LMNLP: $LTAG_0$ conversion to LG

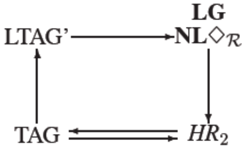
Tuur Leeuwenberg

June 30, 2012

Table of contents

$LTAG_0$ to LG

Moot 2007 & LIRA-paper



- For each *LTAG* there is a weakly equivalent $LTAG_0$.
- For each $LTAG_0$ there is a strongly equivalent *LG*.
- If *LTAG* is out of the context free boundary then so is *LG*.

What is an $LTAG_0$

similar to a normal $LTAG$.

definition:

An $LTAG_0$ grammar is a tuple $\langle T, N_S, N_A, I, A \rangle$ such that:

- T is the finite set of terminals.
- N_S is the finite set of the substitution non-terminals.
- N_A is the finite set of the adjunction non-terminals.
- I is the finite set of the initial trees.
- A is the finite set of the auxiliary trees.

What is an $LTAG_0$

definition:

An $LTAG_0$ grammar is a tuple $\langle T, N_S, N_A, I, A \rangle$ such that:

conditions

- The root nodes of all initial trees are members of N_S.
- The root nodes of all auxiliary trees are members of N_A.

What is an $LTAG_0$

definition:

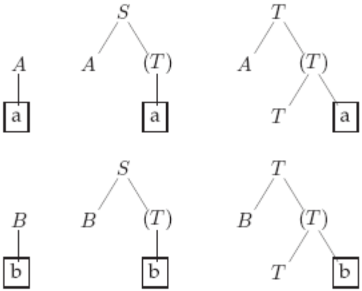
An $LTAG_0$ grammar is a tuple $\langle T, N_S, N_A, I, A \rangle$ such that:

conditions

- The root nodes of all initial trees are members of N_S.
- The root nodes of all auxiliary trees are members of N_A.
- (!) Every auxiliary tree has exactly one leaf which is a member of N_A. (foot node)
- (!) Every initial or auxiliary tree has exactly one leaf which is a member of T.
- (!) Every adjunction node is on the path from the lexical leaf to the root of the tree.

$LTAG_0$ to LG

the copylanguage: $\{ww|w \in \{a, b\}^+\}$



- (!) Every auxiliary tree has exactly one leaf which is a member of N_A. (foot node)
- (!) Every initial or auxiliary tree has exactly one leaf which is a member of T.
- (!) Every adjunction node is on the path from the lexical leaf to the root of the tree.

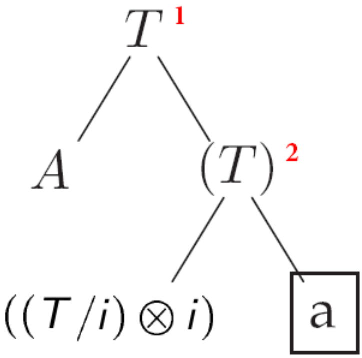
$LTAG_0$ to LG

Constructing LG grammar g' from $LTAG_0$ g

- The set of Atomic formulas A of g' will be $N_A \cup N_S \cup \{i\}$
- Each initial or auxiliary tree in g will have a lexical type assignment in g' constructed from it.
- footnodes are given the type $((T/i) \otimes i)$
- Then we start at the root R and travel down the tree to the lexical anchor, starting with as current formule f = R.
- If a binary link is passed, with a descendant A that does not lie on the path to the lexical anchor, f will be either $A \backslash f$ or f/A depending on whether A is the left or right descendent. If an adjunction node (T) is passed f will be $(T \oslash f) \obackslash ((T/i) \otimes i)$

$LTAG_0$ to LG

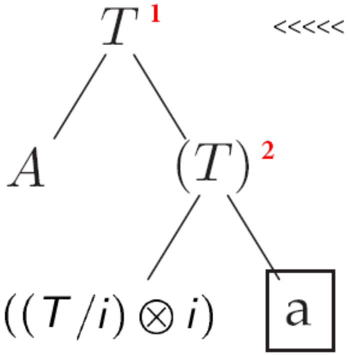
the copylanguage: $\{ww|w \in \{a, b\}^+\}$



footnodes are given the type $((T/i) \otimes i)$
We will construct the lexical type of a, while descending through the tree. While descending f will be the growing type.

$LTAG_0$ to LG

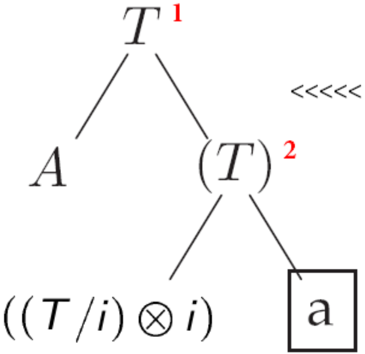
the copylanguage: $\{ww|w \in \{a,b\}^+\}$



$f = T^1$

$LTAG_0$ to LG

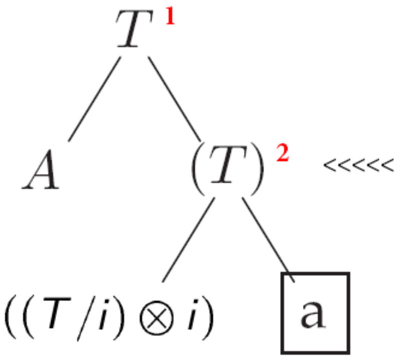
the copylanguage: $\{ww|w \in \{a,b\}^+\}$



$f = A\backslash T^1$

$LTAG_0$ to LG

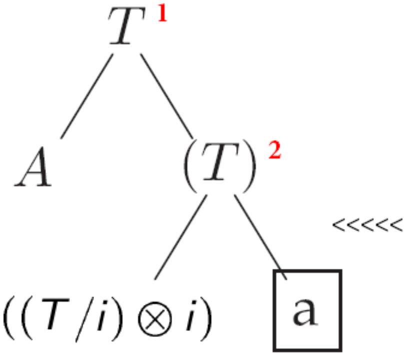
the copylanguage: $\{ww | w \in \{a, b\}^+\}$



$$f = (T^2 \oslash (A \backslash T^1)) \oslash ((T^2 / i) \otimes i)$$

$LTAG_0$ to LG

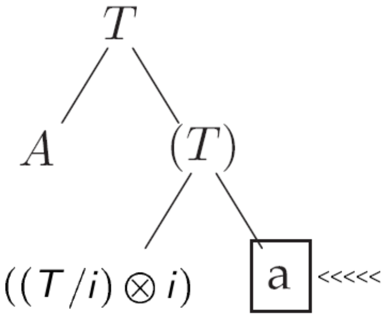
the copylanguage: $\{ww|w \in \{a,b\}^+\}$



$$f = ((T/i) \otimes i) \backslash ((T^2 \obslash (A \backslash T^1)) \oslash ((T^2/i) \otimes i))$$

$LTAG_0$ to LG

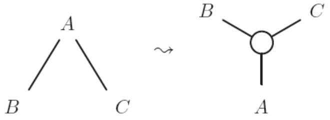
the copylanguage: $\{ww | w \in \{a, b\}^+\}$

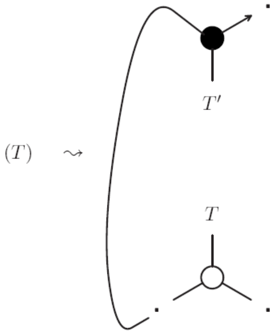


$lex(a) = ((T/i) \otimes i) \backslash ((T^2 \obslash (A \backslash T^1)) \oslash ((T^2/i) \otimes i))$
Now we would like to abbreviate the $((T^2/i) \otimes i)$ to T'
Resulting in: $lex(a) = T' \backslash ((T \obslash (A \backslash T)) \oslash T')$

$LTAG_0$ to LG

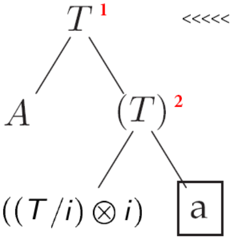
graphical conversion; binary split & adjunction





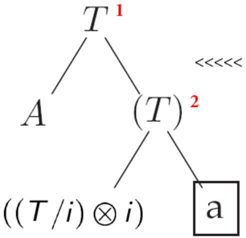
$LTAG_0$ to LG

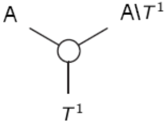
T^1



$f = T^1$

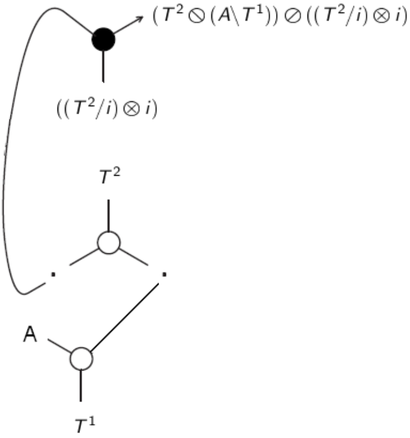
$LTAG_0$ to LG

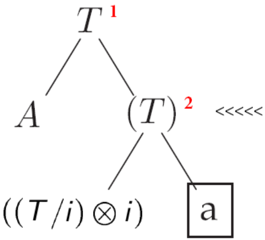




$$f = A \backslash T^1$$

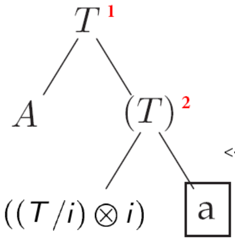
$LTAG_0$ to LG



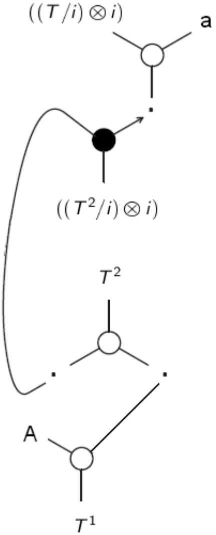


$$f = (T^2 \obslash (A \backslash T^1)) \oslash ((T^2/i) \otimes i)$$

$LTAG_0$ to LG

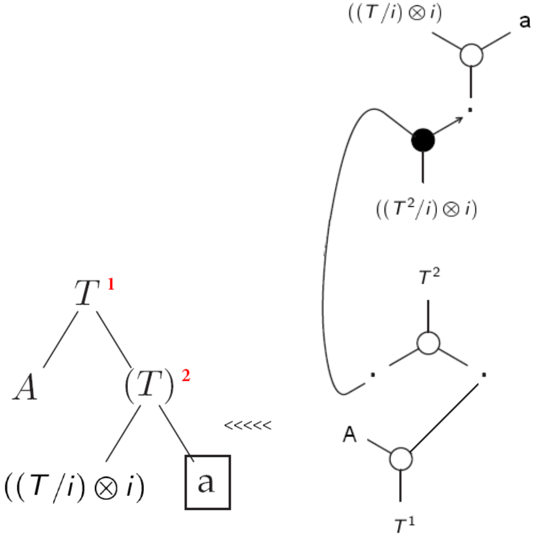


<<<<<



$$f = ((T/i) \otimes i) \backslash ((T^2 \oslash (A \backslash T^1)) \oslash ((T^2/i) \otimes i))$$

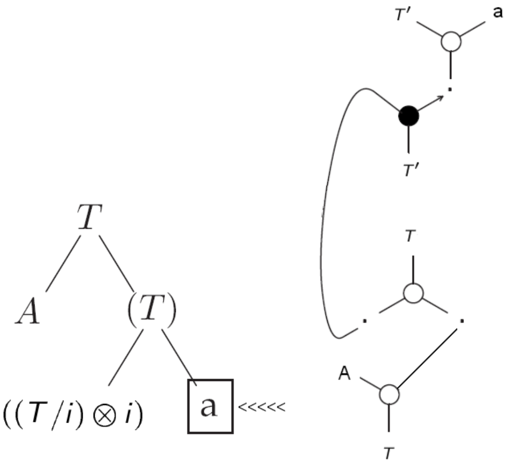
$LTAG_0$ to LG



$f = ((T/i) \otimes i) \backslash ((T^2 \obslash (A \backslash T^1)) \oslash ((T^2/i) \otimes i))$

Abbreviate the $((T/i) \otimes i)$ to T'

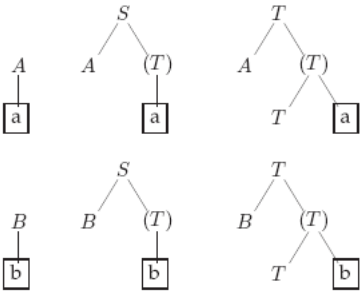
$LTAG_0$ to LG



Resulting in: $lex(a) = T'\backslash((T \owedge (A\backslash T)) \oslash T')$

$LTAG_0$ to LG

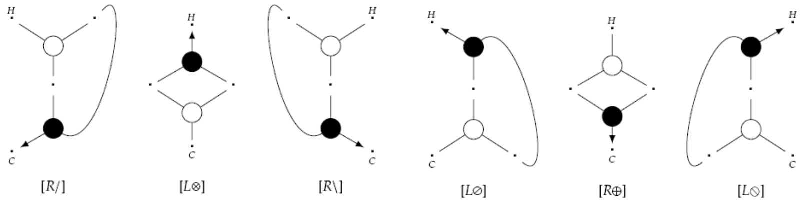
the copylanguage: $\{ww|w \in \{a, b\}^+\}$



$$lex(a) = A$$

$$lex(a) = (T \oslash (A \backslash S)) \obslash T'$$
$$lex(a) = T' \backslash ((T \oslash (A \backslash S)) \obslash T')$$
$$lex(b) = B$$
$$lex(a) = (T \oslash (B \backslash S)) \obslash T'$$
$$lex(a) = T' \backslash ((T \oslash (B \backslash S)) \obslash T')$$

$LTAG_0$ to LG



$$lex(a) = A$$
$$lex(a) = (T \oslash (A \backslash S)) \obslash T'$$
$$lex(a) = T' \backslash ((T \oslash (A \backslash S)) \obslash T')$$
$$lex(b) = B$$
$$lex(a) = (T \oslash (B \backslash S)) \obslash T'$$
$$lex(a) = T' \backslash ((T \oslash (B \backslash S)) \obslash T')$$