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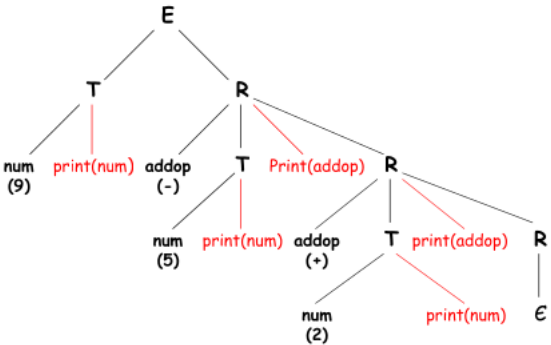
  $E \rightarrow TR$
  $R \rightarrow addop\ T \quad \{print(addop)\} \quad R|\epsilon$
  $T \rightarrow num \quad print(num)$

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
  - $S \rightarrow A_i A B_i B S_s$

SDT have to be made cleverly when inherited attributes are also present, so that it will produce desired results when parsed using depth first order.

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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$S \rightarrow B$ $\quad\quad\quad\quad$ $B.pts = 10$

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$S \to B$	$B.pts = 10$
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	$B_2.pts = shrink(B.pts)$
$B \to text$	

Example: Translation scheme for EQN

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

Example: SDT Form

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

ht is synthesized attribute and pts is inherited attribute

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

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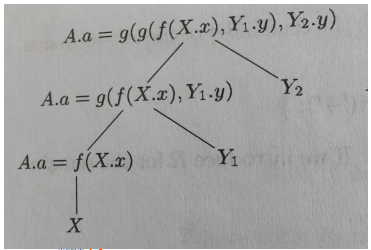
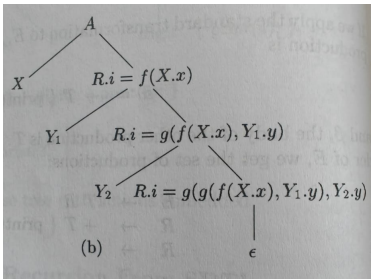
for doing top-down parsing, we have to eliminate left recursion from the SDT given.

$E \to TR$
$R \to +Tprint(+)R$
$R \to \epsilon$





Eliminating Left Recursion

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

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

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$$R \to Y\{R_1 = g(R.i, Y.y\}R_1\{R.s = R_1.s\}$$
$$R \to \epsilon\{R.s = R.i\}$$