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29.11.2016

# Example: LL(1)-Parsing

Consider the CFG G = (N, T, P, S) with $N$ = {S, A, B, C, D}, $T$ = {*a, b, c, d, e*} and

$$
\begin{aligned}
P = \{ & S \rightarrow AB \\
& A \rightarrow CD \\
& B \rightarrow aAB \mid \varepsilon \\
& C \rightarrow bSc \mid d \\
& D \rightarrow eCD \mid \varepsilon \}.
\end{aligned}
$$

1. Compute the *First* sets of the right-hand sides of the productions and the *Follow* sets of the non-terminals.

   First(AB) = {b, d}
   First(CD) = {b, d}
   First(aAb) = {a}
   First(bSc) = {b}
   First(d) = {d}
   First(eCD) = {e}
   First(ε) = {ε}

   Follow(S) = {$, c}
   Follow(C) = {e, a, $, c}
   Follow(D) = {a, $, c}
   Follow(B) = {$, c}
   Follow(A) = {a, $, c}

2. Depending on the values you get, give the LL(1) parsing table.

| | S | A | B | C | D |
|---|---|---|---|---|---|
| a | - | - | $B \rightarrow aAB$ | - | $D \rightarrow \varepsilon$ |
| b | $S \rightarrow AB$ | $A \rightarrow CD$ | - | $C \rightarrow bSc$ | - |
| c | - | - | $B \rightarrow \varepsilon$ | - | $D \rightarrow \varepsilon$ |
| d | $S \rightarrow AB$ | $A \rightarrow CD$ | - | $C \rightarrow d$ | - |
| e | - | - | - | - | $D \rightarrow eCD$ |
| $ | - | - | $B \rightarrow \varepsilon$ | - | $D \rightarrow \varepsilon$ |

3. Is this CFG LL(1)?

   The given CFG is a LL(1) grammar since it does allow for deterministic top-down parsing because in every field of the parsing table there is only one possible production.