Lecture 18

Syntactic Parsing – PART II

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A typical grammar and an input sentence [Lect. 17]

Starts with S

- **S→NP VP**
- **NP→*Noun***
- **NP→*Pronoun***
- **NP→*Det Noun***
- **NP→*Det Adj Noun***
- **VP→*Verb***
- **VP→ *Verb* NP**
- **VP→ *Verb* PP**
- **VP→ *Verb* NP PP**
- **PP→*Preposition* NP**
- **PP→*Preposition* VP**
- *Noun→girl|boy|book|table, Pronoun→i, Det→the|a, Adj→small , Verb→read|want , Preposition→on|under|in|to* **[lexicon]**

Test sentence: i want to read a book (grammatically correct or not?)------Yes/ACCEPT/Grammatically correct   [use parsing]

Top down parsing

Given an input grammar and a test sentence, conduct top-down parsing in the following manner:

[Number the rules; use rules in the order; LIFO stack for "Backup rules"]

- Start from S

- Expand S using the first possible rule of S from the grammar

- Likewise, expand the leftmost child of S

- Go on expanding the leftmost child (depth first manner)

- On a match delete the matched word and the current node else Backtrack

- Continue matching other words in the sentence [else ERROR! If mismatch and no Backup rule left]

(travelling through the tree from top to bottom, left to right)

A top down parsing table
[add Backup rules column also – just before ACTION column]

- Task: match the input string from left to right

- 5 columns in the table

- At the end of the table…

- $, $: MATCH (ACCEPT)

- else try to backtrack else

    ERROR!

Test sentence: i want to read a book $

MATCHED	STACK	INPUT	ACTION
	$E\$$	$\mathbf{id} + \mathbf{id} * \mathbf{id}\$$	
	$TE'\$$	$\mathbf{id} + \mathbf{id} * \mathbf{id}\$$	output $E \to TE'$
	$FT'E'\$$	$\mathbf{id} + \mathbf{id} * \mathbf{id}\$$	output $T \to FT'$
	$\mathbf{id}\, T'E'\$$	$\mathbf{id} + \mathbf{id} * \mathbf{id}\$$	output $F \to \mathbf{id}$
$\mathbf{id}$	$T'E'\$$	$+ \mathbf{id} * \mathbf{id}\$$	match $\mathbf{id}$
$\mathbf{id}$	$E'\$$	$+ \mathbf{id} * \mathbf{id}\$$	output $T' \to \epsilon$
$\mathbf{id}$	$+ TE'\$$	$+ \mathbf{id} * \mathbf{id}\$$	output $E' \to + TE'$
$\mathbf{id} +$	$TE'\$$	$\mathbf{id} * \mathbf{id}\$$	match $+$
$\mathbf{id} +$	$FT'E'\$$	$\mathbf{id} * \mathbf{id}\$$	output $T \to FT'$
$\mathbf{id} +$	$\mathbf{id}\, T'E'\$$	$\mathbf{id} * \mathbf{id}\$$	output $F \to \mathbf{id}$
$\mathbf{id} + \mathbf{id}$	$T'E'\$$	$* \mathbf{id}\$$	match $\mathbf{id}$
$\mathbf{id} + \mathbf{id}$	$* FT'E'\$$	$* \mathbf{id}\$$	output $T' \to * FT'$
$\mathbf{id} + \mathbf{id} *$	$FT'E'\$$	$\mathbf{id}\$$	match $*$
$\mathbf{id} + \mathbf{id} *$	$\mathbf{id}\, T'E'\$$	$\mathbf{id}\$$	output $F \to \mathbf{id}$
$\mathbf{id} + \mathbf{id} * \mathbf{id}$	$T'E'\$$	$\$$	match $\mathbf{id}$
$\mathbf{id} + \mathbf{id} * \mathbf{id}$	$E'\$$	$\$$	output $T' \to \epsilon$
$\mathbf{id} + \mathbf{id} * \mathbf{id}$	$\$$	$\$$	output $E' \to \epsilon$

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Class Assignment : Slide 2 example

Stack   …………   Backup rules

Noun VP $ r3, r4, r5
.
.
.
VP $ r3, r4, r5
Verb NP $ r7, r8, r9, r3, r4, r5

Test sentence: i want to read a book $