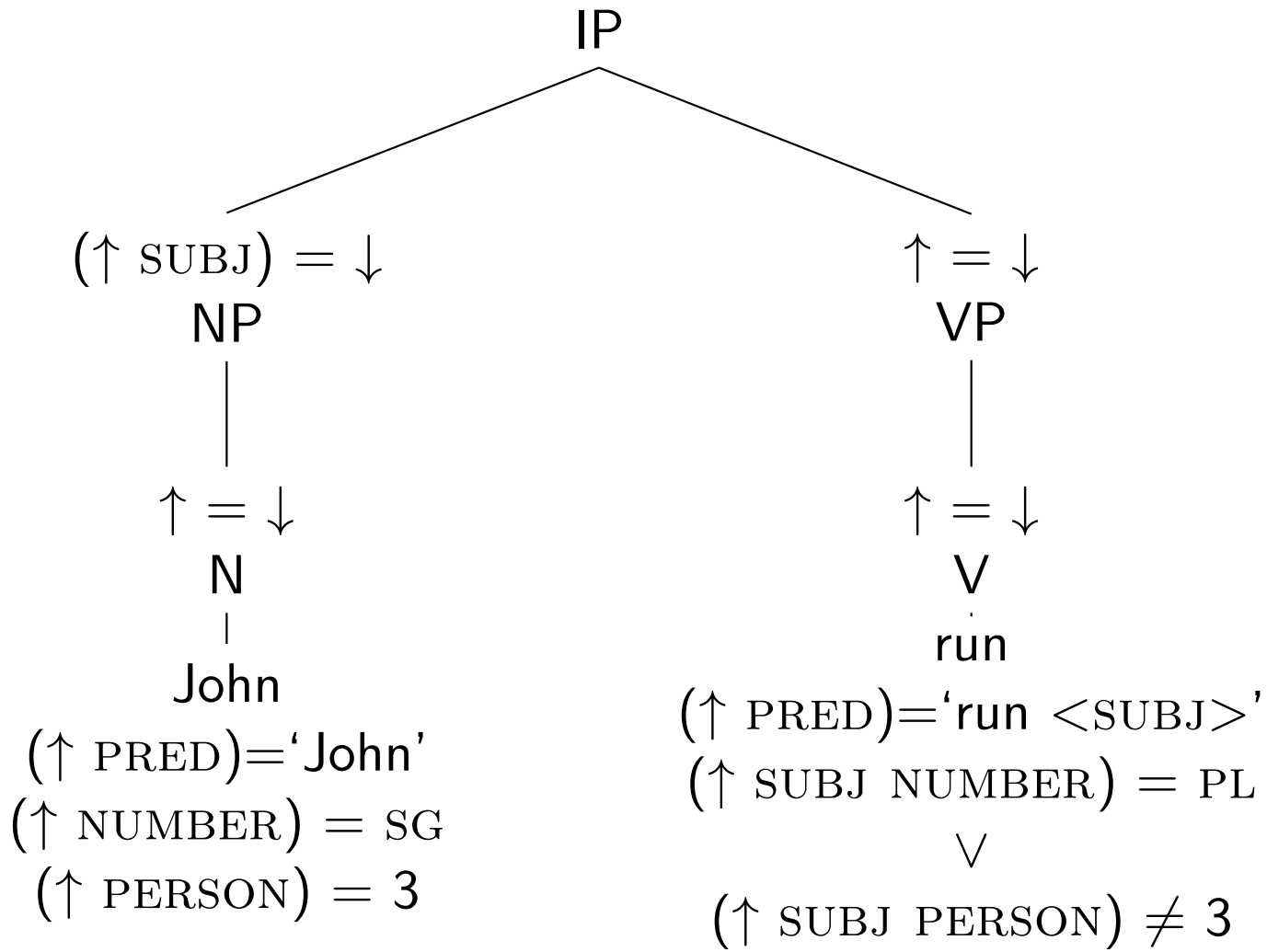
Agreement

- How can we capture agreement with lexical information?



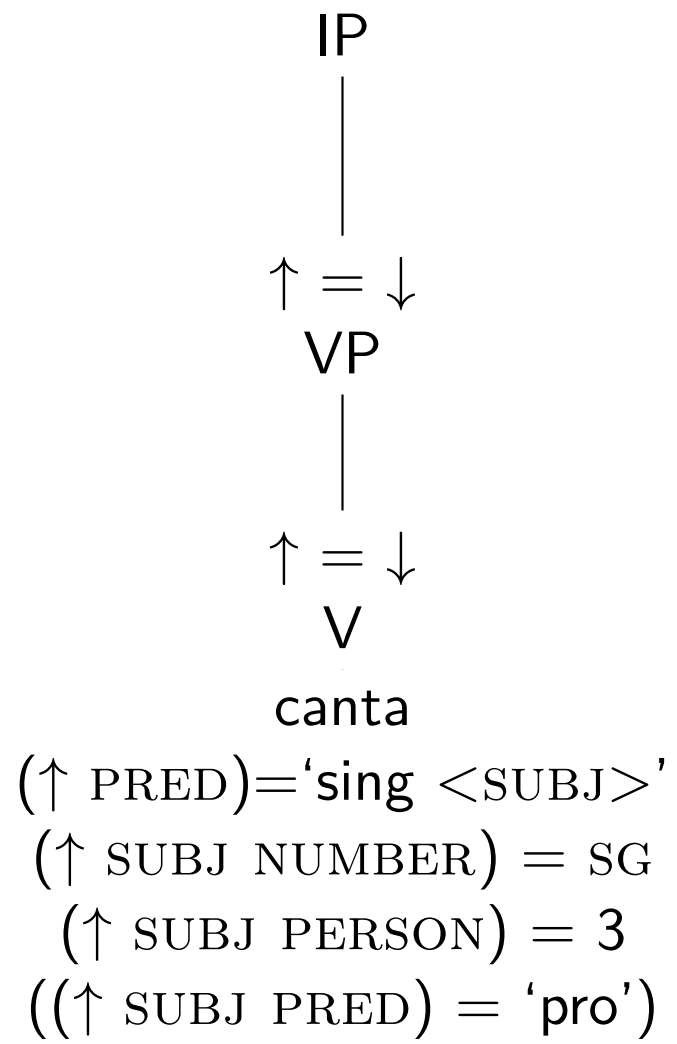
Agreement

- This one is ungrammatical - how can we capture that?



Prodrop

- This one is grammatical in Italian - how can we capture that?



Annotated phrase structure rules

Functional maximal projections

$$\begin{array}{lcccc}
\text{CP} & \rightarrow & \text{XP} & & \text{C}' \\
 & & (\uparrow \textsc{focus}) = \downarrow & & \uparrow = \downarrow \\
 & & & & \\
\text{IP} & \rightarrow & (\text{DP}|\text{CP}|\text{PP}) & & \text{I}' \\
 & & (\uparrow \textsc{subj}) = \downarrow & & \uparrow = \downarrow \\
 & & & & \\
\text{DP} & \rightarrow & \text{DP} & & \text{D}' \\
 & & (\uparrow \textsc{poss}) = \downarrow & & \uparrow = \downarrow \\
 & & (\uparrow \textsc{def}) = + & & \\
 & & (\downarrow \textsc{case}) =_c \textsc{gen} & &
\end{array}$$

Functional single-bar projections

$$\begin{array}{lcccc} C' & \rightarrow & C & & IP \\ & & \uparrow = \downarrow & & \uparrow = \downarrow \end{array}$$

$$\begin{array}{lcccc} I' & \rightarrow & I & & VP \\ & & \uparrow = \downarrow & & \uparrow = \downarrow \end{array}$$

$$\begin{array}{lcccc} D' & \rightarrow & D & & NP \\ & & \uparrow = \downarrow & & \uparrow = \downarrow \end{array}$$

Lexical phrases

VP	$\rightarrow$	V	DP*	PP*	(IP|CP)
		$\uparrow = \downarrow$	$(\uparrow \text{OBJ}) = \downarrow \vee$ $(\uparrow \text{OBJ2}) = \downarrow$	$(\uparrow \text{OBL}_\theta = \downarrow)$	$(\uparrow \text{COMP}) = \downarrow$
PP	$\rightarrow$	P	DP	PP	IP
		$\uparrow = \downarrow$	$(\uparrow \text{OBJ}) = \downarrow$	$(\uparrow \text{OBL}_\theta = \downarrow)$	$(\uparrow \text{COMP}) = \downarrow$
NP	$\rightarrow$	N	PP*	CP	
		$\uparrow = \downarrow$	$(\uparrow \text{OBL}_\theta = \downarrow)$	$(\uparrow \text{COMP}) = \downarrow$	
AP	$\rightarrow$	A	PP	(IP|CP)	
		$\uparrow = \downarrow$	$(\uparrow \text{OBL}_\theta = \downarrow)$	$(\uparrow \text{COMP}) = \downarrow$	

Constraining equations

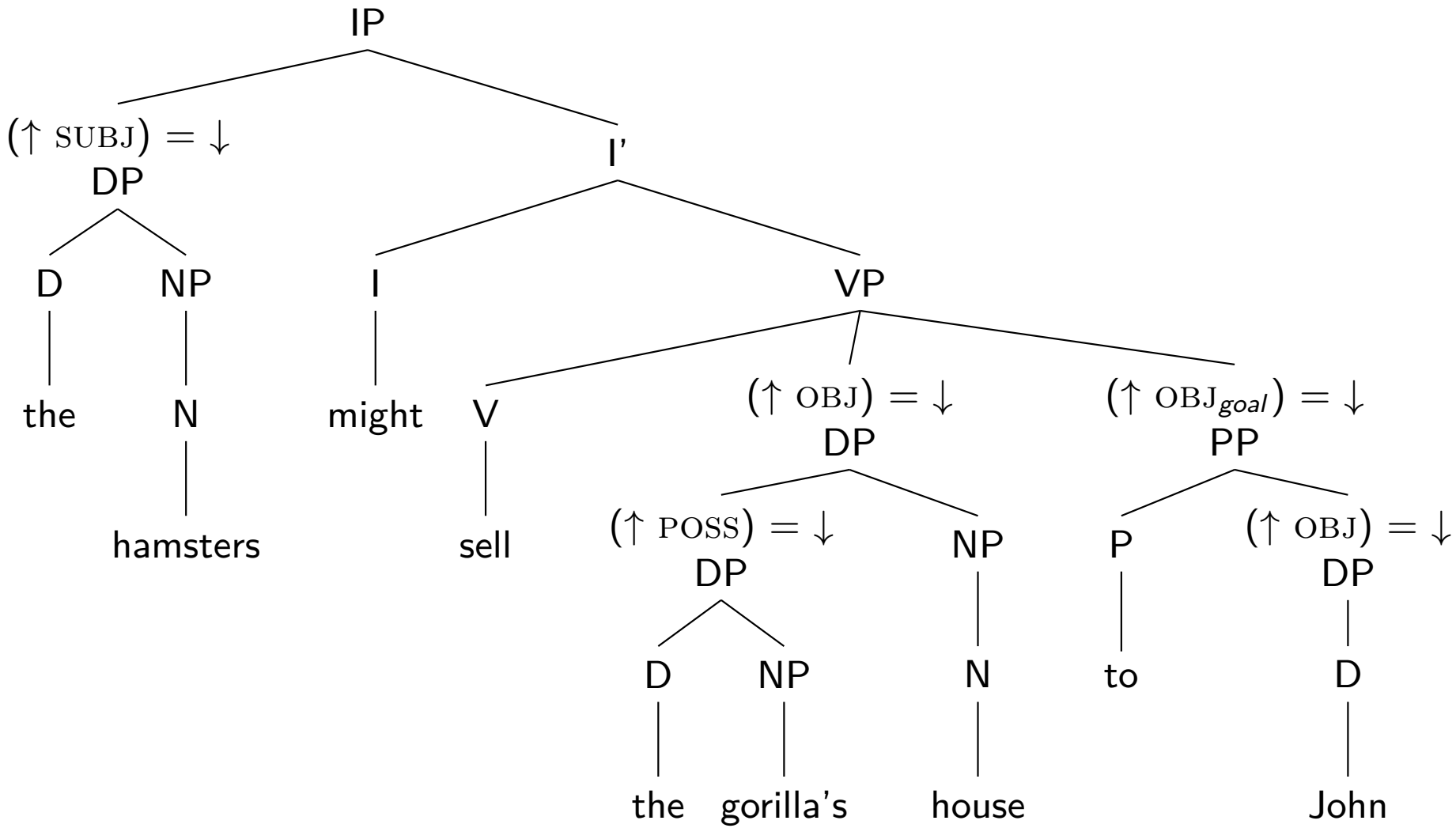
- We have already seen a couple of so-called constraining equations
  - $\textsc{person} \neq 3$
  - $\textsc{case} =_c \textsc{gen}$
- *Existential equations* are another type
  - $(\uparrow \textsc{tense})$ means $\textsc{tense}$ should have *some* value
  - $\neg(\uparrow \textsc{tense})$ means $\textsc{tense}$ should have *not* have *any* value
  - Useful for capturing the selectional restrictions of the complementizers *to* and *that*

Exercises: English (adapted from Falk 2001)

(9) The hamsters might sell the gorilla's house to John

the	D	$(\uparrow \text{DEF}) = +$
hamsters	N	$(\uparrow \text{PRED}) =$ 'hamster'
		$(\uparrow \text{NUMBER}) = \text{PL}$
might	I	$(\uparrow \text{TENSE}) = \text{PRES}$
		$(\uparrow \text{MOOD}) = \text{POSSIBILITY}$
		$(\uparrow \text{VFORM}) =_c \text{INF}$
sell	V	$(\uparrow \text{PRED}) =$ 'sell $<\text{SUBJ}, \text{OBJ}, \text{OBL}_\theta>$'
		$(\uparrow \text{VFORM}) = \text{INF}$
gorilla's	N	$(\uparrow \text{PRED}) =$ 'gorilla'
		$(\uparrow \text{NUMBER}) = \text{SG}$
		$(\uparrow \text{CASE}) = \text{GEN}$
		$(\text{POSS} \uparrow)$
house	N	$(\uparrow \text{PRED}) =$ 'house $<\text{POSS}>$'
		$(\uparrow \text{NUMBER}) = \text{SG}$
to	P	$(\uparrow \text{PRED}) =$ 'to $<\text{OBJ}>$'
John	D	$(\uparrow \text{PRED}) =$ 'John'
		$(\uparrow \text{NUMBER}) = \text{SG}$

The solution: c-structure



The solution: f-structure

$$
\begin{bmatrix}
\text{SUBJ} & \begin{bmatrix} \text{DEF} & + \\ \text{PRED} & \text{`HAMSTER'} \\ \text{NUMBER} & \text{PL} \end{bmatrix} \\
\text{TENSE} & \text{PRES} \\
\text{MOOD} & \text{POSSIBILITY} \\
\text{PRED} & \text{`SELL } \langle \text{SUBJ, OBJ, OBL}_{goal} \rangle \\
\text{VFORM} & \text{INF} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{HOUSE} \\ \text{DEF} & + \\ \text{NUMBER} & \text{SG} \\ \text{POSS} & \begin{bmatrix} \text{PRED} & \text{`GORILLA'} \\ \text{DEF} & + \\ \text{NUMBER} & \text{SG} \\ \text{CASE} & \text{GEN} \end{bmatrix} \end{bmatrix} \\
\text{OBL}_{goal} & \begin{bmatrix} \text{PRED} & \text{`TO } \langle \text{OBJ} \rangle \text{'} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`JOHN'} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

Exercises: Warlpiri (adapted from Bresnan 2001)

(10) Kurdu-jarra-rlu wita-jarra-rlu ka-pala maliki
child-DUAL-ERG small-DUAL-ERG PRES-DUAL dog-ABS
wajilipi-nyi
chase-NONPAST
'The two small children are chasing the dog.'

(11) Kurdu-jarra-rlu ka-pala maliki wajilipi-nyi
child-DUAL-ERG PRES-DUAL dog-ABS chase-NONPAST
wita-jarra-rlu
small-DUAL-ERG
'The two small children are chasing the dog.'

(12) Maliki ka-pala kurdu-jarra-rlu wajilipi-nyi
dog-ABS PRES-DUAL child-DUAL-ERG chase-NONPAST
wita-jarra-rlu
small-DUAL-ERG
'The two small children are chasing the dog.'

Exercises: Warlpiri (adapted from Bresnan 2001)

S	→	X	(Aux)	X*	(where X = NP, V)
		$(\uparrow(\text{SUBJ}\mid\text{OBJ})) = \downarrow$	$\uparrow=\downarrow$	$(\uparrow(\text{SUBJ}\mid\text{OBJ}))$	
NP	→	N*			
		$\uparrow=\downarrow$			

kurdu-jarra-rlu	N	$(\uparrow \text{PRED}) =$ 'child'
		$(\uparrow \text{NUM}) = \text{DUAL}$
		$(\uparrow \text{CASE}) = \text{ERG}$
maliki	N	$(\uparrow \text{PRED}) =$ 'dog'
		$(\uparrow \text{NUM}) = \text{SG}$
		$(\uparrow \text{CASE}) = \text{ABS}$
wita-jarra-rlu	N	$(\uparrow \text{ADJ PRED}) =$ 'small'
		$(\uparrow \text{NUM}) = \text{DUAL}$
		$(\uparrow \text{CASE}) = \text{ERG}$
wajilipi-nyi	V	$(\uparrow \text{PRED}) =$ 'chase $<\text{SUBJ}, \text{OBJ}>$'
		$(\uparrow \text{TENSE}) = \text{NONPAST}$
		$(\uparrow \text{SUBJ CASE}) = \text{ERG}$
		$(\uparrow \text{OBJ CASE}) = \text{ABS}$
ka-pala	Aux	$(\uparrow \text{ASPECT}) = \text{PRESENT.IMPERFECT}$
		$(\uparrow \text{SUBJ NUM}) = \text{DUAL}$