DIGITAL SECURITY ALARM

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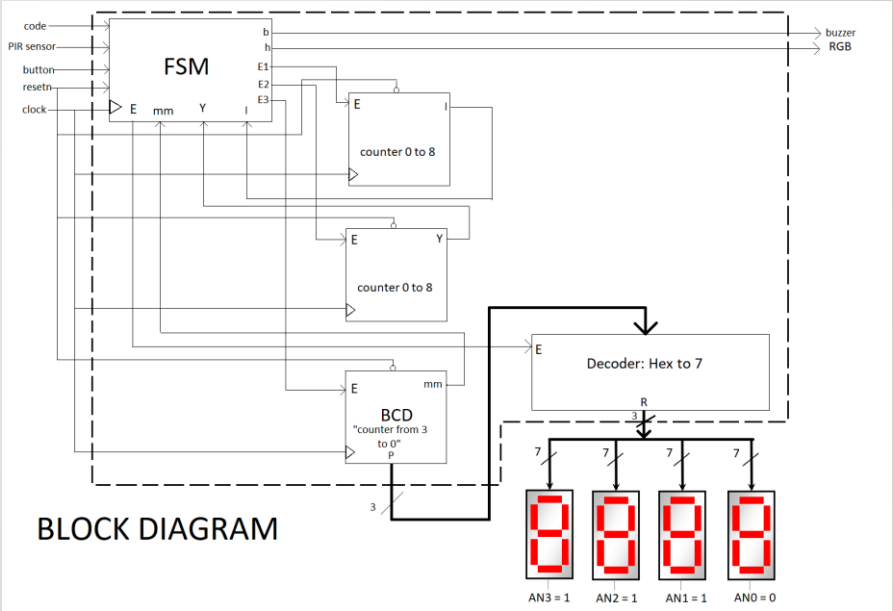
PROJECT OVERVIEW

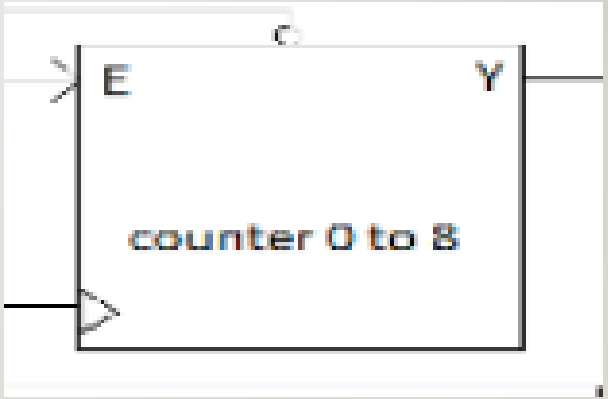
- The main purpose is to protect the home from intruders through a PIR sensor and alarm everyone if there is something suspicious by sounding off a buzzer
- System is only activated if there is motion detected by the sensor
- There are 3 attempts to get the right code before the buzzer is activated
- Each of the attempts, the person has 8 seconds to type in a code
- The number of attempts is shown in the 7-segment screen
- If every attempt is wrong, then a BCD counter activates the buzzer

BLOCK DIAGRAM



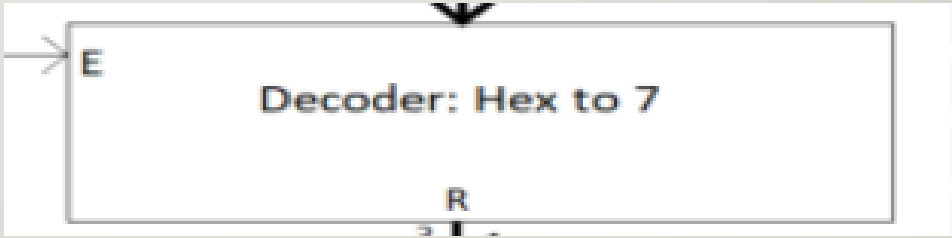
COUNTERS

- There are two 8 second counters and a BCD counter that counts down from three to zero
- The first two counters act as timers between each of the tries that the user has
- BCD counter only activates after the last attempt and it acts as a countdown to activate the buzzer
- Code cannot be inserted during the BCD counter countdown



DECODER: HEX TO 7-SEGMENT

- Converts the outputs of finite state machine from binary to hexadecimal
- The output is displayed on the 7-segment display and lets the user know when the buzzer will get activated



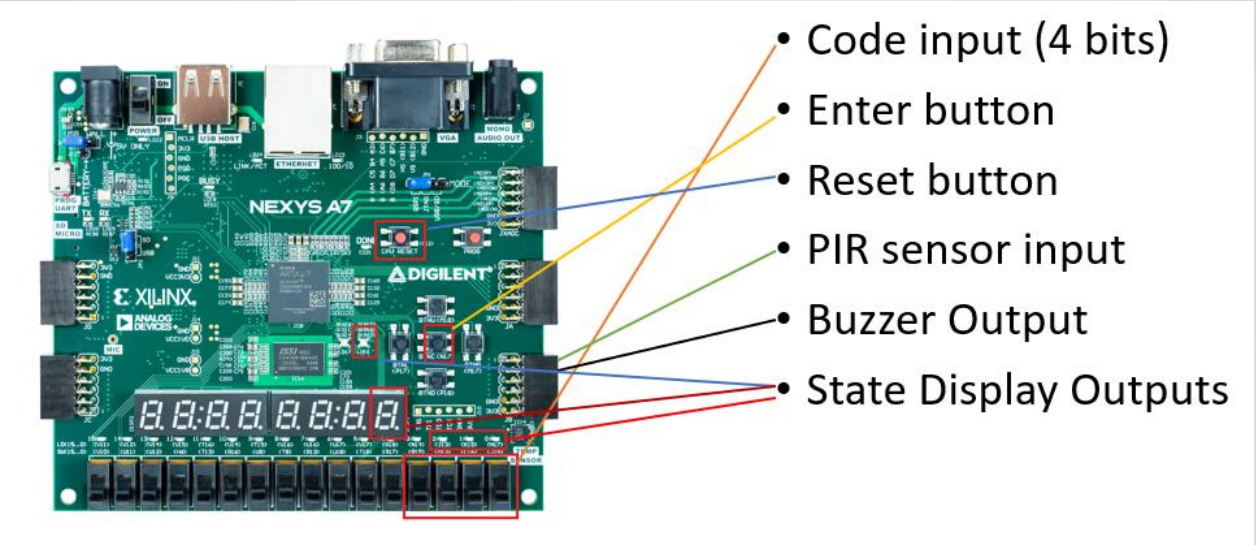
COMPONENTS

- Nexys A7 100T board
- Breadboard
- PIR sensor
- Active Buzzer
- LED's
- Wires

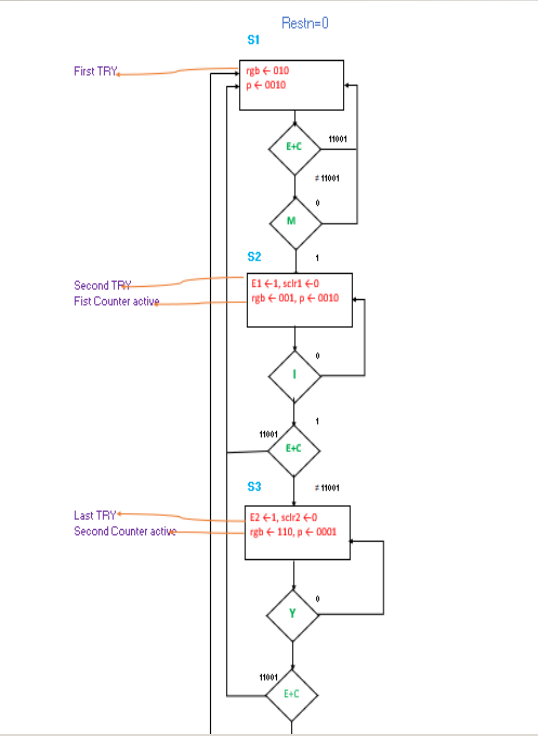
PIR SENSOR

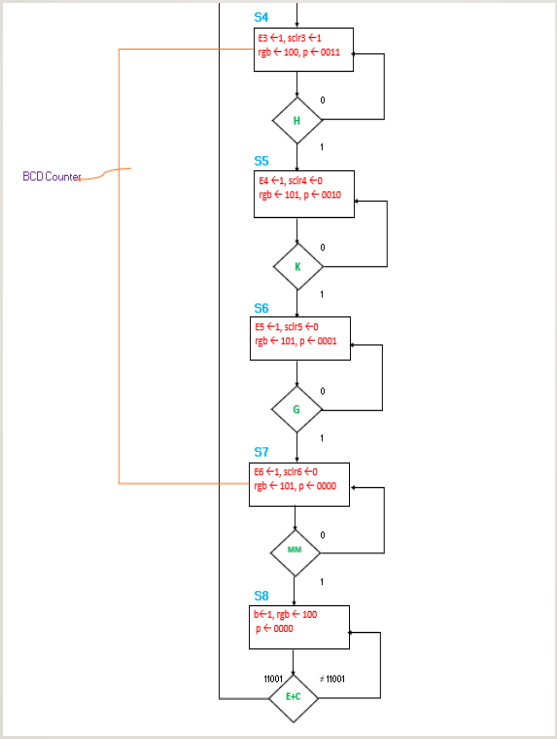
- PIR Sensors are normally used in security alarms, automatic light switches, and vending machines
- PIR Sensors send pulses to pick up object that emit heat
- In this project, the sensor is used to detect motion to activate the alarm system

DIGITAL ALARM BOARD LAYOUT



FSM CHART





E+C represents enter + code

- 5 bits ($eC_3C_2C_1C_0$)="11001"
- Button + 4 switches

P is the 7-segment and LED output

Rgb is the rgb LED output

M is the PIR sensor output

- If M is high then motion is detected and transmitted to FPGA board through Pin JB[1]

L and y are outputs of the 8 second counters

- 8 seconds to put in the right code

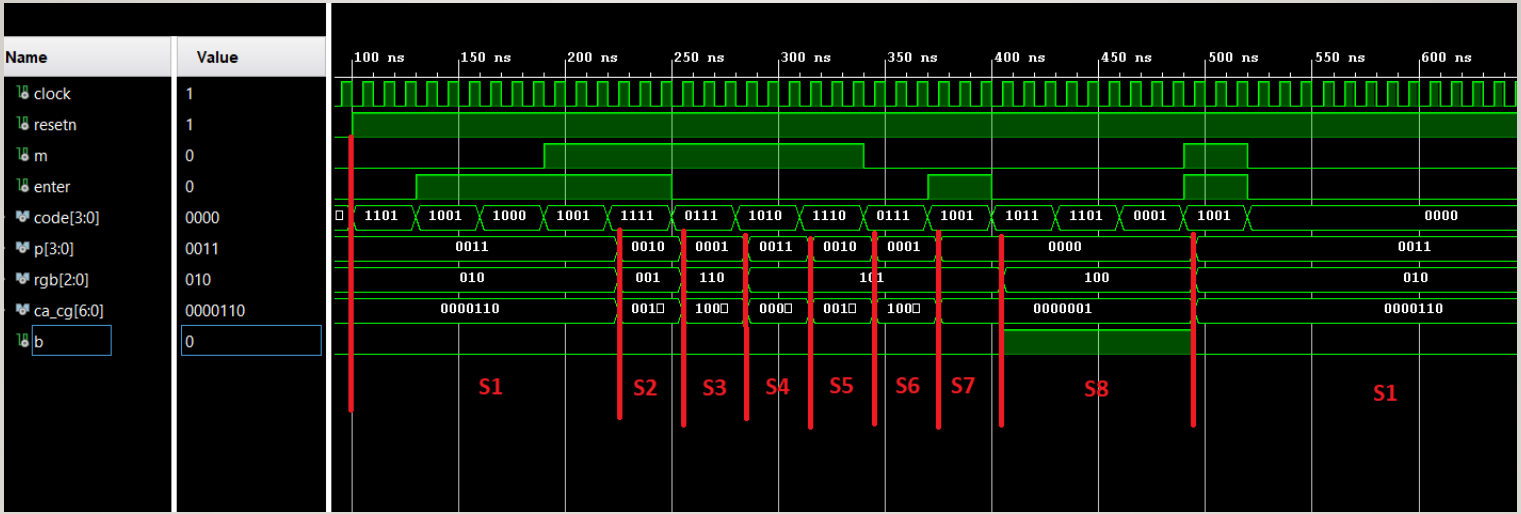
H, k, g, mm are all outputs of 1 second counter

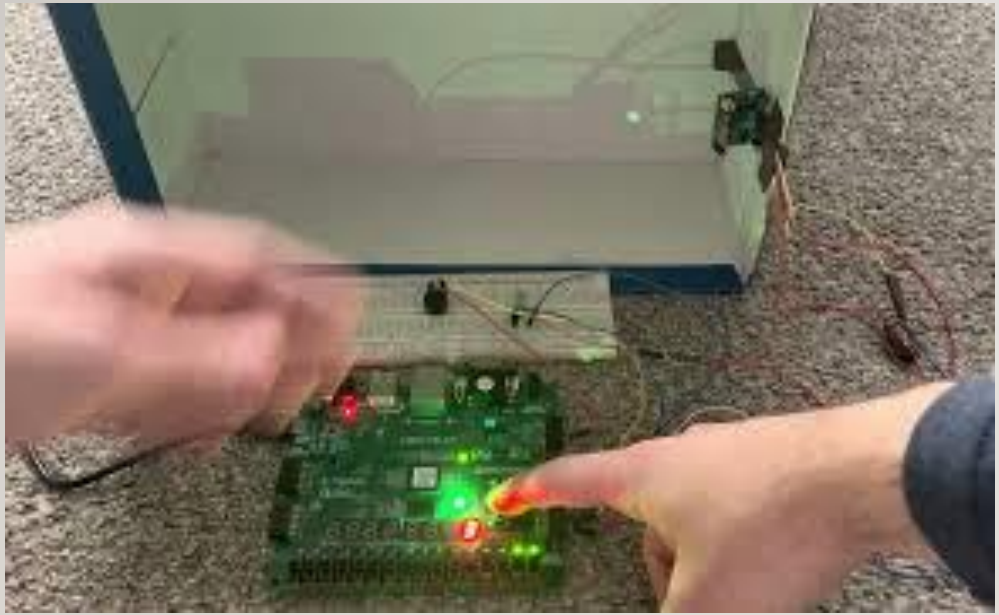
- BCD counter in a FSM

B is the output for the buzzer

- When B is high buzzer is activated through pin JB[2] in the FPGA board

SIMULATION RESULTS





DEMONSTRATION

HTTPS://YOUTU.BE/87N0TXZ7UW4

REFERENCES

- https://www.secs.oakland.edu/~llamocca/VHDLforFPGAs.html
- https://moodle.oakland.edu/mod/assign/view.php?id=6145970
- https://www.ourpcb.com/pir-sensors.html