Lecture Four

1. Consider the grammar : $S \to cAd$ Input string $w = cad$.
   $A \to ab \mid a$

Top-Down parsing :

step1 from the start symbol, S only has one production.

✓ match.

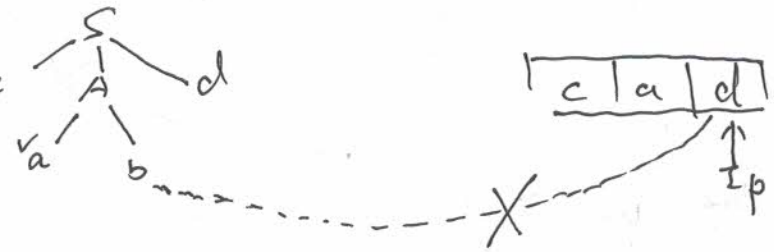
step 2

① choose the first production $A \to ab$.

match.

step 3:

b is terminal

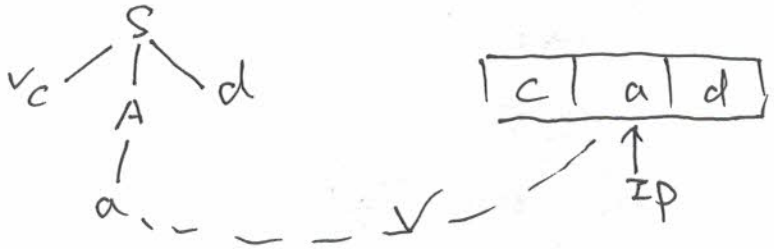


unmatch.

Since A has two productions, the first is unmatched, we try the other

backtracking.

step 4.



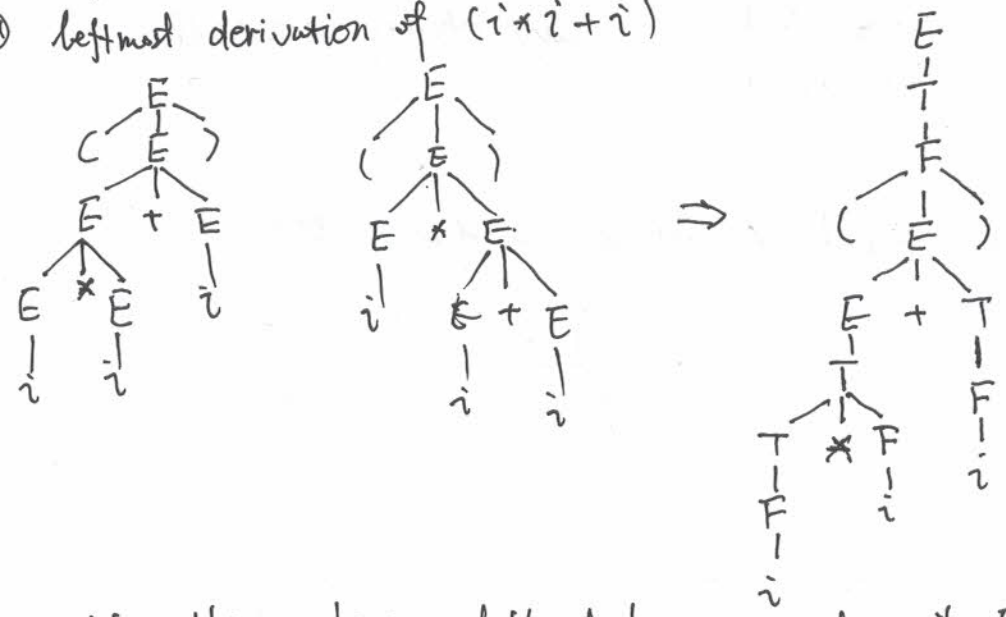
match.

step 5.

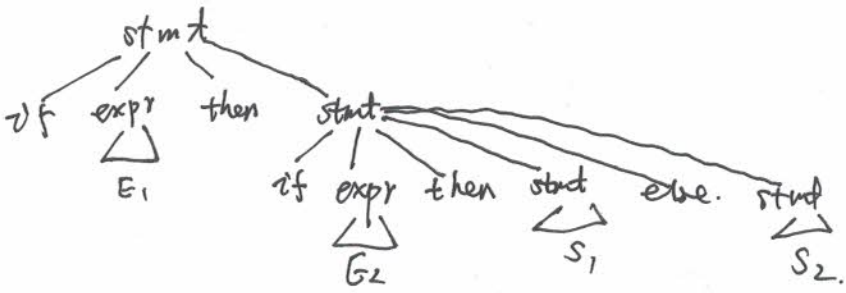
match clone

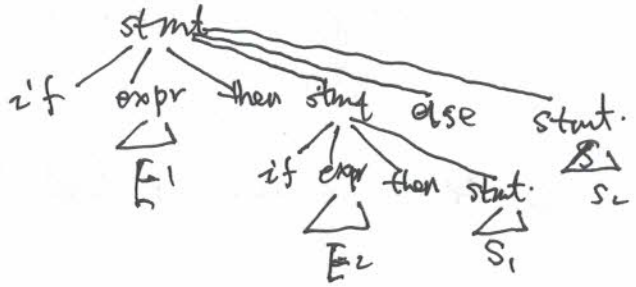
2. Ambiguity Example.

① leftmost derivation of (i*i+i)

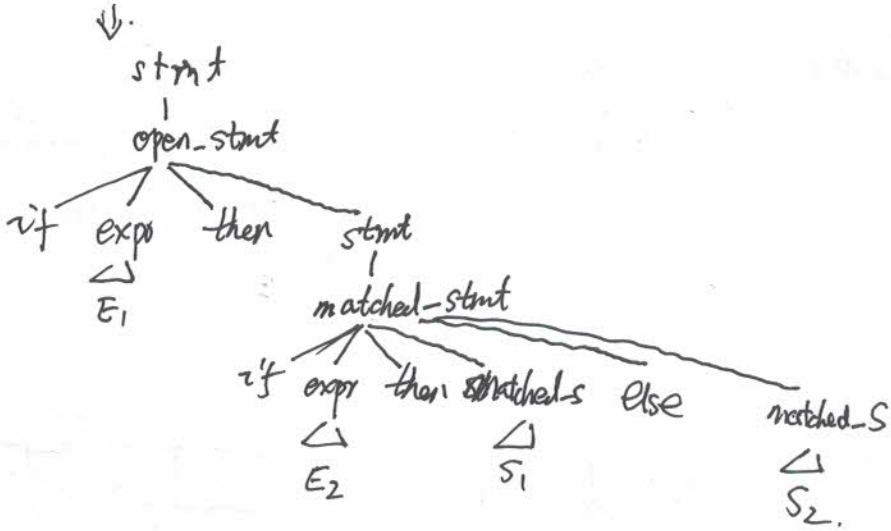


② if... then.. else leftmost derivation of. if E_1 then if E_2 then S_1 else





⇓.



3. Eg. eliminating left recursion involving derivations of two or more steps.

$S \to Aa \mid b$
$A \to Ac \mid Sd$

we have. $S \Rightarrow Aa \Rightarrow Sda$ (1, 2)

$S \to Aa$
$S \to b$
$A \to Ac$
$A \to Sd$ ✓

step 1: arrange the nonterminals in $S\ A$

first iteration $i=1$ $j=0$ × no operation

second iteration $i=2$ $j=1$

we have $A \to Sd$ $\gamma = d$

So for $S \to Aa$, $S \to b$ we have

$A \to Aad$
$A \to bd$.

replace.

Finally the Grammar is

$S \to Aa \mid b$
$A \to Ac \mid Aad \mid bd$.

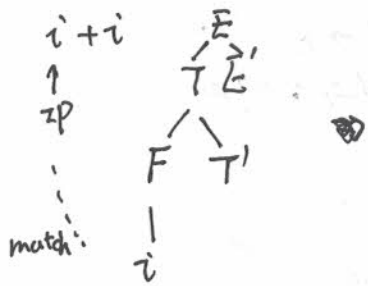
immediate left recursion.

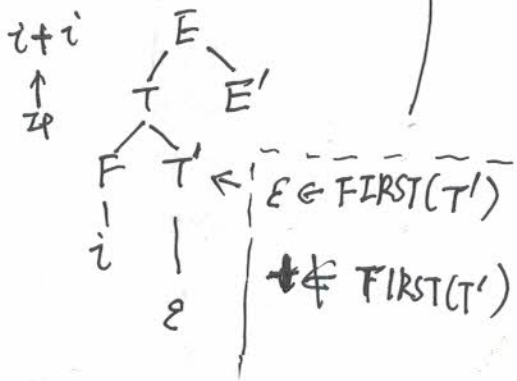
4. $E \to TE'$
$E' \to +TE' \mid \varepsilon$
$T \to FT'$
$T' \to *FT' \mid \varepsilon$
$F \to (E) \mid i$

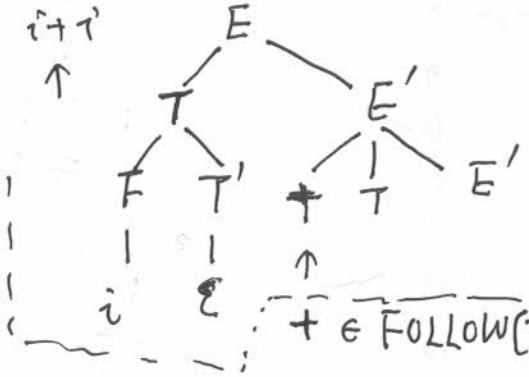
FIRST(E) = {(, i}
FIRST(E') = {+, ε}
FIRST(T) = {(, i}
FIRST(T') = {*, ε}
FIRST(F) = {(, i}

FIRST(TE') = {(, i}
FIRST(+TE') = {+} FIRST(ε) = {ε}
FIRST(FT') = {(, i}
FIRST(*FT') = {*} FIRST(ε) = {ε}
FIRST((E)) = {(} FIRST(i) = {i}

5. What is FOLLOW







Q: ε ∈ FIRST(T')

if + ∈ FIRST(T') and + ∈ FOLLOW(T')

We don't know whether we should match '+' with T' or match 'ε' with T.

$E \to TE'$

$E' \to +TE' \mid \varepsilon$

$T \to FT'$

$T' \to *FT' \mid \varepsilon$

$F \to (E) \mid i$

FOLLOW(E) = {), $ }

FOLLOW(E') = {), $ }

FOLLOW(T) = { +,), $ }

FOLLOW(T') = { +,), $ }

FOLLOW(F) = { *, +,), $ }

6. Predictive Table.

	i	+	*	(	)	$
E	$E \to TE'$			$E \to TE'$		
E'		$E' \to +TE$			$E' \to \varepsilon$	$E' \to \varepsilon$
T	$T \to FT'$			$T \to FT'$		
T'		$T' \to \varepsilon$	$T' \to *FT'$		$T' \to \varepsilon$	$T' \to \varepsilon$
F	$F \to i$			$F \to (E)$		

7.

step	stack	input	production
0	$E	$i * i + i $	
1	$E'T	$i * i + i $	$E \to TE'$
2	$E'T'F	$i * i + i $	$T \to FT'$
3	$E'T'i	$i * i + i $	$F \to i$
4	$E'T'	$* i + i $	
5	$E'T'F*	$* i + i $	$T' \to *FT'$
6	$E'T'F	$i + i $	
7	$E'T'i	$i + i $	$F \to i$
8	$E'T'	$+ i $	
9	$E'	$+ i $	$T' \to \varepsilon$
10	$E'T+	$+ i $	$E' \to +TE'$
11	$E'T	$i $	
12	$E'T'F	$i $	$T \to FT'$
13	$E'T'i	$i $	$F \to i$
14	$E'T'	$	
15	$E'	$	$T' \to \varepsilon$
16	$	$	$E' \to \varepsilon$