CS 445 03/26/19 Chapter 4: LL(1) top-down parsing; SLR(1), LR(1), LALR(1) bottom-up parsing; yacc

{ leftmost derivation
{ rightmost derivation
lookahead(k)

Section 4.4 Top Down Parsing

example:

E → E + T | T
T → T * F | F
F → (E) | ID

(E = start symbol)

remove ① left-recursion & ② left-factoring

E → T E'
E' → + T E' | ε
T → F T'
T' → * F T' | ε
F → (E) | ID

E' → ε p189

① $A \to A\alpha \mid \beta$ ⇒ $A \to \beta A'$, $A' \to \alpha A' \mid \varepsilon$ (Alg 4.1 p177)

② $A \to \alpha B \mid \alpha C$ ⇒ $A \to \alpha A'$, $A' \to B \mid C$ (Alg 4.2 p178)

	FIRST	FOLLOW
E	(, ID	$,)
E'	+, ε	$,)
T	(, ID	+, $,)
T'	*, ε	+, $,)
F	(, ID	*, +, $,)

$F \to (E)$: F = A, (= α, E = B,) = β

FOLLOW(A):

1. $ ∈ FOLLOW(S)
2. If $A \to \alpha B \beta$: place anything in FIRST(β) except for ε in FOLLOW(B)
3. If $A \to \alpha B$ or $A \to \alpha B \beta$ where ε ∈ FIRST(β): place anything in FOLLOW(A) into FOLLOW(B)

start symbol $S\$ \Rightarrow^{*}$ ... A $ ... FOLLOW(A) = ...

Build a Parse Table (Alg 4.4 p190) Fig 4.15 p188

	ID	+	*	(	)	$
E	E→TE'			E→TE'		
E'		E'→+TE'			E'→ε	E'→ε
T	T→FT'			T→FT'		
T'		T'→ε	T'→*FT'		T'→ε	T'→ε
F	F→ID			F→(E)		

Trace pp 188 Fig 4.16

Stack	Input
$E	ID+ID*ID$
$E'T	ID+ID*ID$
$E'T'F	ID+ID*ID$
$E'T'ID	ID+ID*ID$
$E'T'	+ID*ID$
$E'	+ID*ID$
$E'T+	+ID*ID$
$E'T	ID*ID$
$E'T'F	ID*ID$
$E'T'ID	ID*ID$
$E'T'	*ID$
$E'T'F*	*ID$
$E'T'F	ID$
$E'T'ID	ID$
$E'T'	$
$E'	$
$	$

ACCEPT