

Compiler
Assignment 6
Attribute Grammars and Top-Down
Translator

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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 \rightarrow 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
$S \rightarrow L R$	$L.side = 1;$ $R.side = 0;$ $S.val = L.val + R.val;$
$R \rightarrow . L$	$R.val = L.val$
$R \rightarrow \epsilon$	$R.val = 0;$
$L \rightarrow B L_s$	$L.len = 1 + Ls.len;$ $L.val = (L.side == 1) ?$ $\quad B.val * 2^{(L.len - 1)} + Ls.val :$ $\quad B.val / 2 : Ls.val / 2;$
$L_s \rightarrow B L_{s1}$	$Ls.len = 1 + Ls1.len;$ $Ls.val = (Ls.side == 1) ?$ $\quad B.val * 2^{(Ls.len - 1)} + Ls1.val :$ $\quad B.val / 2 : Ls1.val / 2;$
$L_s \rightarrow \epsilon$	$Ls.len = 0;$ $Ls.val = 0;$
$B \rightarrow 0$	$B.val = 0;$
$B \rightarrow 1$	$B.val = 1;$

d) L-attributed attribute grammar \rightarrow top-down translator