Theory of Machines and Languages

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1403-1404

Nondeterministic Pushdown Automata

❏ **Example**

To construct an npda for accepting the language

$$L = \left\{ ww^R : w \in \{a, b\}^+ \right\}$$

$Q = \{q_0, q_1, q_2\},$
$\Sigma = \{a, b\},$
$\Gamma = \{a, b, z\},$
$F = \{q_2\}.$

$\delta(q_0, a, a) = \{(q_0, aa)\},$
$\delta(q_0, b, a) = \{(q_0, ba)\},$
$\delta(q_0, a, b) = \{(q_0, ab)\},$
$\delta(q_0, b, b) = \{(q_0, bb)\},$
$\delta(q_0, a, z) = \{(q_0, az)\},$
$\delta(q_0, b, z) = \{(q_0, bz)\},$

$\delta(q_0, \lambda, a) = \{(q_1, a)\},$
$\delta(q_0, \lambda, b) = \{(q_1, b)\},$

$\delta(q_1, a, a) = \{(q_1, \lambda)\},$
$\delta(q_1, b, b) = \{(q_1, \lambda)\},$

$\delta(q_1, \lambda, z) = \{(q_2, z)\},$

The sequence of moves in accepting *abba*:

$(q_0, abba, z)$
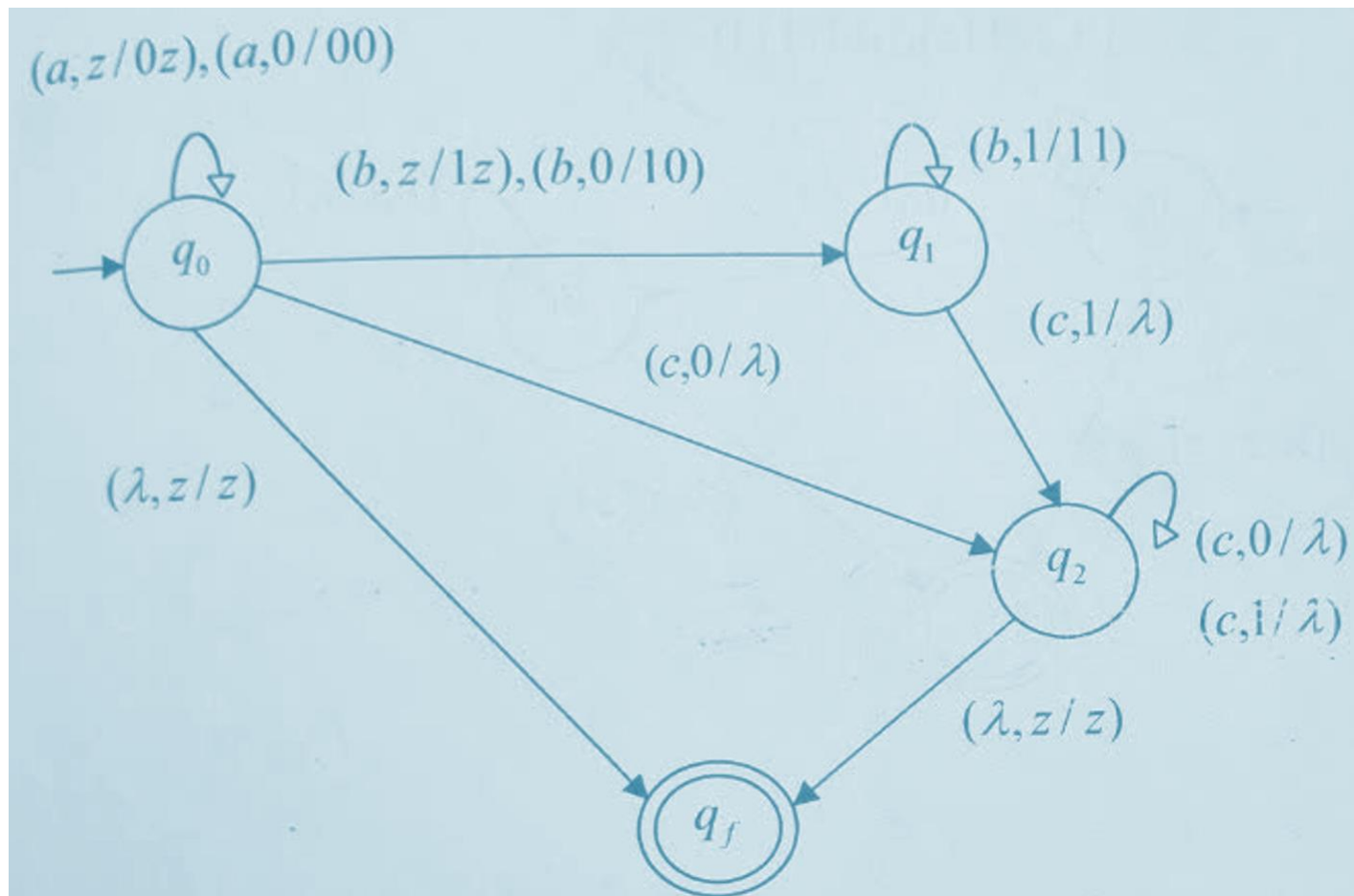$\vdash (q_0, bba, az)$
$\vdash (q_0, ba, baz)$
$\vdash (q_1, ba, baz)$
$\vdash (q_1, a, az)$
$\vdash (q_1, \lambda, z)$
$\vdash (q_2, z)$

Nondeterministic Pushdown Automata

$$L = \{a^n b^m c^{n+m} : n \geq 0, m \geq 0\}$$

Pushdown Automata for Context-Free Languages

❑ **For any context-free language L, there exists an npda M such that:**

$$L = L(M)$$