$|v| = l \quad |w| = k$

let $x = uvw$, $|uv| \leq n$, $|v| \geq 1$

$$x = 3^n, \qquad uvw = N_u 2^{k+l} + N_v 2^k + N_w$$

$$uv^i w = N_u 2^{k+il} + N_v 2^{k+(i-1)l} + \cdots + N_v 2^k + N_w$$

Assume $uv^i w \in A$

$$uv^i w = 3^{n_i}$$

Consider
$$uv^{i+1} w - uv^i w = N_u 2^{k+(i+1)l} + N_v 2^{k+il} - N_u 2^{k+il}$$

$$\Rightarrow \quad 3^{n_{i+1}} - 3^{n_i} = 2^{k+il}\left(N_u 2^l - N_u + N_v\right)$$

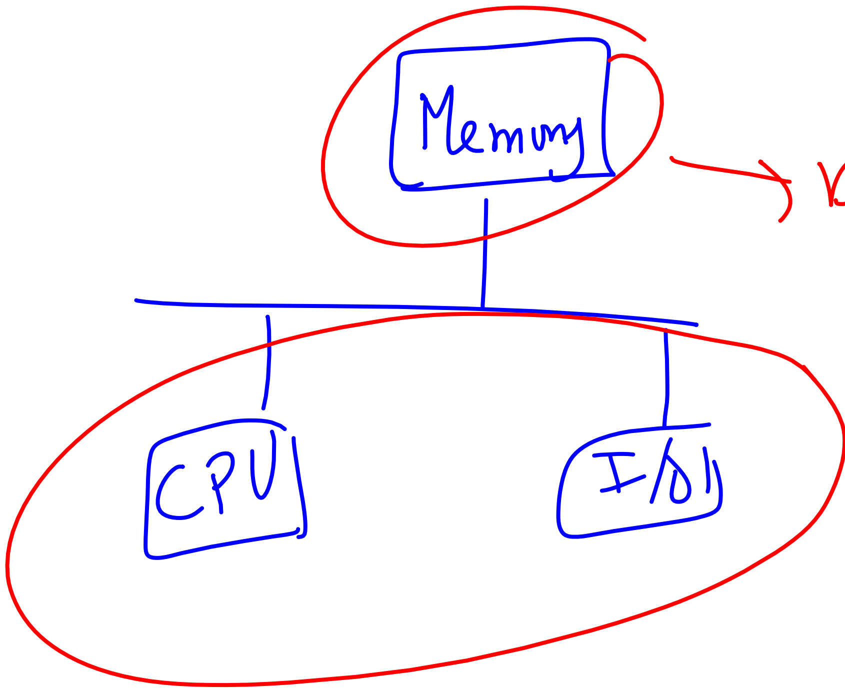
$$\|$$

$$3^{n_i}\left(3^{n_{i+1}-n_i} - 1\right)$$

For large enough i, 3^{n_i} does not divide

$$N_u 2^l - N_u + N_v .$$

$\Rightarrow \quad uv^i w \notin A$ for such i. $\boxtimes$



→ restricted form = stack

⇓

Called Pushdown Automata

A pushdown automata is a 7-tuple

$(Q, \Sigma, \Gamma, s_0, \perp, \delta, F)$ where:

1) Q is a finite set of states
2) Σ is input alphabet
3) Γ is stack alphabet
4) s_0 is start state

5) $\perp$ is symbol denoting bottom of stack

6) $F \subseteq Q$ is set of final states

7) $\delta : Q \times \Sigma \cup \{\epsilon\} \times \Gamma \longrightarrow$

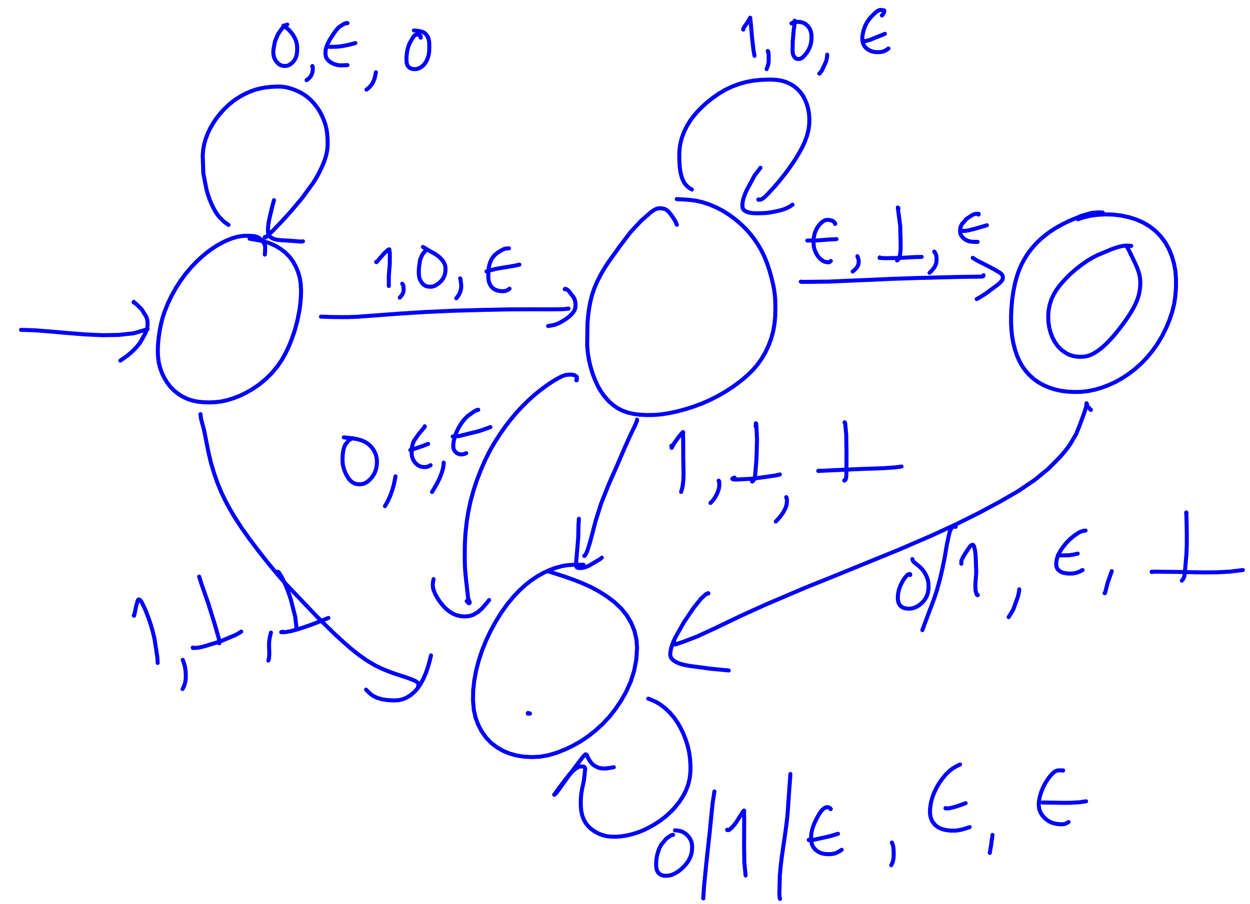
$$Q \times \Gamma^k$$

Acceptance can be of two type:

(i) Final state after input is read

(ii) Empty stack after input is read

Example: $A = \{0^n 1^n \mid n \geq 1\}$



$$A = \{ x x^R \mid x \in \Sigma^* \}, \quad \Sigma = \{0, 1\}$$

x^R = reverse of x