

# Sequential Circuit Example



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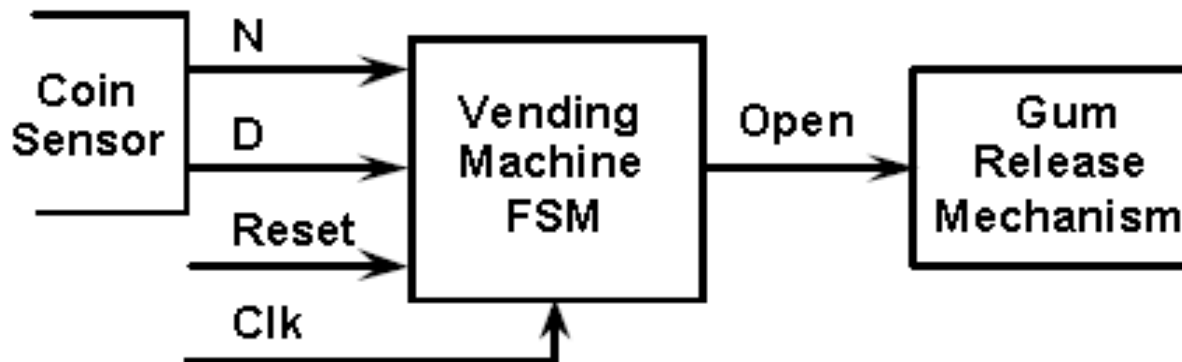
FTI - ITS

# Vending Machine FSM

## General Machine Concept:

- Deliver package of gum after 15 cents deposited
- Single coin slot for dimes, nickels
- No change

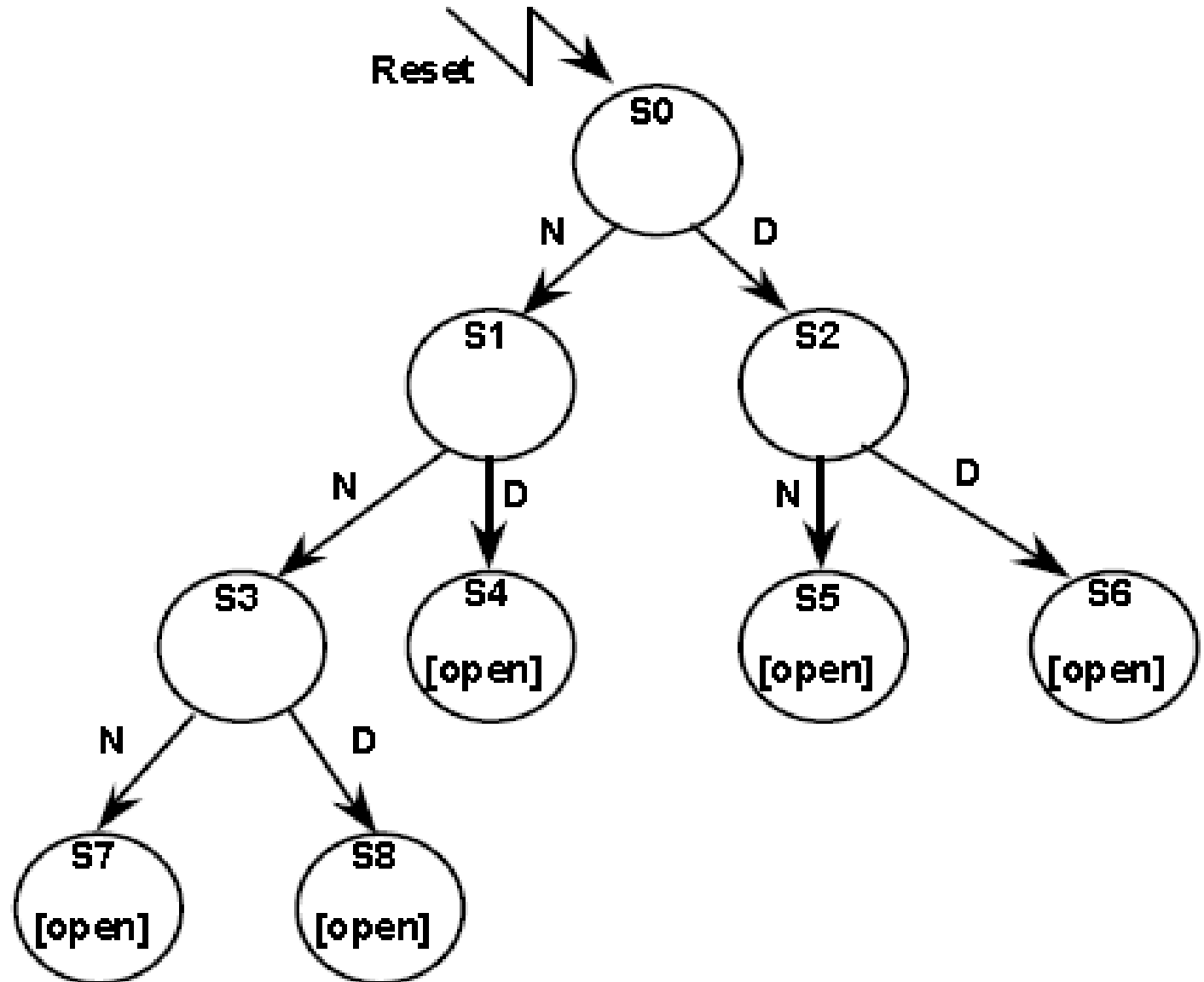
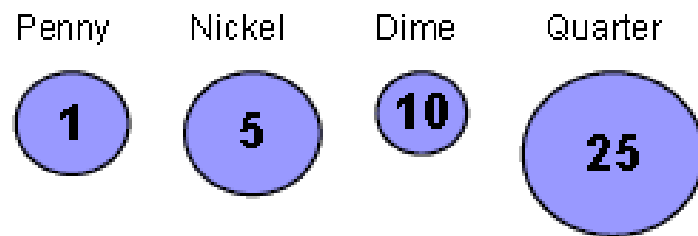
*Block Diagram*

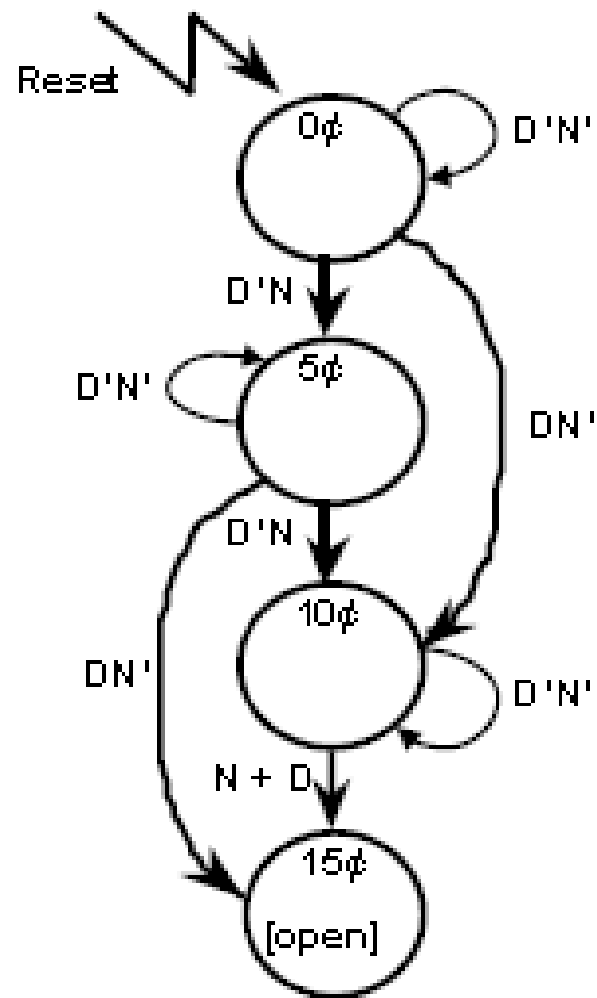


[www.kanesvending.com](http://www.kanesvending.com)

Inputs: N, D, reset

Output: open





Present State	Inputs		Next State	Output OPEN
	D	N		
$0\phi$	0	0	$0\phi$	0
	0	1	$5\phi$	0
	1	0	$10\phi$	0
	1	1	X	0
$5\phi$	0	0	$5\phi$	0
	0	1	$10\phi$	0
	1	0	$15\phi$	0
	1	1	X	0
$10\phi$	0	0	$10\phi$	0
	0	1	$15\phi$	0
	1	0	$15\phi$	0
	1	1	$15\phi$	0
$15\phi$	X	X	$15\phi$	1

Present State		Inputs		Next State		Output
$Q_1$	$Q_0$	D	N	$D_1$	$D_0$	OPEN
0	0	0	0	0	0	0
		0	1	0	1	0
		1	0	1	0	0
		1	1	X	X	0
0	1	0	0	0	1	0
		0	1	1	0	0
		1	0	1	1	0
		1	1	X	X	0
1	0	0	0	1	0	0
		0	1	1	1	0
		1	0	1	1	0
		1	1	1	1	0
1	1	X	X	1	1	1

		Q1			
		Q0	01	11	10
D	N	00	01	11	10
	00	0	0	1	1
	01	0	1	1	1
	11	X	X	X	X
10	1	1	1	1	
		Q0			

*K-map for D1*

		Q1				
		Q0	01	11	10	
D	N	00	0	1	1	0
	01	1	0	1	1	
	11	X	X	X	X	
	10	0	1	1	1	
		Q0				

*K-map for D0*

		Q1				
		Q0	01	11	10	
D	N	00	0	0	1	0
	01	0	0	1	0	
	11	X	X	X	X	
	10	0	0	1	0	
		Q0				

*K-map for Open*

$$D1 = Q1 + D + Q_0 \bullet N$$

$$D0 = N \bullet Q_0' + Q_0 \bullet N' + Q_1 \bullet N + Q_1 \bullet D$$

$$OPEN = Q_1 \bullet Q_0$$

