Lecture 13

LCD 306: Semantics & Pragmatics

C.N. Serrano Madsen II
Queens College
CUNY

Thursday 26 March 2015

Outline

Table of Contents

Quiz

- Review Grade
- Bimodal distribution with a large number of high marks and a decent amount of par marks

Calendar

- 26 March: *PC and Entailments*
- 31 March: *Quantifiers*
- 2 April: **Group presentations**

Calendar

- 5 April: Post-presentation write-up
- 7 April: Spring Break
- 9 April: Spring Break
- 13 April: Exam II and mid-term course assessment
- 14 April: Class resumes

Table of Contents

Table of Contents

Meaning

We have been talking about what it means to *mean* something at the following levels

- Proposition
- Word

Predicate Logic

How do we deal with *meaning* at the level of...

- Proposition: Propositional Logic
  - Truth: True or False
- Word: Sense and Reference
  - Sets of real world entities

Predicate Logic

How do we handle the meaning of lexemes other than concrete nouns

- Adjectives?
  - Properties of an entity
- Verbs?
  - Properties of an entity
  - Relation between entities

Predicate Logic

Properties of an entity & relation between entities are formalized and conceptualized using sets

Predicate Logic

We can talk about meaning in terms of sets

- Using set theory,
- Propositional logic, and
- Predicate Logic. . .
- We can discuss compositional meaning

Table of Contents

Predicate Logic

- We begin with Propositional Logic

Predicate Logic

Predicate logic is an enrichment of propositional logic

- the logical connectives $\neg, \vee, \wedge, \rightarrow, \leftrightarrow$
- the brackets '(' and ')'

Well-formed formulae

The set of wff (aka grammatical sentences) in Predicate Logic is defined recursively as follows:

- If ϕ is a formula in PL, then $\neg\phi$ is a formula in PL.

Well-formed formulae

The set of wff (aka grammatical sentences) in Predicate Logic is defined recursively as follows:

- If ϕ and ψ are formulae in PL, then so are $(\phi \vee \psi)$, $(\phi \wedge \psi)$, $(\phi \rightarrow \psi)$, $(\phi \leftrightarrow \psi)$.

Table of Contents

Predicate Logic

- Recall that we can think of the world as being $U_{<w,t>} = \{u : u \in U\}$
- Enrich our vocabulary (notation system) with the following...

Predicate Logic

The additional vocabulary of (first-order) predicate logic consists of the following:

- a set of constant symbols a, b, c, etc.
- a set of variable symbols x_1, x_2, etc.

Constant Symbols

a, b, c

- The meaning of a
- $[[a]] = \{x : x \text{ is denoted by } a\}$

Variable Symbols

x_1, x_2, x_3

- A "placeholder" which gets meaning through an assignment function
- Some function checks through $u \in U_{<w,t>}$

Table of Contents

Predicate Logic

The vocabulary of (first-order) predicate logic consists of the following:

- a set of predicate letters P, Q, R, etc., each having its own fixed *arity* (e.g. unary symbols, binary symbols, etc).

Well-formed formulae

The set of wff (aka grammatical sentences) in Predicate Logic is defined recursively as follows:

- If P is an n-ary predicate letter and $t_1, \cdots, t_n$ are constant and/or variable symbols, then $P(t_1, \cdots, t_n)$ is a formula in PL.

Predicates

- One place predicate: $P(a)$
- Two place predicate: $P(a, b)$
- Three place predicate: $P(a, b, c)$

Reading predicate logic symbols

$P(a)$

- the meaning of a is an element in the meaning of P
- $[[a]] \in [[P]]$

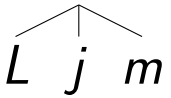
Reading predicate logic symbols

$P(a, b)$

- the meaning of ordered set $< a, b >$ is an element in the meaning of P
- $[[< a, b >]] \in [[P]]$

Ternary Branching

Differences between PL syntax and Chomskian syntax

- 

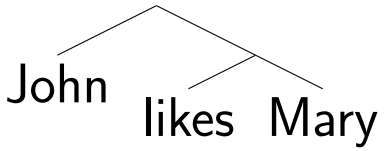
- 

Table of Contents

Predicate Logic

The vocabulary of (first-order) predicate logic consists of the following:

- the quantifiers $\forall, \exists$ ("for-all", and "exists").

Well-formed formulae

The set of wff (aka grammatical sentences) in Predicate Logic is defined recursively as follows:

- If ϕ is a formula in PL and x is a variable symbol, then $\forall x\phi$ and $\exists x\phi$ are formulae in PL.

Universal Quantifiers

"every person is friendly"

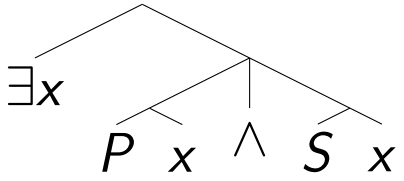
- $\forall x(P(x) \rightarrow F(x))$

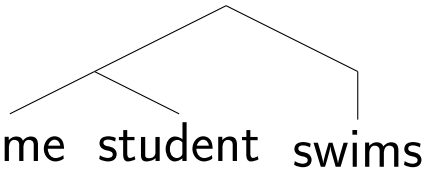
Existential Quantifer

"some student swims"

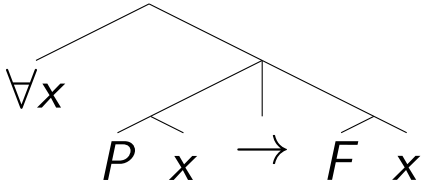
- $\exists x(P(x) \wedge S(x))$

Syntactic arrangement differences

- 

- 

Syntactic arrangement differences

- 

-