Upuntil now we considered nondeterministic PDA's.

But there is a deterministic counterpart of PDA's called deterministic Pushdown automatons.

unlike DFA's and NFA's, nondeterministic Pushdown automatons ARE NOT EQUAL to its deterministic counterparts.

Languages recognized by DPDA's are called deterministic context free languages

And they are a subclass of context free languages.

Defining DPDA is more complicated than we think.

- we allow ε-transitions in DPDA, even though we do not allow it in DFAs.

Def

A deterministic PDA is a 6-tuple $(Q, \Sigma, \Gamma, \delta, q_0, F)$, where Q, Σ, Γ, and F are finite sets, and

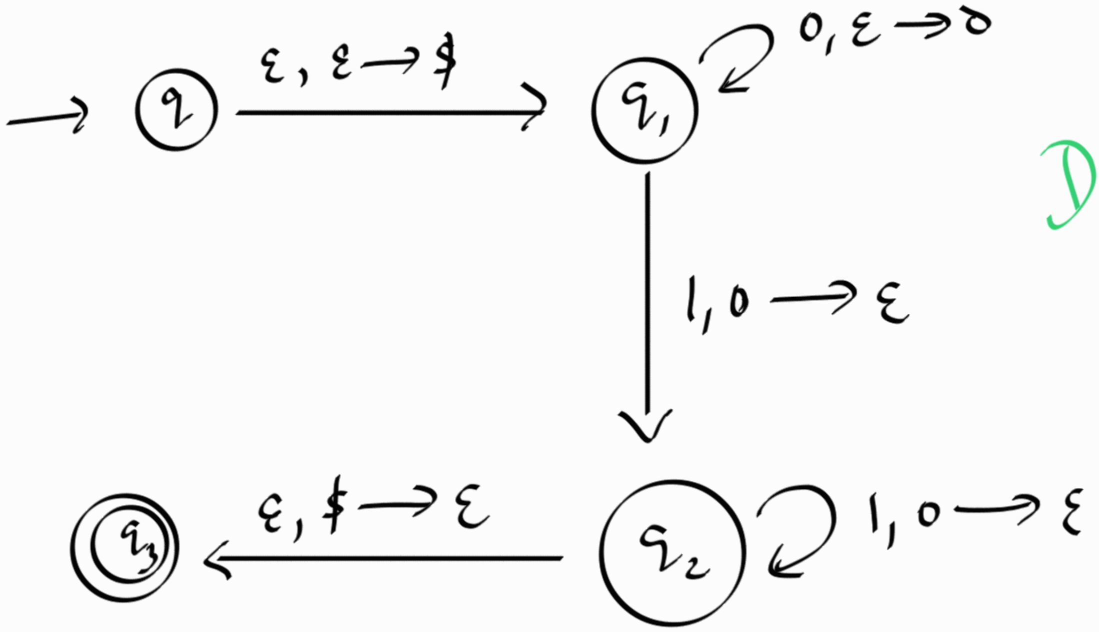
1. Q is the set of states
2. Σ is the input alphabet.
3. Γ is the stack alphabet
4. $\delta: Q \times \Sigma_\varepsilon \times \Gamma_\varepsilon \longrightarrow (Q \times \Gamma_\varepsilon) \cup \{\emptyset\}$ is the transition function
5. $q_0 \in Q$: start state
6. $F \subseteq Q$; set of accept states.

we have an additional constraint.

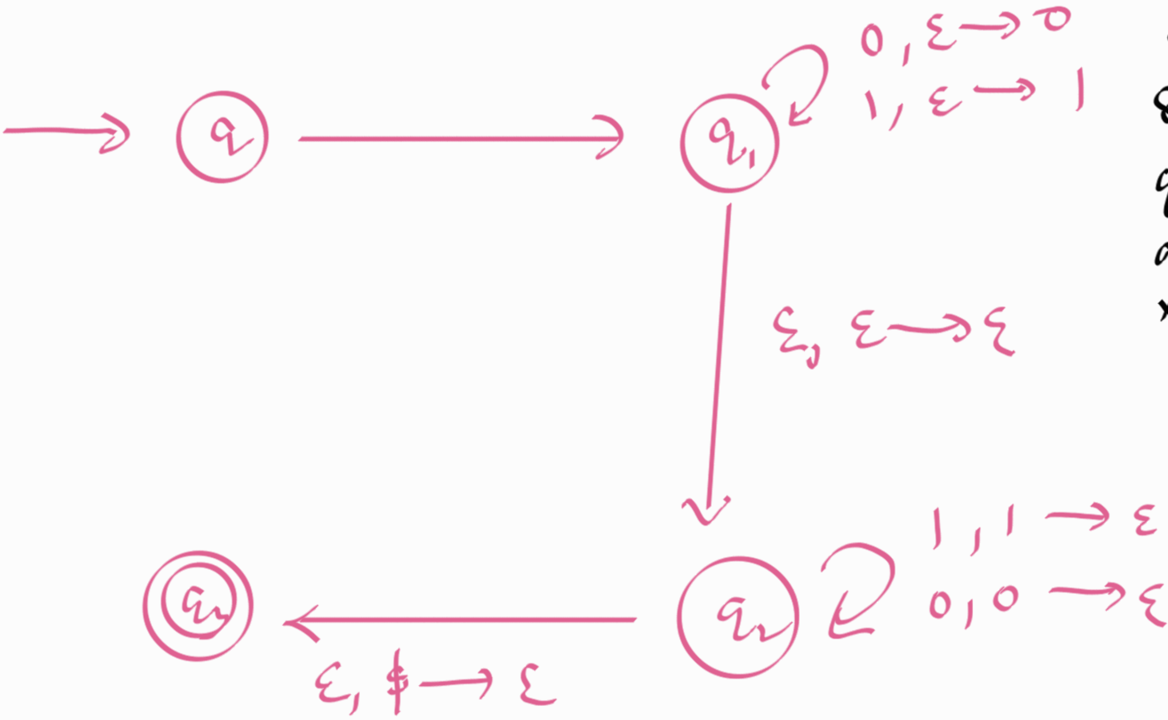
For every $q \in Q$, $a \in \Sigma$, and $x \in \Gamma$ exacty one of these values $\delta(q, a, x)$, $\delta(q, a, \varepsilon)$, $\delta(q, \varepsilon, x)$ and $\delta(q, \varepsilon, \varepsilon)$ is not $\emptyset$. (not non-empty)

Example

$\Sigma = \{0, 1\}$



Deterministic



$\delta(q_1, \varepsilon, 1)$ ✓
$\delta(q, \varepsilon, \varepsilon)$ ✓

$q = q_1$
$a = 1$
$x = 1$

non deterministic

End of mid-point of the semester.