$\delta(p, a, z) = (q, az)$

Construction of PDA

* Obtain a PDA to accept the language $L(m) = \{wcw^R \mid w \in (a+b)^*\}$ where w^R is reverse of w by a final state.

it is clear from the language $L(m) = \{wcw^R\}$

i.e if $w = abb$

Then $w^R = bba$.

The language L will be wcw^R i.e

abbCbba

which is a string of palindrome.

general procedure

To checks for palindrome, let us push all scanned symbols onto the stack till we encounter the letter c

Step 1: Input symbols can be a or b.

Let q_0 be the initial state and Z_0 be the initial symbol on the stack. In state q_0 and when top of the stack is Z_0, whether the input symbol is a or b push it on to the stack, & remain in q_0

The transitions defined for this can be the form.

$$\delta(q_0, a, Z_0) = (q_0, aZ_0)$$

$$\delta(q_0, b, Z_0) = (q_0, bZ_0)$$

$\delta(q_0, a, a) = (q_0, aa)$

$\delta(q_0, b, a) = (q_0, ba)$

$\delta(q_0, a, b) = (q_0, ab)$

$\delta(q_0, b, b) = (q_0, bb)$

Step 2:

$\delta(q_0, c, Z_0) = (q_1, Z_0)$

$\delta(q_0, c, a) = (q_1, a)$

$\delta(q_0, c, b) = (q_1, b)$

Now, we have passed the middle of the string

Step 3: Input symbols can be a or b.

$\delta(q_1, a, a) = (q_1, \varepsilon)$

$\delta(q_1, b, b) = (q_1, \varepsilon)$

Step 4: Finally, in state q_1, if the string is a Palindrome, there is no input symbol to be scanned and the stack should be empty. i.e the stack symbol should contain Z_0. Now change the state q_2, and do not alter the contents of the stack. The transition for this can be of the form

$\delta(q_1, \varepsilon, Z_0) = (q_2, Z_0)$

So, the PDA to accept language

$L(M) = \{wcw^R \mid w \in (a,b)^*\}$.

along with transition graph is given by

$M = (Q, \Sigma, \Gamma, \delta, q_0, z_0, F)$

where

$Q = \{q_0, q_1, q_2\}$

$\Sigma = \{a, b, c\}$

$\Gamma = \{a, b, z_0\}$