

# EE216 Re-configurable Computing Homework3 Report

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## 1 FSM State Transition Diagram

It is a **Mealy** FSM because the output "Money" depends on the input (Dollars or cents).(Though The output "Deliver" only depends on the current state.)

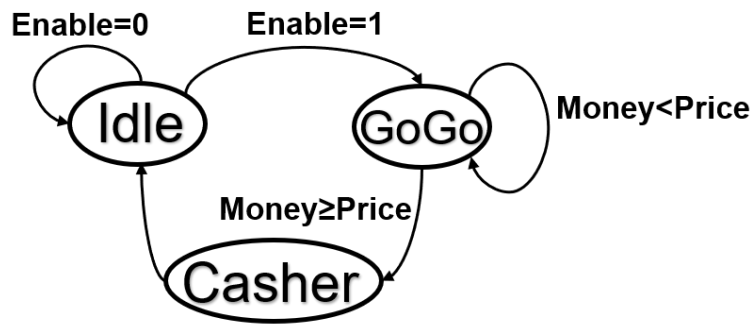


Figure 1: State Transition Diagram

## 2 Testbench Simulation Result

Fig. 2 shows the debouncing effect. The verilog I wrote has a parameter to be configured to decide the cycles that should be waited until stable state. In the testbench of this submodule, I set N(waiting cycles) as 8. So in Fig. 2, only after the ButtonIn is stable for 8 cycles, the ButtonOut started to changed. In the top module, in order to save delay time, I set the N as 3.

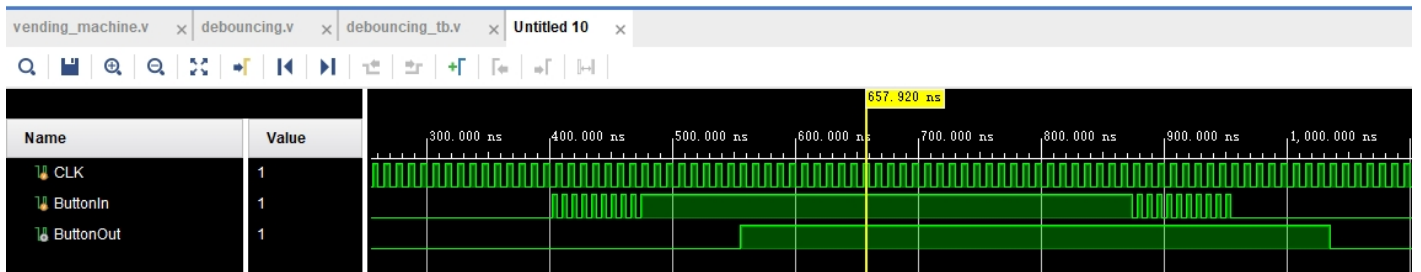


Figure 2: Button Debouncing

Fig. 3 shows that when the input buttons are not enabled, the Money will not be accumulated.(100-200ns has one dollar input, but the Money doesn't take it into account.) When Enabled is high at 180ns, the vending machine starts to work.(State Idle turns to GoGo.) And in Fig.3, there are two valid inputs, one dollar and fifty cents, so the Money output in the figure is 150.

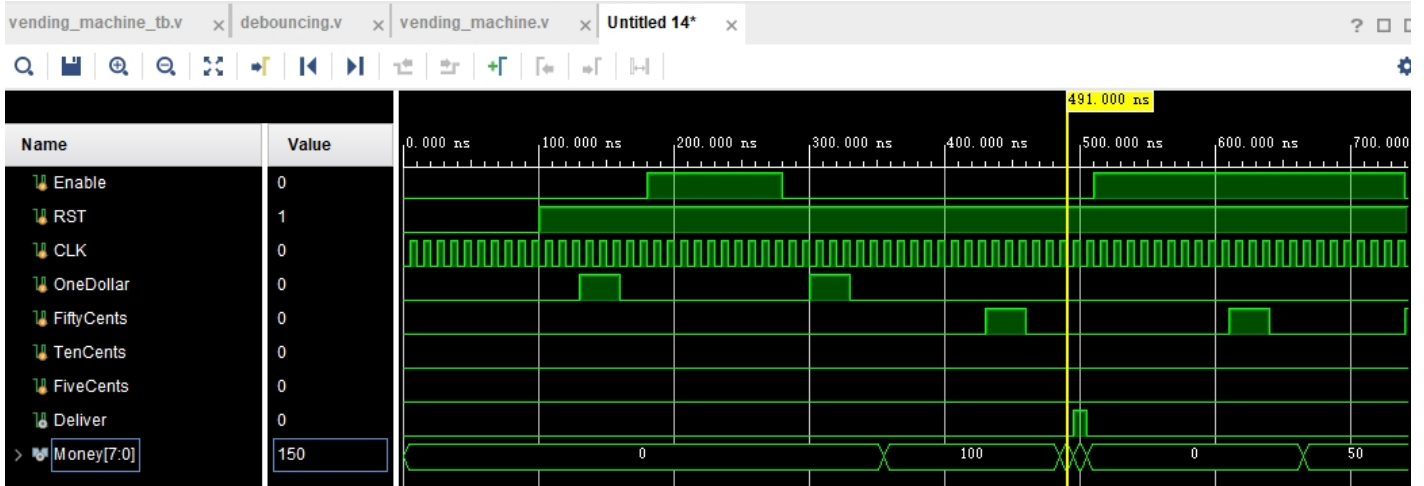


Figure 3: Enable set high to start the machine

Fig. 4 shows the following cycle of the state in Fig. 3. The next cycle detected that the Money(100+50) is more than the Price(125), and the state turns to Cashier for returning change and delivering the product. The Money then outputs the change. (150-125=25) At the same time, the Deliver is set to high in this cycle. In the next cycle, the Money is cleared and the machine should be activated when the Enable is set to high again.



Figure 4: State Gogo turns to Cashier and then Idle again

Fig. 5 shows the result of two fifty-cent and five five-cent. In the figure the Money number is 125 (50+50+5+5+5+5+5=125). And at the next cycle, the Deliver is set to high and the Money is 0 because it does not need to give the change.

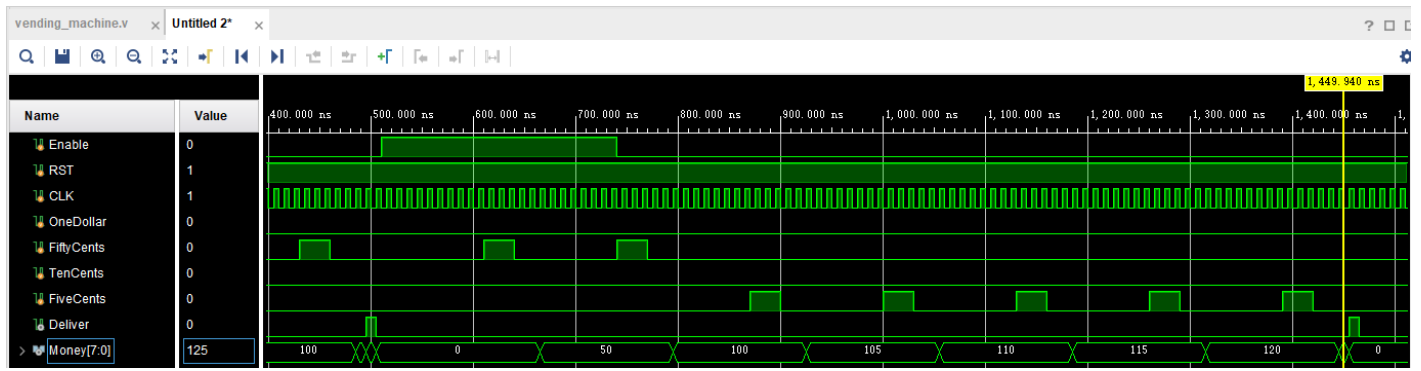


Figure 5: The Cashier state with zero change