Homework 5

Ling 255

Due: March 25

In this homework, you will explore two notions that have been claimed to be related: that of upward/downward entailment and negative polarity items.

1. DIRECTIONAL ENTAILMENT AND "NEGATIVE POLARITY"

The words called "negative polarity items" (or NPIs) are those which, at first glance, require the presence of a negative word such as *not* or *never*. Compare:

(1) a. Leslie has not **ever** been to Spain.
b. * Leslie has **ever** been to Spain.

(2) a. Leslie hasn't come home **yet**.
b. * Leslie has come home **yet**.

(3) a. Leslie never **lifts a finger** to help me clean the house.
b. * Leslie **lifts a finger** to help me clean the house.[1]

(Exercise, not part of the homework: what are some other NPIs?)

So far, so good. But in fact, the distribution of these items is broader than just "when the word *not* appears in the sentence." For example:

(4) a. No [student who's **ever** taken a linguistics course] [has disliked it].
b. No [student] [has **ever** disliked a linguistics course].

The brackets here indicate the two separate $\langle e, t \rangle$-denoting phrases that *no* takes as its two arguments.

The naïve linguist might respond, "Well, the meaning of *no* is kind of like the meaning of *not*." But you aren't that naïve. Your first task: prove that there's more going on than just that.

[1] This has a very literal meaning: somehow, the lifting of Leslie's finger was of assistance. But unlike (3a), where it means "make a minimal effort", (3b) cannot mean "Leslie made a minimal effort to help me clean the house." Ignore the literal meaning.

1.1. Exercise

Consider the following determiners, none of which have a particularly *not*-like meaning:

every, some, most, exactly three

For each one, try putting a negative polarity item in (a) its first argument, as in (4a), and (b) its second argument, as in (4b). Based on your judgments, which determiners allow NPIs in which arguments?

Important caveat: as with everything we do, the data can get quite subtle quite quickly. **Ever** is going to be the clearest NPI in these tests. Note that **yet** has a usage parallel to (2b) which doesn't require a "not":

(5) Leslie has **yet** to come home.

That'll need to be considered a different usage. Also, when the sentences are embedded, the facts change:

(6) If Leslie has **ever** been to Spain, I'd be surprised.

So don't get *too* clever in your sentences; it's easy to introduce an accidental complication.

2. NPIS: THE THEORY

Two linguists, Fauconnier and Ladusaw, independently proposed in the 1970s that there's a property of determiners at work here (one that's shared by *not*, among other things). Just like symmetry, transitivity, conservativity, and so on, they considered whether a determiner is **upward entailing** or **downward entailing** (or perhaps both, or perhaps neither) for each of its two arguments.

The intuition is that given a set and a superset of that set, an upward entailing context is one in which a sentence using the set entails one using the superset; but not vice versa. (That is, you can make the inference "upward" from smaller set to larger set.) For instance:

⟦broccoli⟧ ⊂ ⟦vegetable⟧
Bill ate broccoli entails **Bill ate a vegetable**. (from set to superset)
Bill ate a vegetable does not entail **Bill ate broccoli**. (from superset to set)

Remember that "entailment" means that whenever the first sentence is true, the second sentence must be true as well. The truth conditions of the sentences here are such that, if the world is such that Bill ate broccoli, it must also be true that he ate a vegetable; but the world can be such that Bill ate a vegetable but did not eat broccoli.

A downward entailing context is one in which a sentence using the superset entails the one using the set; but not vice versa. For instance:

⟦**senator**⟧ ⊂ ⟦**politician**⟧
Bill is not a politician entails **Bill is not a senator**. (from superset to set)
Bill is not a senator does not entail **Bill is not a politician**. (from set to superset)

Thus, *not* creates a downward entailing environment. The hypothesis in Fauconnier and Ladusaw: **NPIs can appear in an environment if and only if it is downward-entailing.** The key fact about *no*, then, is not "it's like *not*", but "it's downward entailing on both arguments":

No politician likes broccoli entails *No senator likes broccoli*.
No politician likes vegetables entails *No politician likes broccoli*.

So *no* follows the Fauconnier-Ladusaw hypothesis: it's downward entailing on both arguments and allows NPIs in both arguments.

2.1. Exercise

Once again, consider the determiners **every, some, most, exactly three**. Using entailment tests like those above, decide for each of them whether each of the two arguments is downward-entailing, upward-entailing, both, or neither.

3. ENTAILMENT: TECHNICAL MEANINGS

After we tested our intuitions about the transitivity, symmetry, and reflexivity of **every**, **some**, and so forth, we tested the denotations we had written to see whether they had the same properties. We can do the same with upward/downward entailment:

(7) ⟦**no**⟧ = $\lambda P . \lambda Q . P \cap Q = \varnothing$
⟦**no** *A B*⟧ = TRUE iff ⟦*A*⟧ ∩ ⟦*B*⟧ = ∅

If we replace *A* with a superset of *A*, the truth of **no A B** may change: the superset may include new elements that are also in *B*, making the intersection non-empty. So the denotation of *no* is **not upward entailing** on its first argument; entailment does not hold from the set to the superset. However, if we replace *A* with a subset of *A*, the truth doesn't change: taking elements out of *A* will not add anything to its intersection with *B*. So the denotation is **downward entailing** on its first argument. (The same logic holds for the second argument.) So the denotation agrees with our judgments: downward entailing on both positions.

3.1. Exercise

For each of the determiners...

$[\![every]\!] = \lambda P . \lambda Q . P \subseteq Q$
$[\![some]\!] = \lambda P . \lambda Q . P \cap Q \neq \varnothing$
$[\![most]\!] = \lambda P . \lambda Q . |P \cap Q| > k|P|$ (For some *k* determined by context, between 0 and 1 but closer to 1.)
$[\![three]\!] = \lambda P . \lambda Q . |P \cap Q| = 3$ (that is, ⟦*exactly three*⟧, as opposed to the real "≥ 3" meaning)

...consider its denotation, and what happens when you replace P with a superset or subset, and what happens when you replace Q with a superset or subset, as with *no* above. According to these tests, are the determiners upward/downward entailing on each argument?

4. SUMMARY

Comment on the extent to which your judgments on the NPI properties and the entailment properties of the determiners matches (a) the Fauconnier-Ladusaw hypothesis and (b) the determiner denotations.