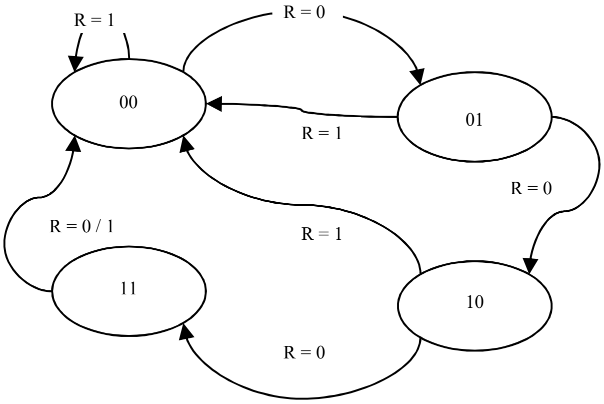
CS 061 – Computer Organization

Homework 5 solution

1. Construct the Finite State Machine representation for a counter with a cycle length of 4 - i.e. a circuit that counts 0 – 1 – 2 – 3 (output as a binary value, obviously) with successive clock pulses, and then starts over. The ***external output*** is the 2-bit count.
The only ***external input*** is R, a reset pulse: when **R = 1** it resets the next count to 0, no matter what the current state (count); when **R = 0** it continues counting (i.e. it allows the FSM to transition to the next state in sequence).
Then construct the complete truth table for the device, showing
- **the inputs**: "current state" labels d*[?:?], and R
- **the outputs:** "next state" labels d[?:?], and the 2-bit count
(Hint: if you choose the state labels sensibly, they will be the same as the output)
Finally, derive and simplify the algebraic expression for bit 0 of the output.

==



d*[1:0] are labels of previous state; d[1:0] are labels of next state; C[1:0] are count (output). The simplest choice for the state labels is to make them the same as the output, so that when the system is in, say, state 10, the count output is 10.

d^*_1	d^*_0	R	d_1	d_0	C_1	C_0
0	0	0	0	1	0	1
0	0	1	0	0	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	0
1	0	0	1	1	1	1
1	0	1	0	0	0	0
1	1	0	0	0	0	0
1	1	1	0	0	0	0

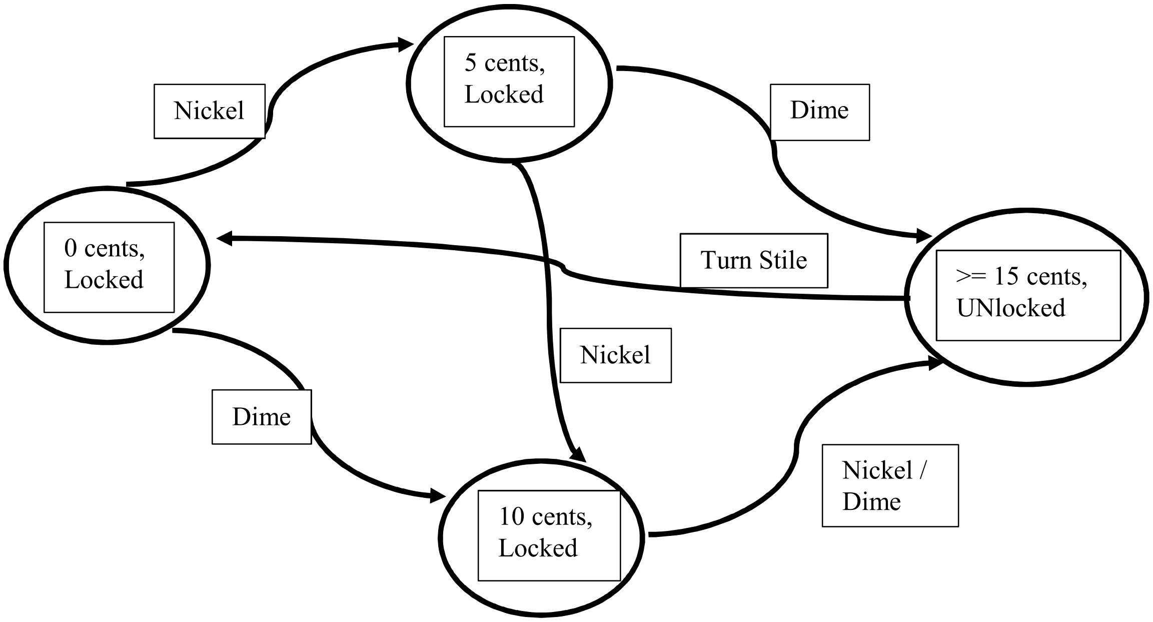
$$C_0 = N_0 = P_1'.P_0'.R' + P_1.P_0'.R' = P_0'.R'$$

This study source was downloaded by 100000886511388 from CourseHero.com on 05-27-2024 15:05:57 GMT -05:00

https://www.coursehero.com/file/26406313/hw5-solutionpdf/

2. Draw the Finite State Representation of a turnstile that accepts only Nickels and Dimes, and opens after receiving 15c.
- It starts in state "Locked, no coins"; traverses several possible "Locked, x cents" states (how many ways are there of making 15c from nickels & dimes?); then transitions to the "Unlocked" state when x >= 15; and finally, following the action "Customer entered", returns to its initial state.

===



This study source was downloaded by 100000886511388 from CourseHero.com on 05-27-2024 15:05:57 GMT -05:00

https://www.coursehero.com/file/26406313/hw5-solutionpdf/

This study source was downloaded by 100000886511388 from CourseHero.com on 05-27-2024 15:05:57 GMT -05:00

https://www.coursehero.com/file/26406313/hw5-solutionpdf/