Tutorial

http://www-rohan.sdsu.edu/~gawron/semantics

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Overview

Outline

Statement logic

1. Translate into statement logic Be sure and represent all the connectives of statement logic explicitly. ($\rightarrow$, $\wedge$, $\vee$, $\neg$, $\leftrightarrow$). For Example:

Bill did not smile at Mary

p = *Bill smiled at Mary*
$\neg p$

If Bill did not smile at Mary, Mary danced a jig

p = *Bill smiled at Mary*
q = *Mary danced a jig.*
$\neg p \rightarrow q$

Basic assumptions

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   Bill did not smile at Mary

p = *Bill did not smile at Mary*
p

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   truth conditions, no more, so equivalent sentences get same translation:

   a. *Bill did not smile at Mary.*
   b. *It is not the case that Bill smiled at Mary.*

Conjunction

1. Bill and Mary smoked.
2. Bill smoked and Mary smoked

$$
\begin{aligned}
&p = \text{Bill smoked} \\
&q = \text{Mary smked} \\
&p \wedge q
\end{aligned}
$$

Outline

Connectives

(both) ... and	$\wedge$, &	$p \wedge q$
		(Both) John and Bill awakened.
		Sue awakened (both) John and Bill.
(either) ... or	$\vee$	$p \vee q$
		(Either) John or Bill awakened.
		Sue awakened John or Bill.
not	$\sim$	$\sim p$
		John didnt sleep.
		It's not the case that John slept.
neither .. nor		Neither Sue nor Mary slept.
		Sue neither ran nor swam.
not ... nor		John didnt sleep (and) nor did Sue.
unless		John will win unless he withdraws.
because		Give up!

Connective Principle

Sentential Connective principle

To translate an English sentence using a sentential connective of statement logic, you must find a logically equivalent sentence in which two full sentences are connected by an appropriate conjunction.

John and Bill awakened.	John awakened and Bill awakened. p = John awakened ; q = Bill awakened p & q awaken(j) & awaken(b)
Sue awakened John and Bill.	Sue awakened John and Sue awakened Bill. p = Sue awakened John; q = Sue awakened Bill p & q awaken2(s,j) & awaken2(s,b)

Further cases

a. Everyone with a cat or a dog is invited.
b. Everyone with a cat is invited or everyone with a dog is invited.
c. John didn't eat a donut or a muffin.
d. John didn't eat a donut or John didn't eat a muffin.

Note: These examples are important because if they AREN'T equivalent, we are completely out of tricks. We can't translate these sentences with our current translation rules, yet we have a pretty clear idea the truth conditions of *or* play a role.

Questions

a. Everyone with a cat or a dog is invited.
b. Everyone with a cat is invited or everyone with a dog is invited.
c. John didn't eat a donut or a muffin.
d. John didn't eat a donut or John didn't eat a muffin.

1. Are (a) and (b) equivalent? If not, describe a situation in which (a) is true, and (b) is not (or vice versa). To make it clear, have "everyone" be some set of people clear from context (Alice, Bob, Carol, and Doug are popular because of their first initials), and describe which of them is invited, and which have dogs and which have cats.
2. Are (c) and (d) equivalent? Same challenge. If not, give an example in which one is true and the other isn't.

Neither John nor Bill awakened.

John didn't awaken and Bill didn't awaken.

Q = awaken; p = John Q'ed ; q = Bill Q'ed

$\sim p \& \sim q$

$\sim (p \vee q)$

Truth table

J. Q'ed	B. Q'ed	Neither J. nor B. Q'ed	$\sim p \& \sim q$	$\sim (p \vee q)$
T	T	F	F	F
T	F	F	F	F
F	T	F	F	F
F	F	T	T	T

1. Bill or Sue saw Tom

p = Bill sleeps

q = Sue sleeps

$p \vee q$

2. Bill saw Tom and Al

$$p = \text{Bill saw Tom}$$
$$q = \text{Bill saw Al}$$
$$p \wedge q$$

3. Bill or Sue saw Tom and Al. Two possibilities. Which is right?

   (Bill or Sue saw Tom) and (Bill or Sue saw Al).
   (Bill saw Tom or Sue saw Tom) and (Bill saw Al or Sue saw Al)

   This is true if Bill saw Tom and Sue saw Al.

   (Bill saw Tom and Al) or (Sue saw Tom and Al).
   (Bill saw Tom and Bill saw Al) or (Sue saw Tom and Sue saw Al)

   This is false if Bill saw Tom and Sue saw Al.