Lecture 14

LCD 306: Semantics & Pragmatics

C.N. Serrano Madsen II
Queens College
CUNY

Tuesday 31 March 2015

Outline

1. Administrativa
2. Predicate Logic
   - Quantifiers

Table of Contents

Quiz

Group Experiments	30%	→	28%
Assignments	10%	→	9%
Exam 1	20%	→	19%
Exam 2	20%	→	19%
Exam 3	20%	→	19%
Quiz		→	5%

Calendar

- 31 March: *Quantifiers*
- 2 April: **Group presentations**

Table of Contents

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 $(\phi \vee \psi)$, $(\phi \wedge \psi)$, $(\phi \rightarrow \psi)$, $(\phi \leftrightarrow \psi)$.

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.

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.

Thematic Heirarchy

UTAH: *Agent* $<$ *Theme* $<$ *Experiencer* $<$ *Other*

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"

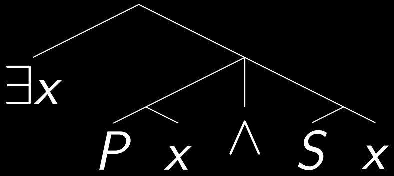
- $\forall x(P(x) \rightarrow F(x))$

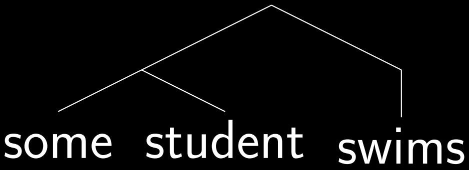
Existential Quantifer

"some student swims"

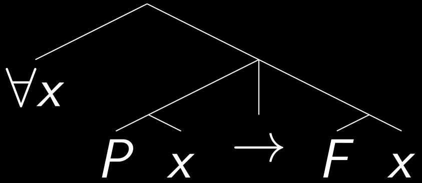
- $\exists x(P(x) \land S(x))$

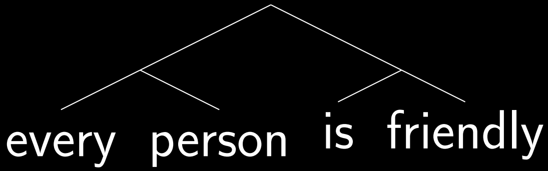
Syntactic arrangement differences

- 

- 

Syntactic arrangement differences

- 

- 

Negation

What is the negation of the universal?

- the existence of one case
- $\neg(\forall x(P(x)) \leftrightarrow \exists x(\neg P(x))$

Negation

- $\neg\forall x[S(x)] \leftrightarrow \exists x[\neg S(x)]$
  - "Not all students smoke" is equivalent to "some students don't smoke"
- $\forall x[\neg S(x)] \leftrightarrow \neg\exists x[S(x)]$
  - "All students don't smoke" is equivalent to "no student smokes"

Negation

What is the negation of the existential?

- every entity doing P
- $\neg(\exists x(P(x))) \leftrightarrow \forall x(\neg P(x))$

Negation

- $\neg(\exists x[S(x)]) \leftrightarrow \forall x[\neg S(x)]$
  - “No student smokes” is equivalent to “all students don’t smoke”
- $\exists x[\neg S(x)] \leftrightarrow \neg\forall x[S(x)]$
  - “Some student doesn’t smoke” is equivalent to “Not all students smoke”