

The Beginnings of Semantics

LING 255

January 29, 2008

1. WORD MEANINGS

From page 6 of the notes:

- **Denotation**

The denotation of a linguistic expression x is [in some way] the thing in the real world that x corresponds to.

- **The interpretation function**

[[...]] is a function that takes a linguistic expression and returns its denotation.

[[**Snow is white**]] = TRUE, if snow is white (and false otherwise)

[[**Will Russell**]] = the particular individual named Will Russell

What about verbs (**snores**), nouns (**dog**), adjectives (**green**), articles (**the**)?

Some possibilities:

[[**snores**]] = - the worlds in which snoring goes on
- the act of snoring
- true of those individuals x who snore

[[**dog**]] = - a bunch of animals
- the concept of dogginess

[[**green**]] = - things that are green (= inexperienced; at a certain wavelength)
- the perception of greenness

[[**the**]] = - ...something to do with specificity (but what? how?)

We'll start with **snore**...

2. FORMAL SEMANTICS

(1) Abraham Lincoln snores.

(2) **The Principle of Compositionality:**

The meaning of a complex expression is determined by the meaning of its parts and the way those parts are combined.

[[Abraham Lincoln]] =  [[Abraham Lincoln snores]] = TRUE iff Lincoln snores

So [[snores]] = ...?

2.1. “the worlds in which snoring goes on”

How can we combine “Lincoln” with “the worlds in which snoring goes on”?

(3) **a possible Rule of “Noun Verb” interpretation**

If a sentence is of the form NP VP (where NP = a noun phrase, e.g. a proper name; and VP = a verb phrase, e.g. a verb like **snores**), then [[NP VP]] = TRUE if [[NP]] exists in [[VP]]

So:

- [[Lincoln snores]] = TRUE if [[Lincoln]] exists in [[snores]], i.e.,
TRUE if Lincoln exists in worlds in which snoring goes on.

That’s a legitimate meaning. Unfortunately, it happens to be wrong: more has to be true than just Lincoln existing near snoring.

2.2. “the act of snoring”

How can we combine “Lincoln” with “the act of snoring”?

(4) **another possible Rule of “Noun Verb” interpretation**

If a sentence is of the form NP VP (where NP = a noun phrase, e.g. a proper name; and VP = a verb phrase, e.g. a verb like **snores**), then [[NP VP]] = TRUE if [[NP]] does [[VP]]

So:

- $[[\text{Lincoln snores}]] = \text{TRUE}$ if $[[\text{Lincoln}]]$ does $[[\text{snores}]]$, i.e.,
TRUE if Lincoln does the act of snoring.

Again, we've gotten a legitimate meaning; and this time, it's at least closer ("Lincoln does the act of snoring" \approx "Lincoln snores").

But there are problems here. What does "does" really mean in this case? If it's just "being involved in an action", we might not be able to tell actors ("agents") from those acted upon. And some verbs don't lend themselves quite as well to "doing an action":

- $[[\text{George loves America}]] = \text{TRUE}$ if George does an act of loving America(?)
- $[[\text{Irina knows Russian}]] = \text{TRUE}$ if Irina does an act of knowing Russian(?)

So this isn't going to work very generally.

2.3. "true of those individuals who snore"

The final suggestion, that $[[\text{snores}]] = \text{"true of those individuals who snore"}$, is going to get us closer to what we want. The suggestion at this point was that, rather than have a rule of interpretation that uses "exists in" or "does", we could have a rule that used the mathematical formalism. That way, there wouldn't be any vagueness or ambiguity.

2.3.1. The interpretation rule: set version

(5) The Rule of "Noun Verb" interpretation

If a sentence is of the form NP VP (where NP = a noun phrase, e.g. a proper name; and VP = a verb phrase, e.g. a verb like **snores**), then $[[\text{NP VP}]] = \text{TRUE}$ if $[[\text{NP}]] \in [[\text{VP}]]$

This requires that $[[\text{snores}]]$ denotes a *set*, namely $\{x \mid x \text{ snores}\}$. Then we have:

- $[[\text{Lincoln snores}]] = \text{TRUE}$ if $[[\text{Lincoln}]] \in [[\text{snores}]]$, i.e.,
TRUE if Lincoln is in the set $\{x \mid x \text{ snores}\}$

And this seems to be exactly what we want.

2.3.2. *The interpretation rule: function version*

Because we can swap in the characteristic function of a set in place of the set, we could have instead:

- **[[snores]]** = the characteristic function of $\{x \mid x \text{ snores}\}$, i.e., that function from individuals to truth values such that, given an individual, it returns TRUE if and only if that individual snores.
- (6) **The Rule of “Noun Verb” interpretation**
If a sentence is of the form NP VP (where NP = a noun phrase, e.g. a proper name; and VP = a verb phrase, e.g. a verb like **snores**), then $[[\text{NP VP}]] = \text{TRUE}$ if $[[\text{VP}]][[\text{NP}]]$
- **[[Lincoln snores]]** = TRUE if $[[\text{snores}]][[\text{Lincoln}]]$, i.e.,

TRUE if and only if the **[[snores]]** function, when given Lincoln, returns TRUE (which only happens when Lincoln snores), i.e.

TRUE if and only if Lincoln snores

For the next few weeks, the function version is going to be easier to deal with.

Terminological note: applying a function to an argument is called **FUNCTION APPLICATION**.

3. A SYNTACTIC DIGRESSION

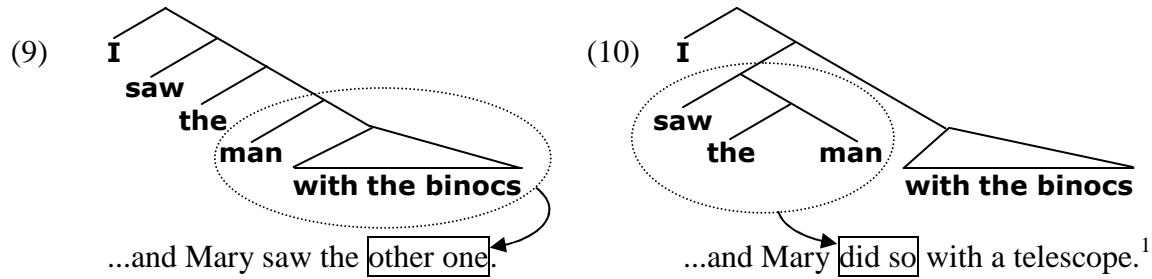
As it happens, we shouldn't really be interpreting “NP VP” or “Lincoln snores”. Why? Because [at least some] ambiguity is the result of differences in *structure*, i.e. syntax.

- A non-structural ambiguity*
- (7) I went to the bank.
= “I went to the financial institution.”
= “I went to the edge of the river.”

The ambiguity here relies only on an ambiguity in one of the words.

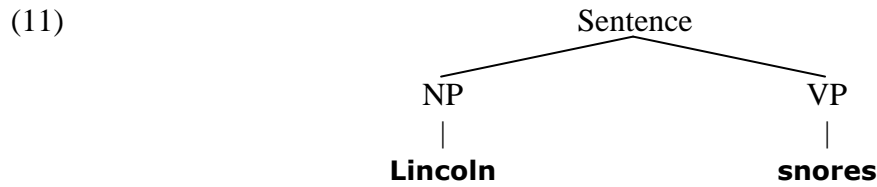
- A structural ambiguity*
- (8) I saw the man with the binoculars.
= “There was a man with binoculars, and I saw him.”
= “There was a man, and using binoculars I saw him.”

Why is this structural? In part, because the difference in meaning doesn't reside in any of the words. And in part, because we can detect different structures for the meanings...



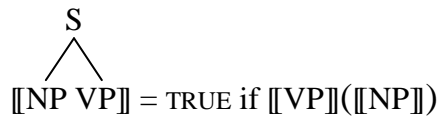
3.1. What this means for us

So rather than **Lincoln snores**, we should really be interpreting:

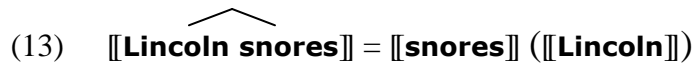


Thus:

- (12) **The Rule of “Noun Verb” interpretation (roughly final version)**
 If we have a Sentence node, and its daughters are NP and VP, then



And our interpretation is actually on the structure, not just the series of words:



¹ Some really quick terminology and conventions: these are called **TREES**; each point in the tree is a **NODE**; the **DAUGHTERS** of a node are the ones that branch off immediately below it; and the triangle indicates “there’s internal structure here, but it’s left out because it’s not relevant”.