Finite State Machine Design for Coffee Vending

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***Abstract*—This paper presents the design of a finite state machine that describes a system which takes money in correct denominations and return the balance if any and accordingly give coffee. The machine takes in only 5 and 10 rupee denominations and will not respond to any other incorrect denomination. The design also facilitates a trigger for balance signal generated if any. This FSM is to be placed in between a currency receiver and coffee vending machine. This FSM can replace the role of human and can automate the task of coffee vending. Less labour, efficient and accurate function is possible because here no human error is caused.**

***Keywords*—Coffee Vending, Finite State Machine, Mealy FSM**

I. Description

Finite state machines (FSM) are important class of sequential circuits. They provide memory to silicon and take action with memory. FSM can be implemented either as Mealy where output is a function of present state and current input or Moore where output is a function of present state only. Coffee Vending machine is real world application of FSM. The FSM takes two input *in5* and *in10* that indicates the input of rupees 5 and 10 denominations respectively. Any other incorrect denominations are not accepted by the machine and the state doesn't change. A coffee costs rupees 15. The system activates the yielding of coffee using the *coffee* signal. A balance amount of rupees 5 is possible for which the triggering is done using *balance* signal.

II. State Diagram

The state diagram of the the desired system is shown in figure 1. The design is done as a Mealy FSM. Three states are used to keep track of Rs. 0, Rs. 5 and Rs. 10 received. Initial state is S0 which indicates no money is received. If rupees 5 signal is triggered, then the present state changes to S1(Rs. 5 received), else if rupees 10 signal is triggered, then the present state is changed ti S2(Rs. 10 received). Other transitions also take place in similar manner. The input vector is a 2 bit number that indicates rupees 10 MSB and rupees 5 LSB. Both inputs are never HIGH simultaneously but can be both LOW indicating no input. To prevent from malfunctioning of the circuit, the state diagram shows no state change for both 00 and 11 input. The output vector is also a 2 bit number that indicates coffe MSB and balance LSB.

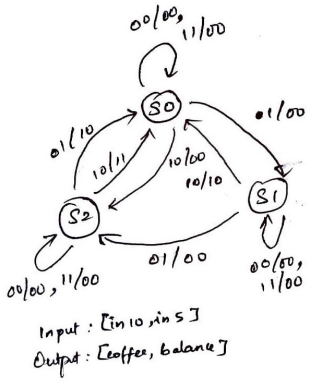

Fig. 1. State diagram for Coffee Vending Logic

III. Waveform

The figure 2 shows the sample functioning of the design described in figure 1.

Three 5 rupees and one 10 rupee results in a coffee and a balance of rupees 5. Thus both *coffee* and *balance* are HIGH. Four 5 rupees gives a coffee with no balance. Only the *coffee* is HIGH while *balance* is LOW.

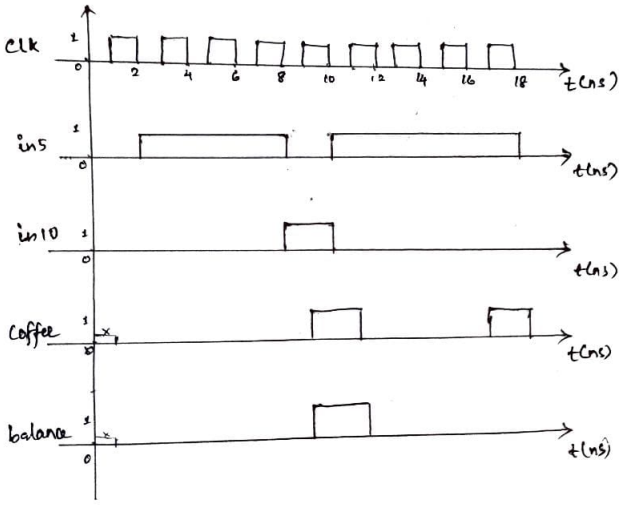

Fig. 2. Coffee Vending in action

References

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