Lecture 9: February 3rd , 2020

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9.1 Analysis Continued

9.1.1 Parsing Continued

9.1.1.1 LR(1) NFA

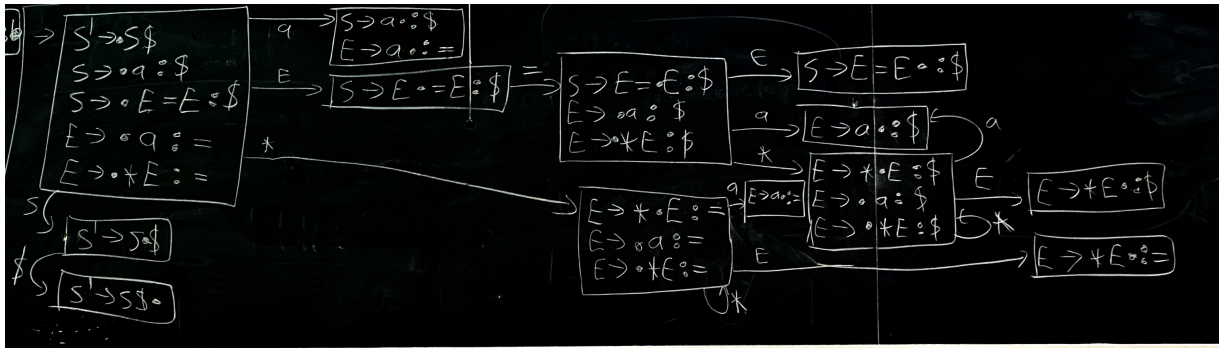**Note:** (H : I), I is the look ahead symbol in this context

- $\Sigma = T \cup N$

- $Q = \{A \to \alpha \cdot \beta : a | A \to \alpha\beta \in R\}$

- $q_0 = S' \to s\$: \$$

- $A = Q$

- $\delta(A \to \alpha \cdot B\beta : a, \epsilon) = \{B \to \cdot\gamma : b | B \to \gamma \in R \text{ and } b \in first(\beta a)\}$

- $\delta(A \to \alpha \cdot X\beta : a, X) = \{A \to \alpha X \cdot \beta : a\}$

- If NFA ends up in $B \to \gamma\cdot : b$ on stack $\beta\gamma$, then $B \to \gamma \in Reduce(\beta\gamma, b)$ because the NFA would also accept $\beta\beta b$

9.1.1.2 LR(1) DFA

- S-R: if DFA state contains $A \to \gamma\cdot : a$ and $B \to \alpha \cdot a\beta : b$

- R-R: if DFA state contains $A \to \gamma\cdot : a$ and $B \to \delta\cdot : a$

Example 9.1 -
Grammar:

- $S' \to \cdot S\$$

- $S \to \cdot a : \$$

- $S \to \cdot E = E : \$$

- $E \to \cdot a :=$

- $E \to \cdot \star E :=$

- The example highlights that LR(1) DFA's are often big and occupy more than 1Mb.

- LALR(1): uses LR(0) DFA with local follow sets in states.

9.1.1.3   LALR(1)

Definition 9.2 $cove(q) = \{A \to \cdot\beta | A \to a \cdot \beta : a \in q\}$

Fact

If we replace each LR(1) DFA state with its cove, we get LR(0) DFA

Idea

For each item (NFA state) in the LR(0) DFA state, use corresponding look-a-ahead symbols from LR(1) DFA states