Truth-conditional compositional semantics

Readings: Portner, Ch. 1.3 (start from *As English speakers, we know…*)–2.4; optional: 2.5

1. What is this course about?

- Subfields of linguistics:
  - *Phonetics* and *phonology* study linguistic sounds.
  - *Morphology* studies words and their structure.
  - *Syntax* studies the structure of sentences.
  - *Lexical semantics* studies the meaning of and relationships between individual words
  - ***Truth-conditional semantics*** (a.k.a. *formal semantics*) studies the meaning of sentences.
  - ***Pragmatics*** studies the way in which context influences meaning (more on this next week!).
- Basic question: how does a sentence end up associated with meaning?

2. Meanings of sentences as truth conditions

In-class Exercise 1

- Draw a scenario T in which (1) is true and another one, F, in which it is false (*inside* should be understood as 'completely inside').

(1) The triangle is inside the circle.

- Now add a few more scenarios to your drawing above, different from your original scenarios T and F and from each other (for example, they can contain other figures), such that they all contain one and only one triangle, but in some of them (1) is true and in some of them it's false. Circle the "true set".

- In-class Exercise 1 relies on the idea that if you know what the sentence means, you know in which scenarios it's true and in which it's false, i.e., you know its *truth conditions*.
- Truth conditions vs. *truth values*. Do you know the truth value of the sentence in (2)? Do you know its truth conditions?

(2) It was raining in Saint Petersburg on August 23, 1989, at 6am.

2.1. Sets of possible worlds

- We can think of the scenarios we drew in In-class Exercise 1 as partial depictions of *possible worlds*.
- We can then model *denotations* of (declarative) sentences as sets of possible worlds in which those sentences are true. We call such sets of possible worlds *propositions*.
- Parallel between nouns and sentences: the noun *triangle* denotes the set of all things that are triangles, and the sentence *The triangle is inside the square* denotes the set of all possible worlds in which this sentence is true.

2.2. Why think of meanings of sentences as truth conditions?

- Reason 1: to capture the meaning of *logical connectives*, such as *and*, *or*, and *not*.

In-class Exercise 2

- Go back to your drawing from In-class Exercise 1 and shade some of the triangles in the "true set" and in the "false set".
- Now identify the scenarios in which the sentence in (3c) is true.

(3) a. The triangle is inside the circle.
b. The triangle is shaded.
c. The triangle is inside the circle and the triangle is shaded.

- Logical connectives allow us to perform operations on sets. E.g., we can think of conjunction as *intersection* of two sets. Draw a diagram below that represents two propositions and their conjunction. Use two overlapping circles to represent the propositions, and shade the area corresponding to their conjunction.

- Reason 2: to capture intuitive relationships between sentences, such as entailment or contradiction.
  - Sentence (4b) is true whenever (4a) is true. We say that (4a) *entails* (4b).

(4) a. There is a shaded triangle inside the circle.
b. There is a triangle inside the circle.

– Sentence (5a) is false whenever (5b) is true, and vice versa. We say that (5a) and (5b) *contradict* each other.

(5) a. The triangle is inside the circle.
b. The circle is inside the triangle.

In-class Exercise 3

- Draw two diagrams representing entailment and contradiction. In each diagram use two circles to represent two propositions.

- Reason 3: to model beliefs and belief updates, desires, etc. via possible worlds. E.g., imagine you don't know if (2) is true. The set of worlds compatible with your beliefs will contain both the worlds in which it was raining in Saint Petersburg on August 23, 1989, at 6am, and the worlds in which it wasn't. What happens if I utter (2) (and you choose to believe me)?

2.3. Fitting non-declarative sentences into truth-conditional semantics

- How do sentences like (6) and (7) fit into truth-conditional semantics?

(6) Who ate the cookies?

(7) Eat the cookies!

- We can think of questions as denoting sets of propositions that can serve as answers to those questions. What would be the denotation of (6) then?
- We can think of imperatives as denoting sets of "satisfactory" worlds. What would be the denotation of (7) then?

3. Compositional semantics

3.1. The gist of compositional semantics

- How do we get to a sentence's truth conditions from the meanings of its parts? This is the main question of *compositional semantics*.
- For example, we know what it takes for (8a) and (8b) to be true. But how do we know it?

(8) a. Neil giggles.
b. Marilyn giggles.

- Both (8a) and (8b) consist of an NP (*Neil* and *Marilyn*, respectively) and a VP *giggles*. What do these parts mean and how do we combine them?
- *Neil* and *Marilyn* are *names*, which simply refer to the individuals thus named.
- We can think of a VP *giggles* as an incomplete, or an *unsaturated*, proposition, which we call a *predicate*. A predicate needs to combine with an *argument* (or multiple arguments) to become a proposition.
- In (8a) *giggles* is saturated by *Neil*, and in (8b) it is saturated by *Marilyn*. Depending on what the actual world is like, the sentences might be true or false, but we don't need to know if they are true or false to know their truth conditions.

In-class Discussion

- How can we convince ourselves that sentence meanings get computed from syntactic structures rather than from strings of words?

- How can we convince ourselves that the principle of compositionality is plausible? Why not just assume that people learn the meaning of sentences by heart?

What you need to know

Key notions: truth conditions, truth value, possible world, denotation, proposition, logical connective, entailment, contradiction, compositionality, name, predicate, argument, saturation

Answers to the following questions:

- Why should we think of meanings of sentences as their truth conditions?
- How do we model declarative sentences, questions, and imperatives via possible worlds?
- How do we model the meaning of *and*, *or*, and *not* via possible worlds?
- How do we arrive at the truth conditions of simple sentences consisting of a proper name and an intransitive verb?