Compiler
Assignment 6
Attribute Grammars and Top-Down Translator

403410033 資工三 曾俊宏

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1 Question 1

a) S-attributed attribute grammar

production	semantic rules
$S \rightarrow L\ R$	S. val = L. val + R. val / R. base ;
$R \rightarrow .\ L$	R. val = L. val R. base = L. base ;
$R \rightarrow \epsilon$	R. val = 0; R. base = 0;
$L \rightarrow B\ L_s$	L. base = Ls. base ; L. val = B. val * L. base + Ls. val ; L. base *= 2;
$L_s \rightarrow B\ L_{s1}$	Ls. base = Ls1. base ; Ls. val = B. val * Ls. base + Ls1. val ; Ls. base *= 2;
$L_s \rightarrow \epsilon$	Ls. base = 1; Ls. val = 0;
$B \rightarrow 0$	B. val = 0;
$B \rightarrow 1$	B. val = 1;

b) S-attributed attribute grammar → top-down translator

c) L-attributed attribute grammar

Assume `side = 1` means left-hand side, and `side = 0` means right-hand side

Assume `2^x` in the code means 2 to the power of x

production	semantic rules

$S \rightarrow L\ R$	`L.side = 1;`
	`R.side = 0;`
	`S.val = L.val + R.val;`

$R \rightarrow .\ L$	`R.val = L.val` `L.side = R.side;`
$R \rightarrow \epsilon$	`R.val = 0;`

$L \rightarrow B\ L_s$	`L.len = 1 + Ls.len;`
	`Ls.side = L.side;`
	
	`L.val = (L.side == 1) ?`
	`        B.val * (2^(L.len - 1)) + Ls.val :`
	`        B.val / 2 + Ls.val / 2;}`

$L_s \rightarrow B\ L_{s1}$	`Ls.len = 1 + Ls1.len;`
	`Ls1.side = Ls.side;`
	
	`Ls.val = (Ls.side == 1) ?`
	`        B.val * (2^(Ls.len - 1)) + Ls1.val :`
	`        B.val / 2 + Ls1.val / 2;}`

$L_s \rightarrow \epsilon$	`Ls.len = 0;` `Ls.val = 0;`
$B \rightarrow 0$	`B.val = 0;`
$B \rightarrow 1$	`B.val = 1;`

d) L-attributed attribute grammar → top-down translator