DD Project: Digital Safe

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Features

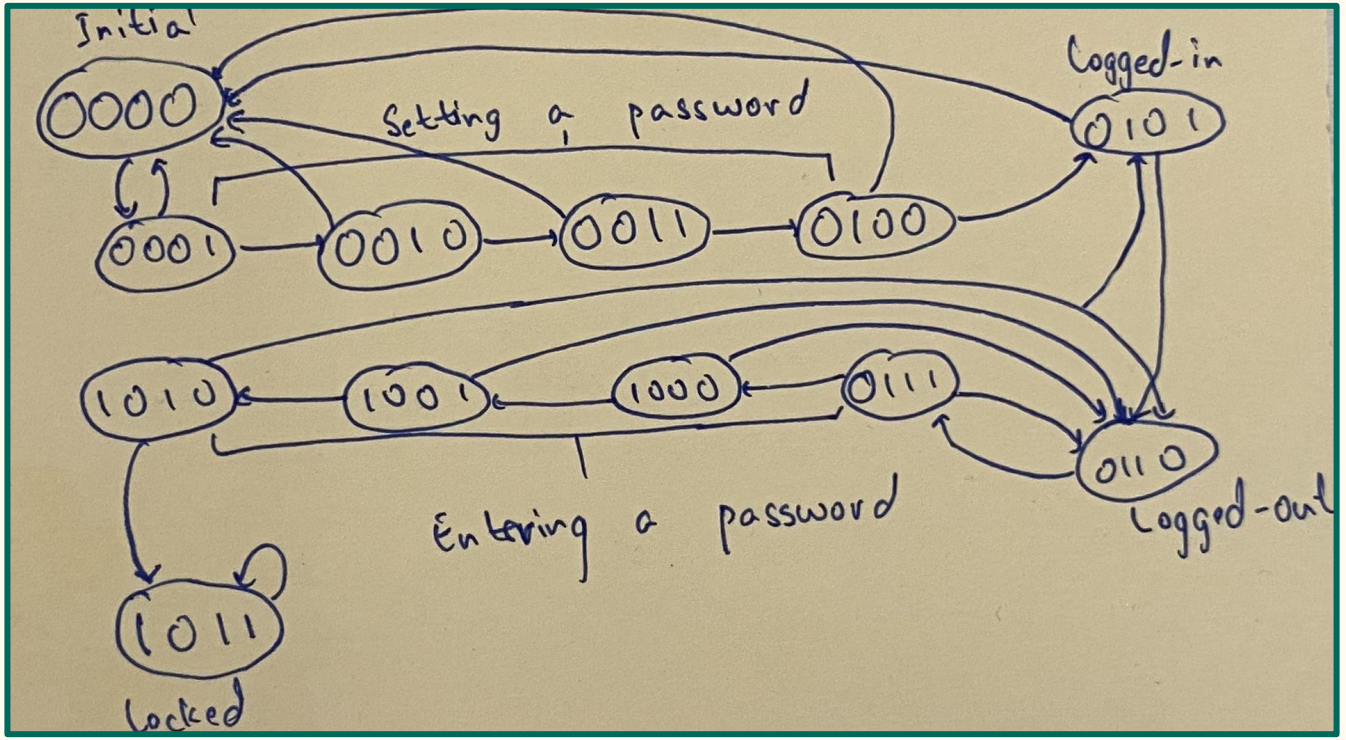
1. Different LEDs for different states
2. Ability to set new password (only when in the logged-in state)
3. Permanent locking of the device on 3 incorrect attempts
4. An external 7 segment display which shows the current state of the device
5. Option to reset the entered input
6. Countdown of the number of incorrect inputs

Concept

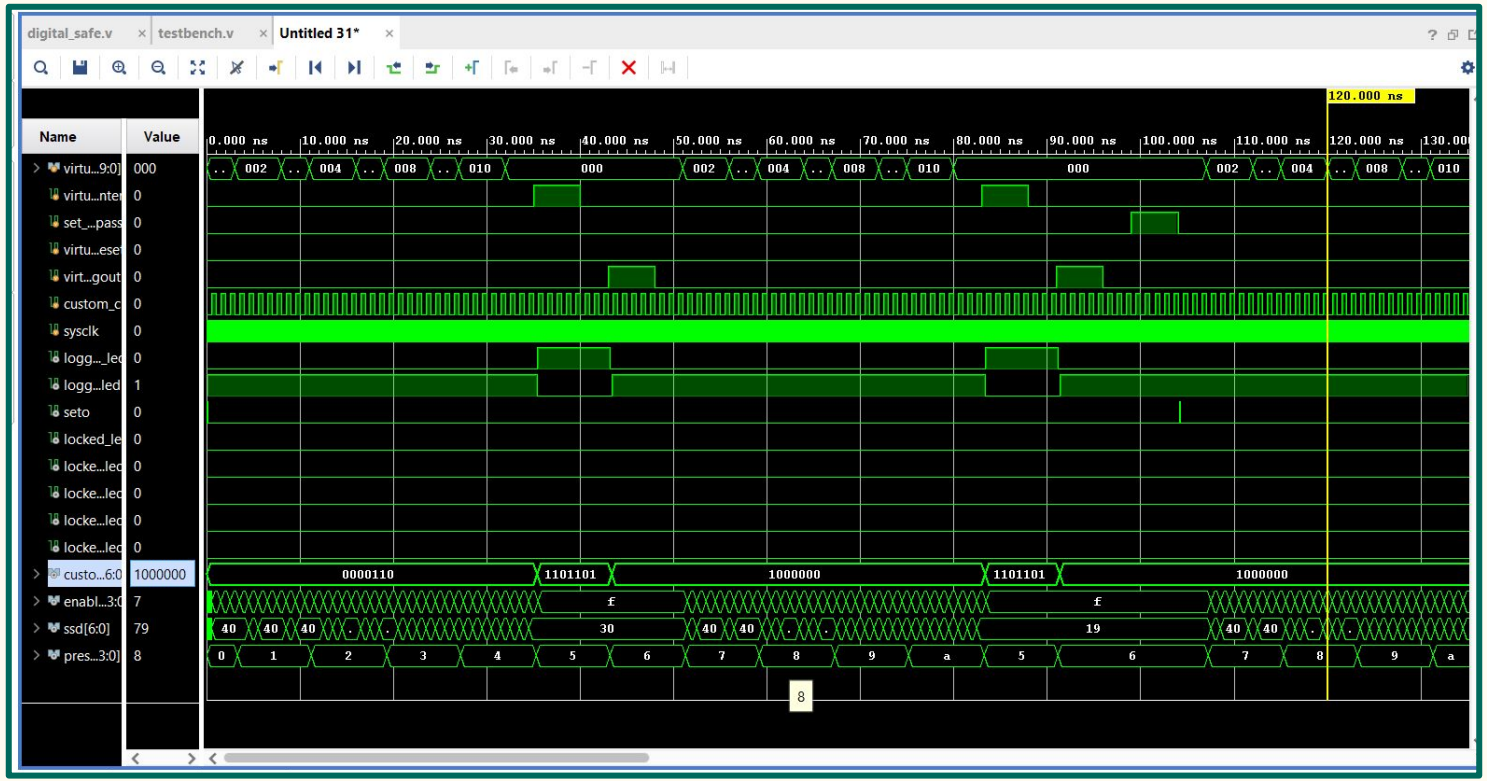
Finite State Machine

```
//parameters are the binary numbers chosen for different states
parameter[3:0] init_state = 4'b0000 , logout = 4'b0110 , login = 4'b0101 , locked = 4'b1011;
parameter[3:0] num1 = 4'b0001 , num2 = 4'b0010 , num3 = 4'b0011 , num4 = 4'b0100;
parameter[3:0] entered_num1 = 4'b0111 , entered_num2 = 4'b1000 , entered_num3 = 4'b1001 , entered_num4 = 4'b1010;
```

State Transition Diagram



Simulation



NOTE: This is a snippet of the simulation as it is too big to fit inside one screenshot

Important Aspects

1. Clock frequency reduced for better visualization
2. Implementation of virtual button module to store previous high state on positive edge of clock; prevents overwriting on other SSDs
3. No transitions from locked state, signifying that no further changes can be made to the device
4. Displays on external SSD:
    a. Initial state: ‘I’
    b. Logged-in state: ‘S’
    c. Logged-out state: ‘-’
    d. Countdown of number of incorrect attempts available: ‘2’ / ‘1’
    e. Locked state: ‘F’

Contributions

Virtual button module and concept: Rishabh

State designing and code ideation: Pujit, Ayush

Testbench and simulation: Rishabh

Implementation: Rishabh, Ayush, Pujit