

Homework 10

Consider the grammar with productions:

$$\begin{aligned} S &\rightarrow AB \\ A &\rightarrow (S) \mid \text{int } C \\ B &\rightarrow +S \mid \epsilon \\ C &\rightarrow *A \mid \epsilon \end{aligned}$$

Construct FIRST, FOLLOW, LL(1) table and perform LL(1) parsing for $w = (\text{int}) + \text{int}$

$$\text{FIRST}(x_1 \dots x_n) = \text{FIRST}(x_1) \oplus \dots \oplus \text{FIRST}(x_n)$$

	F_0	F_1	F_2
S	\emptyset	(, int	(, int
A	(, int	(, int	(, int
B	+, ϵ	+, ϵ	+, ϵ
C	*, ϵ	*, ϵ	*, ϵ

$$F_2 = F_3 = \text{FIRST}$$

$$\text{FIRST}(S) = \text{FIRST}(AB) = \text{FIRST}(A) = \{(, \text{int}\}$$

$$\text{FIRST}(A) = \{(, \text{int}\}$$

$$\text{FIRST}(B) = \{+, \epsilon\}$$

$$\text{FIRST}(C) = \{*, \epsilon\}$$

FOLLOW

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$$\text{FOLLOW}(S) \stackrel{(4)}{=} \text{FOLLOW}(B) \text{ and } \stackrel{(2)}{)} \quad (1)$$

$$\text{FOLLOW}(A) \stackrel{(1)}{=} \text{FOLLOW}(S) \text{ and } \stackrel{(6)}{\text{FOLLOW}(C)}$$

$$\stackrel{(1)}{=} \text{FIRST}(B) = +, \epsilon$$

$$\text{FOLLOW}(B) \stackrel{(1)}{=} \text{FOLLOW}(S)$$

$$\text{FOLLOW}(C) \stackrel{(3)}{=} \text{FOLLOW}(A)$$

	L ₀	L ₁	L ₂	L ₃	L ₄
S	ϵ	$\epsilon,)$	$\epsilon,)$	$\epsilon,)$	$\epsilon,)$
A	\emptyset	$\epsilon, +$	$\epsilon, +,)$	$\epsilon, +,)$	$\epsilon, +,)$
B	\emptyset	ϵ	$\epsilon,)$	$\epsilon,)$	$\epsilon,)$
C	\emptyset	\emptyset	$\epsilon, +$	$\epsilon, +,)$	$\epsilon, +,)$

$$L_3 = L_4 = \text{FOLLOW}$$

LL(1) parse table

	()	int	+	*	ϵ
S	AB, 1		AB, 1			
A	(S), 2		int C, 3			
B				+S, 4		$\epsilon, 5$
C					*A, 6	$\epsilon, 7$
(pop					
)		pop				
int			pop			
+				pop		
*					pop	
ϵ						except

LL(1) parsing for $w = (int) + int$

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$((int) + int \$, S \$, \epsilon) \vdash ((int) + int \$, AB \$, 1)$

$\vdash ((int) + int \$, (S)B \$, 12) \vdash ((int) + int \$, S)B \$, 12)$

$\vdash ((int) + int \$, AB)B \$, 121) \vdash ((int) + int \$, intCB)B \$, 121, 3)$

$\vdash () + int \$, CB)B \$, 1213) \vdash () + int \$, B)B \$, 12137)$

$\vdash () + int \$,)B \$, 121375) \vdash (+ int \$, B \$, 121375)$

$\vdash (+ int \$, +S \$, 1213754) \vdash (int \$, S \$, 1213754)$

$\vdash (int \$, AB \$, 1213754) \vdash (int \$, intCB \$, 12137543)$

$\vdash (\$, CB \$, 12137543) \vdash (\$, B \$, 121375437)$

$\vdash (\$, \$, 1213754375)$

$S \xrightarrow{1} AB$

$A \xrightarrow{2} (S) \quad \quad \quad \xrightarrow{3} intC$

$B \xrightarrow{4} +S \quad \quad \quad \xrightarrow{5} \epsilon$

$C \xrightarrow{6} *A \quad \quad \quad \xrightarrow{7} \epsilon$