CSE322

Acceptance by Pushdown Automata

Lecture #31

Acceptance by PDA

A pda has final states like a nondeterministic finite automaton and has also the additional structure, namely PDS. So we can define acceptance of input strings by pda in terms of final states or in terms of PDS.

Definition Let $A = (Q, \Sigma, \Gamma, \delta, q_0, Z_0, F)$ be a pda. The set accepted by pda by final state is defined by

$$T(A) = \{w \in \Sigma^* \mid (q_0, w, Z_0) \overset{*}{\vdash} (q_f, \Lambda, \alpha) \text{ for some } q_f \in F \text{ and } \alpha \in \Gamma^*\}$$

Definition Let $A = (Q, \Sigma, \Gamma, \delta, q_0, Z_0, F)$ be a pda. The set $N(A)$ accepted by null store (or empty store) is defined by

$$N(A) = \{w \in \Sigma^* \mid (q_0, w, Z_0) \overset{*}{\vdash} (q, \Lambda, \Lambda) \text{ for some } q \in Q\}$$

In other words, w is in $N(A)$ if A is in initial ID (q_0, w, Z_0) and empties the PDS after processing all the symbols of w. So in defining $N(A)$, we consider the change brought about on PDS by application of w, and not the transition of states.

Example

Construct a pda A accepting $L = \{wcw^T \mid w \in \{a, b\}^*\}$ by final state.

- ***Example***

Construct a pda A accepting the set of all strings over $\{a, b\}$ with equal number of a's and b's.

Solution

Let

$$A = (\{q\}, [a, b], [Z_0, a, b], \delta, q, Z_0, \emptyset)$$

where δ is defined by the following rules:

$$\delta(q, a, Z_0) = \{(q, aZ_0)\} \quad \delta(q, b, Z_0) = \{(q, bZ_0)\}$$

$$\delta(q, a, a) = \{(q, aa)\} \quad \delta(q, b, b) = \{(q, bb)\}$$

$$\delta(q, a, b) = \{(q, \Lambda)\} \quad \delta(q, b, a) = \{(q, \Lambda)\}$$

$$\delta(q, \Lambda, Z_0) = \{(q, \Lambda)\}$$