Lecture 15

Semantics Analysis

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Take aways from the last class

- Dependency Graph

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- S-attriuted grammar

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- Abstract Syntax Tree and its construction

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- Translation Scheme

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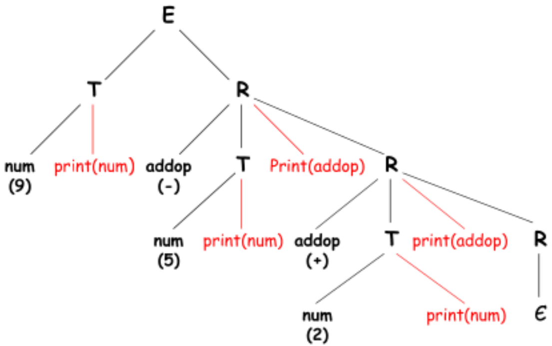
  $E \rightarrow TR$

  $R \rightarrow addop\ T \quad \{print(addop)\} \quad R|\epsilon$

  $T \rightarrow num \quad print(num)$

Parse tree for 9-5+2



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  - $S \rightarrow$ __ A __ B __
  - An inherited attribute for a symbol on rhs of a production must be computed in an action before that symbol
  - $S \rightarrow A_i A B_i B S_s$

Example: Translation scheme for EQN

$S \rightarrow B$
$B \rightarrow B_1 B_2$
$B \rightarrow B_1 \text{ sub } B_2$
$B \rightarrow \textit{text}$

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$$
\begin{array}{ll}
S \rightarrow B & B.pts = 10 \\
B \rightarrow B_1 B_2 & B_1.pts = B.pts \\
 & B_2.pts = B.pts
\end{array}
$$

Example: Translation scheme for EQN

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$B \rightarrow B_1 B_2$	$B_1.pts = B.pts$
	$B_2.pts = B.pts$
$B \rightarrow B_1$ sub B_2	$B_1.pts = B.pts$

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$B \rightarrow B_1 \text{ sub } B_2$	$B_1.pts = B.pts$
	$B_2.pts = shrink(B.pts)$
$B \rightarrow text$	

Example: Translation scheme for EQN

$S \rightarrow B$	$B.pts = 10$
	$S.ht = B.ht$
$B \rightarrow B_1 B_2$	$B_1.pts = B.pts$
	$B_2.pts = B.pts$
	$B.ht = max(B_1.ht, B_2.ht)$
$B \rightarrow B_1 \text{ sub } B_2$	$B_1.pts = B.pts$
	$B_2.pts = shrink(B.pts)$
	$B.ht = disp(B_1.ht, B_2.ht)$
$B \rightarrow text$	$B.ht = text.h * B.pts$

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$S \rightarrow \{B.pts = 10\}$ B
$\{S.ht = B.ht\}$

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$\{B_2.pts = B.pts\} \quad B_2$

$\{B.ht = max(B_1.ht, B_2.ht)\}$

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    $A \rightarrow A_1 Y \quad A.a = g(A_1.a.Y.y)$

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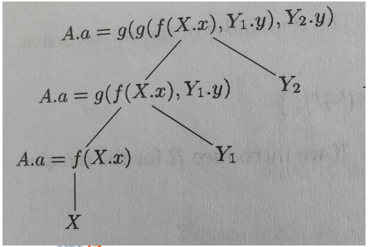

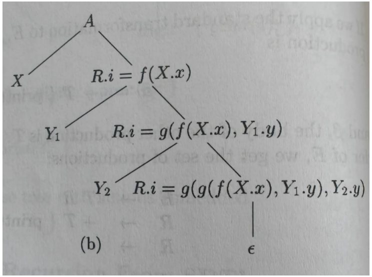

Eliminating Left Recursion

$$A \to X \quad \{R.i = f(X.x)\}R\{A.a = R.s\}$$

Eliminating Left Recursion

$$A \rightarrow X \quad \{R.i = f(X.x)\} R \{A.a = R.s\}$$
$$R \rightarrow Y \{R_1 = g(R.i, Y.y\} R_1 \{R.s = R_1.s\}$$

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$$A \to X \quad \{R.i = f(X.x)\}R\{A.a = R.s\}$$
$$R \to Y\{R_1 = g(R.i, Y.y\}R_1\{R.s = R_1.s\}$$
$$R \to \epsilon\{R.s = R.i\}$$