

Deterministic Pushdown Automata

A deterministic pushdown automata (DPDA) is a variation of the pushdown automata. The class of deterministic pushdown automata accepts the deterministic context-free languages, a proper subset of context-free languages. A deterministic pushdown automaton has at most one legal transition for the same combination of input symbol, state, and top stack symbol. This is where it differs from the nondeterministic pushdown automata.

Let $M = (Q, \Sigma, \Gamma, q_0, Z_0, A, \delta)$ be a PDA. Then M is deterministic if and only if both the following conditions are satisfied:

- For any $q \in Q, a \in \Sigma \cup \{\epsilon\}, x \in \Gamma$, the set $\delta(q, a, x)$ has at most one element.
- For any $q \in Q, x \in \Gamma$, if $\delta(q, \epsilon, x) \neq \emptyset$, then $\delta(q, a, x) = \emptyset$ for every $a \in \Sigma$.