TI-RSLK MAX

Texas Instruments Robotics System Learning Kit

Texas Instruments

Module 7

Activity: Finite State Machines

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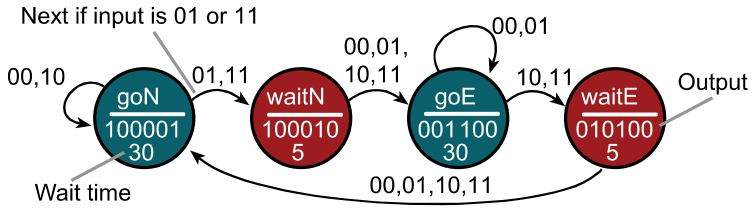
Question 1

Write C code to define a structure that contains 3 signed 16-bit numbers (x , y ,z) containing the position with units of cm, and 3 signed 16-bit numbers (vx, vy, vz) containing the velocity with units of cm/sec. Use the structure to define an object type in RAM. Use the object type to define an object. Write a function, called once a second, that uses the velocities to update position

x = x+vx
y = y+vy
z = z+vz

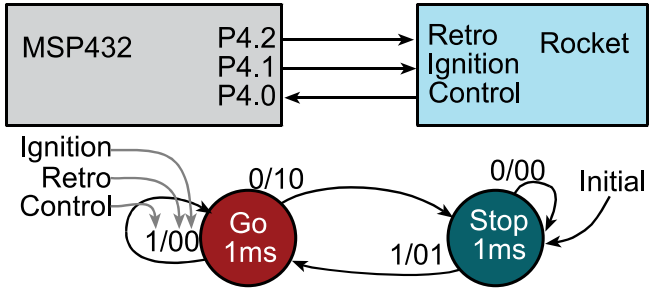
Question 2

Consider this traffic light FSM. What happens if you are in the goN state because the input is 10, the input goes 11 so you move to the waitN state, and while you are in the waitN state the input reverts to 10 (because the car is no longer on the east road)?



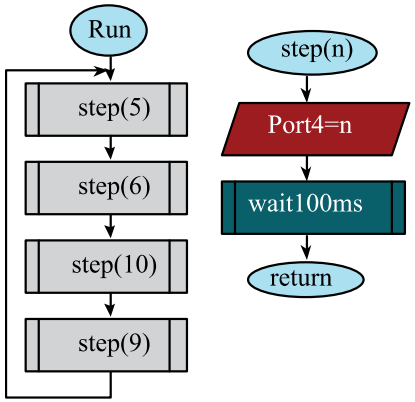
Question 3

Write the C code to implement this FSM.



Question 4

Design an FSM solution for a stepper motor controller that implements this algorithm. Show the state transition graph (no C code needed)



This motor spins clockwise when outputting the pattern 5,6,10,9 over and over. It spins counterclockwise when outputting the pattern in the other direction (5,9,10,6). The motor will stop if you leave its output at any of the valid patterns 5, 6, 10 or 9. Extend the FSM to have two inputs. If the input 0 or 1 the motor stops, if the input is 2 the motor spins clockwise, and if the input is 3 it spins counterclockwise.

Question 5

Consider the stepper motor algorithm described in Question 4. Consider a system with four outputs (stepper 5,6,10,9) and two inputs. If the input is 0 or 1, the motor should stop. If the input is 2, the motor should spin clockwise with a 100 ms delay. If the input is 3, the motor should spin clockwise twice as fast (delay = 50ms). Show the state transition graph (no C code needed).

Question 6

If a system has 5 binary inputs, how many next state arrows will each state have?

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