IA165

Combinatory Logic for Computational Semantics

Spring 2012

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Some Tools

- https://files.nyu.edu/cb125/public/Lambda/ski.html (Chris Barker)
  - S-K-I proofness checking
- http://www.angelfire.com/tx4/cus/combinator/birds.html (Chris Rathman)
  - elementary combinators calculator
- http://svn.ask.it.usyd.edu.au/trac/candc/wiki/Demo (Johan Bos)
  - based on the DRT (generation of the DRS)
  - Boxing: process of turning real texts into the box-like semantic representation used in DRT
  - http://homepages.inf.ed.ac.uk/jbos/comsem/book2.html

Summing up-1

- Combinators

- elementary combinators: B, C, W, C*, Φ ...
- derived combinators
  - Deferred combinators: B_2, C_3...
  - Powers of combinators: B^3, C^2...

==> Remind the beta-reduction rules of each combinator

Summing up–2

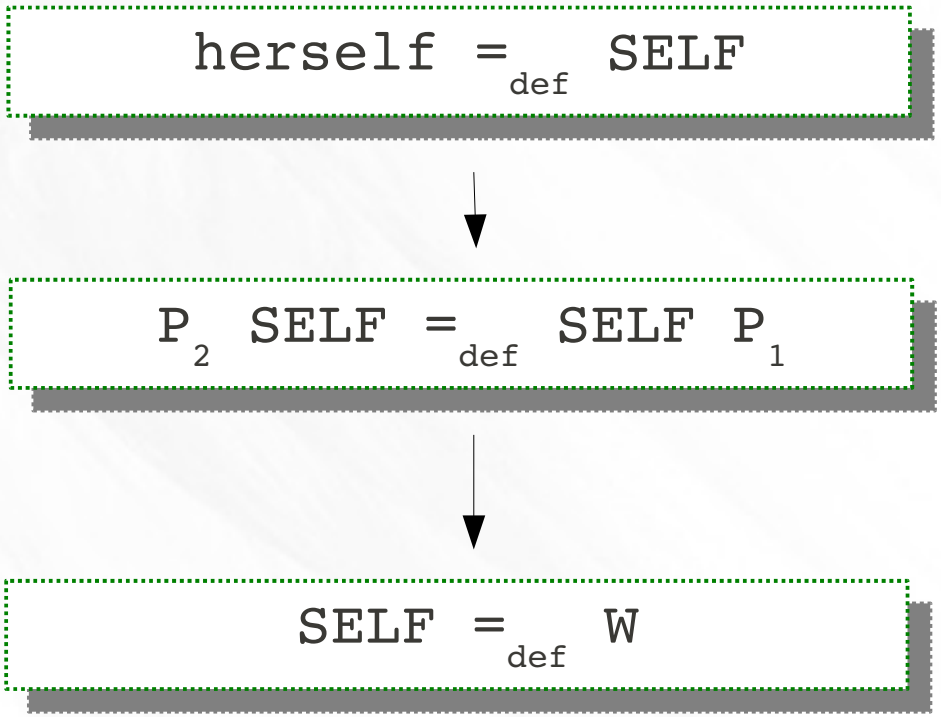
1. Reflexivisation: the operator SELF
2. Passivisation: the operator PASS
3. Aspecto–temporal relation: the operators STATE, PROC, EVENT
4. Quantification: the operators Π and Σ

1. Reflexivisation

*Mary despised **herself***

↓

*Mary despised **Mary***



2. Passivisation–1

The man has been killed by the enemy

↓

The enemy has killed the man

[PASS = B Σ C]

$\Sigma(E^1\ E^2) \rightarrow (E^1 \times E^2)$

Passivisation-2

The lexical predicate "*give-to*" has a predicate converse associated to "*receive-from*";

[receive-from z y x = give-to x y z]

[give-to = BC (C (BC (receive-from)))]

3. Aspecto-temporal relation-1

$$PROC_{J0}\ ((I\text{-}SAY)\ (\&\ (ASP_{I}\ (\Lambda))\ [I\ REP\ J^{0}]))$$

<u>comment:</u>

the aspectual process $PROC_{J0}$ is applied on the result of the application of (I-SAY) on a conjunction of an aspectualized predicative relation $ASP_{I}\ (\Lambda)$ and a temporal relation $[I\ REP\ J^{0}]$ between the interval I related to the predicative relation and an interval J^{0} related to enunciative process.

Aspecto-temporal relation-2

- Operators of the aspectuality

a. **COMPLETE-EVENT-PAST**: e.g. Verbal ending *-ed*

$[\text{COMPLETE-EVENT-PAST}=X \;\&\; ([\delta(F^4) < \delta(J^0)])\ \text{I-am-saying}\ \text{EVEN}_{F4}]$

where X is $B_6C_3C_3CB^2$

b. **INC-PRST**: verbal ending *-e*

$[\text{INC\_PRST}_{J1\ J0} =\text{déf}\ B^2\ (C_2\ B)\ B^2\ \text{I-am-saying}_{J0} \;\&\; \text{PROC}_{J1}\ ([\delta(J^1)=\delta(J^y)])]$

4. Quantification

- Theories of quantification

a. Fregean teories with bound variables

1. Classical theory in First-Order Language

2. Montague's quantification expressed in Church's λ-Calculus

b. Fregean theory without bound variables

3. Illative theory expressed in Curry's Combinatory Logic

- Illative universal quantifiers: Π_1 and Π_2

Definition of the universal quantifier

$$[\ \Pi_2 =_{def} ((B(CB_2)\Phi) \Rightarrow \Pi_1)\ ]$$

- Illative existential quantifiers: Σ_1 and Σ_2

Definition of the existential quantifier

$$[\ \Sigma_2 =_{def} (B(CB^2)\Phi)\ \&\ \Sigma_1\ ]$$

Text analysis using combinators

- *...Max{opened}the door. The room{was}pitch dark. He so{switched}on the light. John{was waiting}there. When John{greeted}him, Max{felt} a shrap pain from his back.*

Open-ed EVENT

was STATE

switch-ed EVENT

was-ing PROC

greet-ed EVENT

felt EVENT

...Anna{is drawing}{herself}in front of a mirror. The deadline{is announced}by the teacher. {All students}should finish it fast. But {some}may need more times...

is-ing PROC

SELF Reflexie

PASS Passivisation

Σ Quantification

Π Quantification

Next week...

- Course Examination on 25 May 2012
  - from 2pm–4pm
  - B410
  - Any materials are allowed