TID - Attributed Scattered Context Grammars

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Agenda

- Attributed grammars
- Scattered Context Grammars

Attributed Grammars

- An attribute grammar is an ordinary CF grammar extended to specify the "meaning" of each string in the language.

- $attribute$ - any quantity associated with a programming construct.

- semantic actions

Inherited and Synthesized Attributes

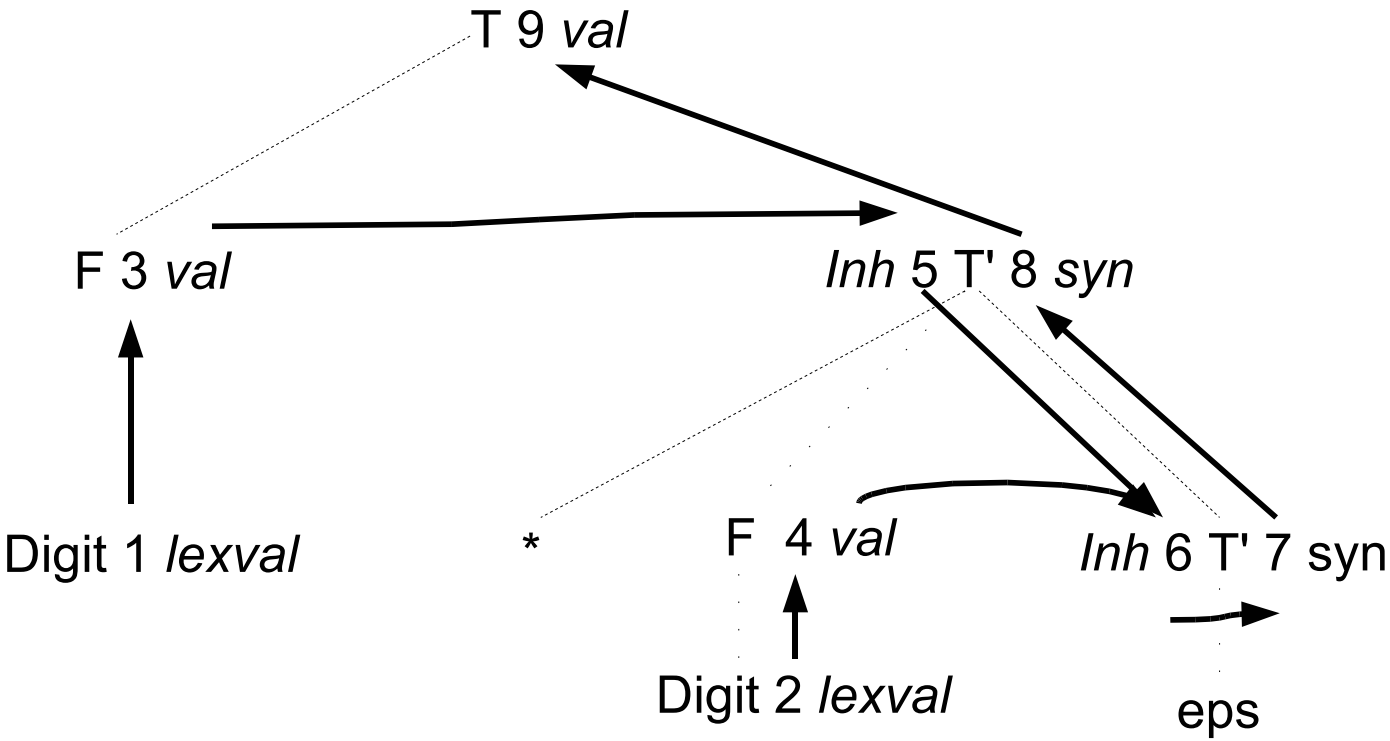
❖ A $synthesized\ attribute$ for a nonterminal A at a parse-tree node N is defined by a semantic rule associtated with the production at N. The production must have A as its head. A synthesized attribute at node N is defined only in terms of attribute values at the children of N and at N itself.

❖ An $inherited\ attribute$ for a nonterminal B at a parse-tree node N is defined by a semantic rule associated with the production at the parent of N. That production must have B as a symbol in its body. An inherited attributed at node N is defined only in terms of attribute values at N's parent, N itself, and N's siblings.

Example

	PRODUCTION	SEMANTIC RULES
1)	$L \rightarrow E\$$	$L.val = E.val$
2)	$E \rightarrow E_1 + T$	$E.val = E_1.val + T.val$
3)	$E \rightarrow T$	$E.val = T.val$
4)	$T \rightarrow T_1 * F$	$T.val = T_1.val \times F.val$
5)	$T \rightarrow F$	$T.val = F.val$
6)	$F \rightarrow (E)$	$F.val = E.val$
7)	$F \rightarrow digit$	$F.val = digit.lexval$

Dependency Graphs



Scattered Context Grammars - Definition

- A scattered context grammar (SCG) defined as:
- $G = (V, T, P, S)$
- V is an alphabet
- terminal $T \subseteq V$
- starting nonterminal $S \in V - T$
- finite set of production $(A_1, \ldots, A_n) \rightarrow (x_1, \ldots, x_n) \in P$
- $x_i \in V^*$
- $i \in < 1, n >$

Propagating SCG - PSCG

- for every $(A_1, \ldots, A_n) \rightarrow (x_1, \ldots, x_n) \in P$
- $x_i \in V^+$
- $i \in < 1, n >$

$\Rightarrow, \Rightarrow^*, \Rightarrow^+$

- $(A_1, \ldots, A_2) \rightarrow (x_1, \ldots, x_n) \in P$
- $u = u_1 A_1 u_2 A_2 \ldots u_n A_n u_{n+1}$
- $v = u_1 x_1 u_2 x_2 \ldots u_n x_n u_{n+1}$
- $u \Rightarrow v[(A_1, \ldots, A_n) \rightarrow (x_1, \ldots, x_n)]$ in G. $u \Rightarrow v$

Attributed Scattered Context Grammar

- attributed grammar & scattered context grammar
- using source of bison to create Attributed Scattered Context Grammars Compiler
- implementation of attributes on stack
- reduce table of rules

Resources

- http://ftp.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-255/paper09.pdf

- Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman. Compilers –Principles, Techniques, & Tools