„Semantic Theory“ SS 06 Exercise 1 (25/04/2006)

http://www.coli.uni-saarland.de/courses/semantics-06/

1 Lexical ambiguity

Explore the WordNet lexicon and find a word with a really high number of senses. You can access WordNet online at `http://wordnet.princeton.edu/cgi-bin/webwn`. Discuss whether you believe that the word has all these senses, and whether you find all the sense distinctions convincing.

2 Formalising natural-language sentences

Give formulas of first-order predicate logic that represent the truth conditions of the following sentences as closely as possible. You can ignore tense and use a single predicate symbol to represent several words where appropriate.

(a) It is raining.

(b) John loves Mary.

(c) All students are intelligent.

(d) If Mary attends a semantics course, she is bored or she learns something interesting.

(e) Nobody is loved by no one.

(f) Dolphins are mammals that live in the sea.

(g) Every student presents at least one exercise solution in class.

3 Formalising natural-language arguments

For each of the following arguments from the lecture, formalise each sentence as a formula of first-order predicate logic. Then add axioms of lexical or world knowledge (where this is necessary) such that the consequence logically follows from the premises together with the axioms. Explain why each entailment holds.

(a) John loves Mary. Mary is a woman. Therefore, John loves a woman.

(b) Every student is intelligent. John is not intelligent. Therefore, John is not a student.

(c) Every student is intelligent. John is stupid. Therefore, John is not a student.

(d) John takes a train to Paris. Therefore, John takes a train to France.

4 Status of logical formulas

For each of the following logical sentences, decide whether it is logically valid, unsatisfiable, or contingent. For valid and unsatisfiable sentences, explain why you believe it is valid or unsatisfiable. For contingent sentences, give a model and a countermodel.

(a) $\forall x.P(x) \wedge \forall y.Q(y) \wedge (\exists z.\neg P(z) \vee \exists x.\neg Q(x))$

(b) $(\forall x.\mathsf{student}(x) \rightarrow \mathsf{intelligent}(x)) \rightarrow (\exists y.\mathsf{student}(y) \wedge \mathsf{intelligent}(y))$

(c) $(\forall x.P(x) \wedge \forall y.Q(y)) \rightarrow \forall x.(P(x) \wedge Q(x))$

(d) $\forall x.(\mathsf{student}(x) \rightarrow \mathsf{person}(x))$

5 Semantic representations in type theory

Find formulas of λ-free type theory that represent the truth conditions of the following sentences as accurately as possible. You can represent words that are connected by hyphens (such as "the-president" or "lives-in") as single constants of an appropriate type. The comments in *italics* are hints that are meant to help you get the intended meaning of the sentences.

(a) John gives Mary the-book.

(b) Peter owns a red car.

(c) The-president rarely sleeps.

(d) Presumably, the-president lives-in a very nice house.

(e) Mary eats only a sandwich. *(and she doesn't eat anything else)*

(f) Mary only EATS a sandwich. *(and she doesn't do anything else with it)*

Can you also find a representation for "Mary only eats a sandwich" *(and doesn't do anything else)*?

To be turned in by 02/05/2006, 11:15 am