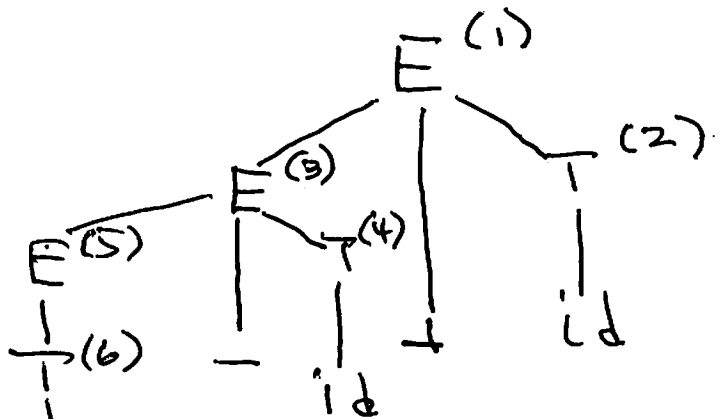


RIGHTMOST AND BOTTOM UP

RIGHTMOST TREES EVOLVE AS FOLLOWS!

$$E \rightarrow E + T \mid E - T \mid T$$
$$T \rightarrow id \mid (E)$$



$$id \quad E \Rightarrow E + T \Rightarrow E + id \Rightarrow E - T + id \Rightarrow E - id + id \Rightarrow T - id + id \Rightarrow id - id + id$$

BOTTOM UP is implemented as "SHIFT"/"REDUCE", THIS IS MADE DIFFICULT BY RIGHT RECURSION, SO LOVES OUR CURRENT GRAMMAR.

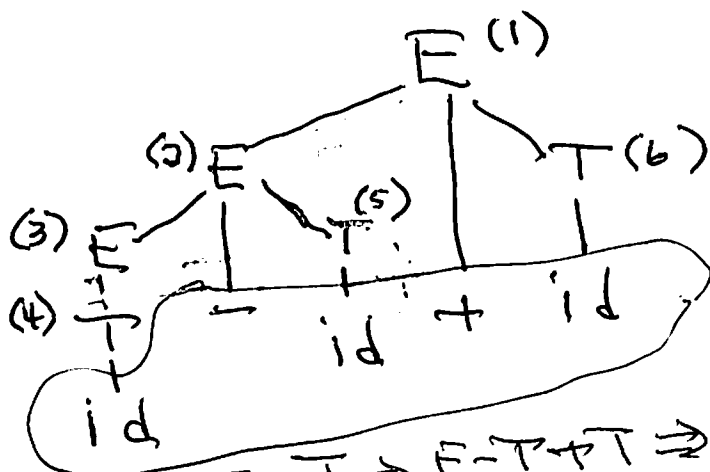
NOTE: THE LAST REWRITE IS OF LEFTMOST NON-TERMINAL AND SO FIRST REDUCE IS ON LEFT IN BOTTOM-UP

LEFTMOST AND TOP DOWN

LEFTMOST TREES EVOLVE AS
FOLLOWS :

$$E \rightarrow E + T \mid E - T \mid T$$

$$T \rightarrow id \mid (E)$$



$$E \Rightarrow E + T \Rightarrow E - T + T \Rightarrow T - T + T \Rightarrow id - T + T \Rightarrow id - id + T \Rightarrow id - id + id$$

PROBLEM HERE IS THE PROCESS
OF BUILDING TREE, BASED ON INPUT,
IS "PREDICTIVE" (TOP DOWN) AND
IS MADE VERY DIFFICULT WHEN
GRAMMAR IS LEFT-RECURSIVE.

TOP DOWN IS OFTEN IMPLEMENTED BY
"RECURSIVE DESCENT"

TYPES OF DERIVATIONS

- (1) NO CONSTRAINT ON WHICH NON-TERMINAL TO REWRITE WHEN CHOICES EXIST
- (2) RIGHTMOST: ALWAYS REWRITE RIGHTMOST NON-TERMINAL
- (3) LEFTMOST: ALWAYS REWRITE LEFTMOST NON-TERMINAL

WHILE (1), (2) AND (3) MAKE NO DIFFERENCE ON WHAT CAN BE DERIVED AT FRONTIER (LEAVES) OF TREE, THEY DO TYPICALLY AFFECT INTERMEDIATE TREES AND ARE INTEGRALLY TIED TO PARSING STRATEGY (TOP DOWN VS BOTTOM UP)

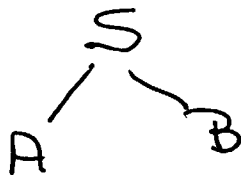
DERIVATIONS & TREES (CONTEXT FREE)

IF A GRAMMAR, G , IS A CFG THEN SYNTACTIC FORMS CAN BE ANY α , $\alpha \in (\Sigma \cup V)^*$

THUS, WHEN $S \xRightarrow{*} \alpha$ AND α CONTAINS

NON-TERMINALS, THERE ARE CHOICES
FIRST OF (1) WHICH NON-TERMINAL TO REWRITE
(2) WHICH RHS OF THAT NON-TERM TO USE

A DERIVATION (PARSE) TREE HAS A FORM
THAT COULD INCLUDE CASES LIKE



WE CAN NOW CHOOSE TO REWRITE A OR B
IMPORTANTLY, THOUGH, OUR CHOICE HAS NO
EFFECT ON THE POSSIBLE OUTCOMES AS
EACH SUBTREE EVOLVES INDEPENDENT OF
ALL OTHER SUBTREES

DERIVATIONS & TREES (REGULAR)

IF A GRAMMAR, G , IS RIGHT LINEAR THEN EVERY NON-TERMINAL SYNTACTIC FORM IS OF THE CONSTRAINED FORM αB WHERE $\alpha \in \Sigma^*$ AND $B \in V$, THAT IS, IF $S \xRightarrow{*} \beta$ THEN $\beta = \alpha B$ OR $\beta = \alpha$, WHERE $\alpha \in \Sigma^*$ AND $B \in V$.

IF WE DRAW A TREE ASSOCIATED WITH A DERIVATION FOR A REGULAR GRAMMAR, THE TREE LOOKS LIKE

