

VENDING MACHINE

Vending_machine – 1 instance – TOP

In this module all the submodules are instantiated, this module doesn't contain logic, only contains interconnections between modules

FSM – 1 instance

This module is the Finite State machine of the vending machine, implements the same FSM that is described in the document.

Only receive 1 bit control signals to change between states and the outputs also are 1 bit control signals to enable, disable or rst the other modules

It's divided in 3 always blocks

- Assigns state to next_state each clock cycle
- Assigns next_state depending on the inputs (combinational circuit)
- Assigns the outputs depending on the state (combinational circuit)

LED_controller – 1 Instance

Drives the outputs LEDS depending on the state, for example if the system is in IDLE this module will drive the LEDS with a blinking signal, if the state is VEND this module will turn off 2 LEDS and will turn on the selected LED

BLINK_generator – 1 Instance

This module generates a blink signal that is toggling every 0.5 seconds, this signal is used to blink the LEDS when needed

Cash_accumulator – 1 Instance

This module will store the money introduced with the buttons,

It's reset in the IDLE state to restart the count, its enabled in the COIN state to start counting the money introduced, in the states VEND and REFUND the module isn't reset and isn't enabled, in this way the module will conserve the count, but if a button is pressed the count won't increment

Only will count if the button is pressed, if the button is hold down only one count 1 time, the button shall be released to enable the next count

2 or more buttons can be pressed at the same time

Refund – 1 Instance

This module drives the cash to be displayed in the seven segment displays

If the state is IDLE it will drive 0 to the segments

If the state is COIN or VEND it will drive cash accumulated by the cash accumulator module

If the state is REFUND it will drive $\text{cash_accumulated} - \text{cost_haircut}$

If the state REFUND is reached by the refund_button $\text{cost_haircut} = 0$

SevenSegmentDecoder – 1 Instance

This module drives the FPGA seven segment displays, will receive the cash from the Refund module and will display this cash in the displays.

InternalSevenSegmentDecode – 3 Instances

Inside SevenSegmentDecoder, it's a simple decoder to show the numbers in the displays

TicketEnable – 1 Instance

It's a comparator, will enable child_haircut, men_haircut or women_haircut if the $\text{accumulated_cash} > \text{haircut_cost}$

TimeGenerator – 1 Instance

Generate pulses at the following times

- 0.5s
- 1s
- 3s
- 5s

These signals are used to control the states and to blink the LED

BCD_counter – 10 instances

BCD counter, are connected in cascade to accumulate counts, when the first counter reaches 10 the next counter will increment by 1 its counter

The last counter will overflow when the first counter reaches 10000000 counts = 10s