MILESTONE 4

Finite State Machine

Objectives

- Basics of finite state machine

4.1 Preliminaries

Read the following application notes

- AN5 Finite State Machines with Quartus State Machine Editor
  http://www.fke.utm.my/simsv1.1a/upload/labsheet-upload/AN05%20FSM%20with%20State%20Machine%20Editor.pdf
- AN6 mplementing One Hot State Machines Using Schematics
  http://www.fke.utm.my/simsv1.1a/upload/labsheet-upload/AN06%20One%20Hot%20State%20Machines%20(2).pdf

4.2 Using State Machine Editor

This section is worth 40% of the assignment.

Using the same hardware setup as the "nickel-and-dime" vending machine, build a combination lock which turns on the LED with the proper sequence of buttons are pressed. Each group should have a different sequence. The possible options are:

DDDN	DDND	DDNN	DNDD	DNDN	DNND	DNNN
NNND	NNDN	NNDD	NDNN	NDND	NDDN	NDDD

Procedure:

1. On paper, sketch the state diagram to detect the sequence given to your group. **Solve it using both Moore or Mealy approaches**. Keep this sketch as your documentation.
2. Enter one state diagram (either Moore or Mealy) using the **State Machine Editor** in Quartus.
3. Convert to HDL and compile the design.
4. Simulate the design to check the correctness of the state diagram.
5. When simulation is successful, add the Input Filter, Prescaler and Knight Rider (from Milestones 2 and 3).
6. Program the CPLD.
7. Test it. The Knight Rider lights should run once when the correct sequence is entered on the pushbuttons.

If you're submitting the milestone by video, record the process of building and testing this circuit. Show that entering the correct button sequence turns on the Knight Rider.

4.3 Using One Hot Encoding

This section is worth another 20% of the assignment.

1. Based on the Moore version of the state diagram, get the next state equations and output equation.
2. Enter the circuit using the **Schematic Editor**.
3. Simulate the design.
4. Add the Input Filter, Prescaler and Knight Rider.
5. Program the CPLD and test.

4.4 Using Sequential Binary Encoding

This section is the final 40% of the assignment.

1. Based on the Mealy version of the state diagram, derive the state table. Use straight binary encoding.
2. Get the next state equations and output equation.
3. Enter the circuit using the **Schematic Editor**.
4. Simulate the design.
5. Add the Input Filter, Prescaler and Knight Rider.
6. Program the CPLD and test.