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Time: 14:30–16:00

Compositional Semantics
Heinrich Heine University
Winter Semester 2011/12
Room: 25.22-U1.72

Semantic Types of DPs

1 Our fragment of English so far

1.1 Composition Rules

For branching nodes:

(1) **Functional Application (FA)**
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any assignment a, if $[\![\beta]\!]^a$ is a function whose domain contains $[\![\gamma]\!]^a$, then $[\![\alpha]\!]^a = [\![\beta]\!]^a([\![\gamma]\!]^a)$.

(2) **Predicate Modification (PM)**
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any assignment a, if $[\![\beta]\!]^a$ and $[\![\gamma]\!]^a$ are both functions of type $\langle e, t\rangle$, then $[\![\alpha]\!]^a = \lambda x \in D\ .\ [\![\beta]\!]^a(x) = [\![\gamma]\!]^a(x) = 1$.

(3) **Predicate Abstraction (PA)** (p. 114)
If α is a branching node whose daughters are β_i and γ, where β is a relative pronoun or "such", and i is a natural number, then $[\![\alpha]\!] = \lambda x \in D_e\ .\ [\![\beta]\!]^{a^{x/i}}$

For non-branching and terminal nodes:

(4) **Non-branching Nodes (NN)**
If α is a non-branching node and β its daughter, then, for any assignment a, $[\![\alpha]\!]^a = [\![\beta]\!]^a$.

(5) **Terminal Nodes (TN)**
If α is a terminal node occupied by a lexical item, then $[\![\alpha]\!]$ is specified in the lexicon.

(6) **Traces and Pronouns Rule (TP)** (p. 116)
If α is a pronoun or trace and a is an assignment and i is in the domain of a, $[\![\alpha_i]\!]^a = a(i)$

1.2 Lexical Entries

Determiners:

(7) $[\![\text{the}]\!] = \lambda f \in D_{\langle e,t\rangle}$: there is exactly one x such that f(x) = 1 . the unique y such that f(y) = 1

(8) $[\![\text{a}]\!] = \lambda f \in D_{\langle e,t\rangle}\ .\ f$

Common nouns:

(9) $[\![\text{cat}]\!] = \lambda x \in D_e$. x is a cat

(10) $[\![\text{square root}]\!] = \lambda y \in D_e\ .\ \lambda x \in D_e$. x is the square root of y

(11) $[\![\text{Republican}]\!] = \lambda x \in D_e$. x is a Republican

(12) $[\![\text{governor}]\!] = \lambda y \in D_e\ .\ \lambda x \in D_e$. x is the governor of y

Proper nouns:

(13) $[\![\text{Texas}]\!]$ = Texas

(14) $[\![\text{Mary}]\!]$ = Mary

(15) $[\![\text{four}]\!] = 4$

Adjectives:

(16) $[\![\text{negative}]\!] = \lambda x \in D_e$. x is negative

(17) $[\![\text{negative}']\!] = \lambda f \in D_{\langle e,t\rangle}\ .\ \lambda x \in D_e$. f(x) = 1 and x is negative

(18) $[\![\text{conservative}]\!] = \lambda x \in D_e$. x is conservative

(19) $[\![\text{conservative}']\!] = \lambda f \in D_{\langle e,t\rangle}\ .\ \lambda x \in D_e$. f(x) = 1 and x is conservative

(20) $[\![\text{proud}]\!] = \lambda y \in D_e\ .\ \lambda x \in D_e$. x is proud of y

Prepositions:

(21) $[\![\text{of}]\!] = \lambda x \in D_e\ .\ x$

(22) $[\![\text{in}]\!] = \lambda y \in D_e\ .\ \lambda x \in D_e$. x is in y

Verbs:

(23) $[\![\text{smokes}]\!] = \lambda x \in D_e$. x smokes

(24) $[\![\text{likes}]\!] = \lambda y \in D_e\ .\ \lambda x \in D_e$. y likes x

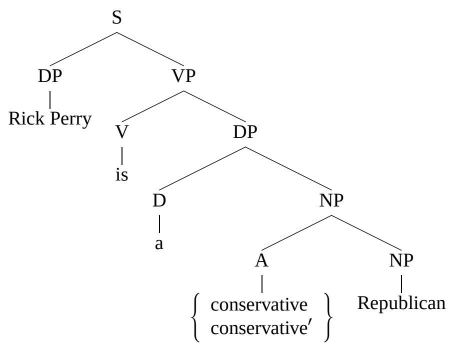
(25) $[\![\text{is}]\!] = \lambda f \in D_{\langle e,t\rangle}\ .\ f$

Complementizers:

(26) $[\![\text{that}]\!] = \lambda p \in D_t\ .\ p$

1.3 Some nice sentences we can derive truth conditions for

(27)



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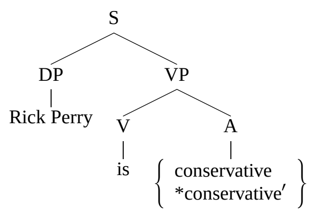

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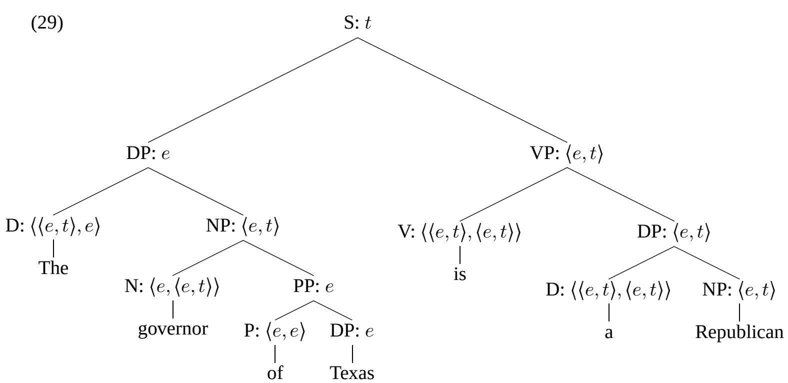

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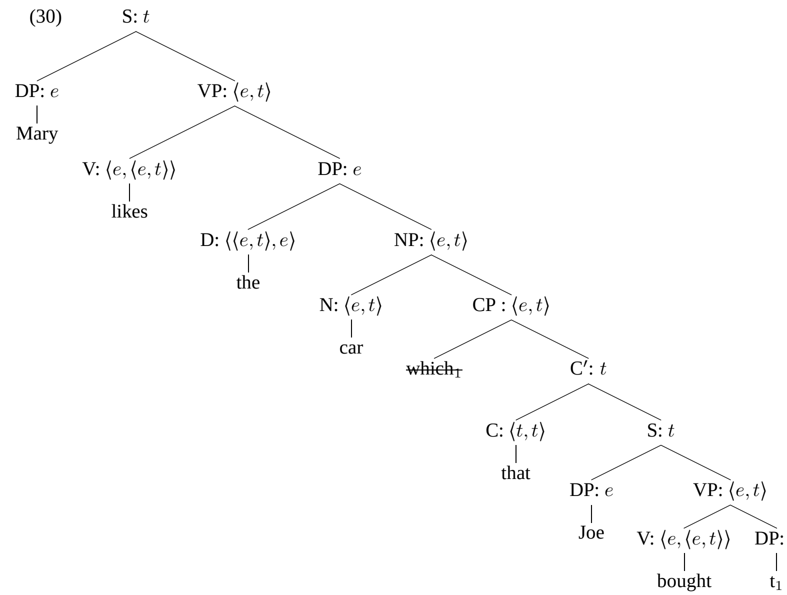

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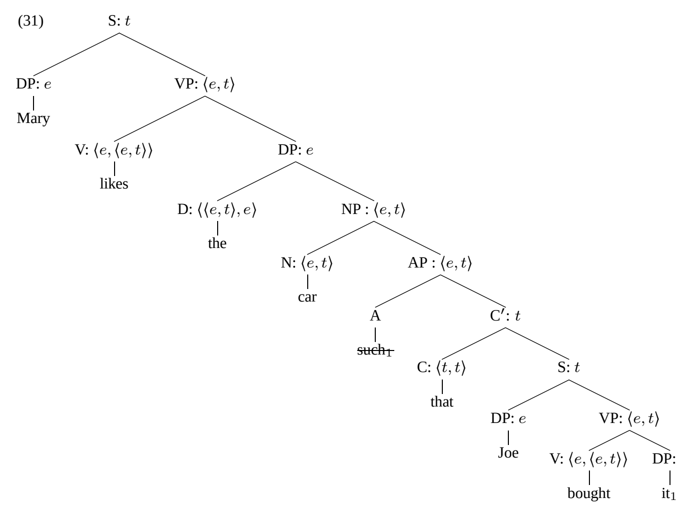
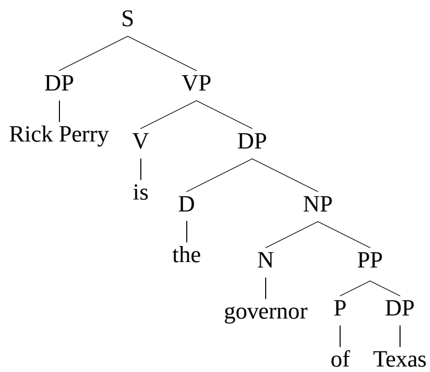


We still don't get:

(32)



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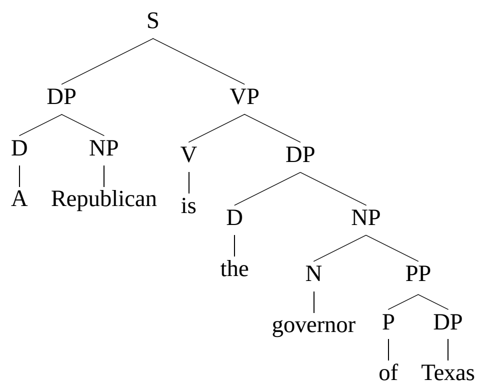


(34) Mary likes every car that Joe bought.

(35) Someone likes Mary.

(36) Nobody likes Mary.

(37) Only John likes Mary.

(38) At least one person likes Mary.

(39) Few/Most/Many people like Mary.

2 Quantifiers

2.1 Type e?

Most of the DPs we have seen so far have been of type e:

- Proper names: Mary, John, Rick Perry, 4, Texas
- Definite descriptions: the governor of Texas, the square root of 4
- Pronouns and traces: it, t

Exception: indefinites like *a Republican* after *is*.

Should words and phrases like *Nobody* and *At least one person* be treated as type e? How can we tell?

Predictions of the type e analysis:

- They should validate subset-to-superset inferences
- They should validate the law of contradiction
- They should validate the law of the excluded middle

Subset-to-superset inferences

(40) John came yesterday morning.
Therefore, John came yesterday.

This is a valid inference if John is type e. Proof: $[\![$came yesterday morning$]\!] \subseteq [\![$came yesterday$]\!]$ (everything that came yesterday morning came yesterday), and if the subject denotes an individual, then the sentence means that the subject is an element of the set denoted by the VP. If the first sentence is true, then the subject is an element of the set denoted by the VP, which means that the second sentence must be true. QED.

(41) At most one letter came yesterday morning.
Therefore, at most one letter came yesterday.

This inference is <u>not</u> valid, so *at most one letter* must not be type e.

The law of contradiction $(\neg[P \wedge \neg P])$

This sentence is contradictory:

(42) Mount Rainier is on this side of the border, and Mount Rainier is on the other side of the border.

The fact that it is contradictory follows from these assumptions:

- ⟦Mount Rainier⟧ $\in$ D_e
- ⟦is on this side of the border⟧ $\cap$ ⟦is on the other side of the border⟧ = $\varnothing$ (Nothing is both on this side of the border and on the other side of the border)
- When the subject is type e, the sentence means that it is in the set denoted by the VP
- standard analysis of *and*

This sentence is not contradictory:

(43) More than two mountains are on this side of the border, and more than two mountains are on the other side of the border.

So *more than two mountains* must not be type e.

The law of the excluded middle $(P \vee \neg P)$

(44) I am over 30 years old, or I am under 40 years old.

This is a tautology. That follows from the following assumptions:

- ⟦I⟧ $\in$ D_e
- ⟦over 30 years old⟧ $\cup$ ⟦under 40 years old⟧ = D (everything is either over 30 years old or under 40 years old)
- When the subject is type e, the sentence means that it is in the set denoted by the VP
- standard analysis of *or*

This sentence is not a tautology:

(45) Every woman in this room is over 30 years old, or every woman in this room is under 40 years old.

So *every woman* must not be of type e

Arguments from Löbner (2000)

(46) a. *Not the man came.
b. Not every man came.

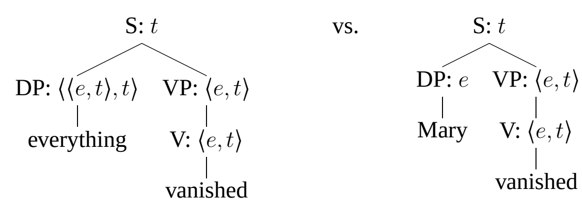
(47) a. *Almost the man came.
b. Almost every man came.

2.2 Solution: Generalized quantifiers

(48) ⟦nothing⟧ = $\lambda f \in D_{\langle e,t\rangle}$. there is no $x \in D_e$ such that f(x) = 1

(49) ⟦everything⟧ = $\lambda f \in D_{\langle e,t\rangle}$. for all $x \in D_e$, f(x) = 1

(50) ⟦something⟧ = $\lambda f \in D_{\langle e,t\rangle}$. there is some $x \in D_e$ such that f(x) = 1

(51)


(52) ⟦every⟧ = $\lambda f \in D_{\langle e,t\rangle}$. [$\lambda g \in D_{\langle e,t\rangle}$. for all $x \in D_e$ such that f(x) = 1, g(x)=1]

(53) ⟦no⟧ = $\lambda f \in D_{\langle e,t\rangle}$. [$\lambda g \in D_{\langle e,t\rangle}$. there is no $x \in D_e$ such that f(x) = 1 and g(x)=1]

(54) ⟦some⟧ = $\lambda f \in D_{\langle e,t\rangle}$. [$\lambda g \in D_{\langle e,t\rangle}$. there is some $x \in D_e$ such that f(x) = 1 and g(x)=1]

(55)