EECE 4038C Embedded System Design

Smart Secure

Presented
By

Rishabh Choudhary
(513-827-4748) (choudhrr@mail.uc.edu)
Sudarshan Pillai
(513-857-8484) (pillaisn@mail.uc.edu)
Group 15

Fall 2018

University of Cincinnati
Electrical Engineering and Computer Science

Description

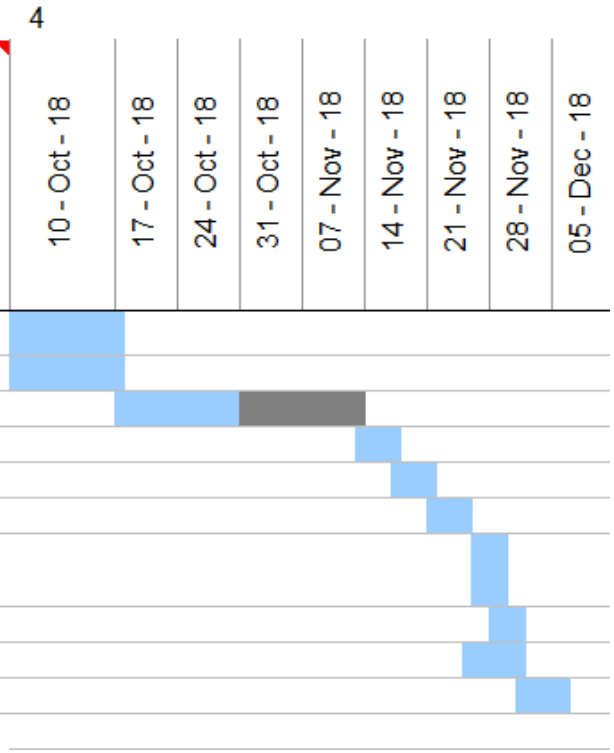
Smart Secure is a home security system. Entrance through a doorway is detected, and the user must enter a set password to prevent the alarm from sounding. Besides normal security features, there is a clock in/out system which keeps track of the presence of up to 5 family members. If a family member went missing, other members can view whether the missing member clocked in or out before he/she went missing.

Timeline

Smart Secure

Start Date: 10/10/2018 Wednesday

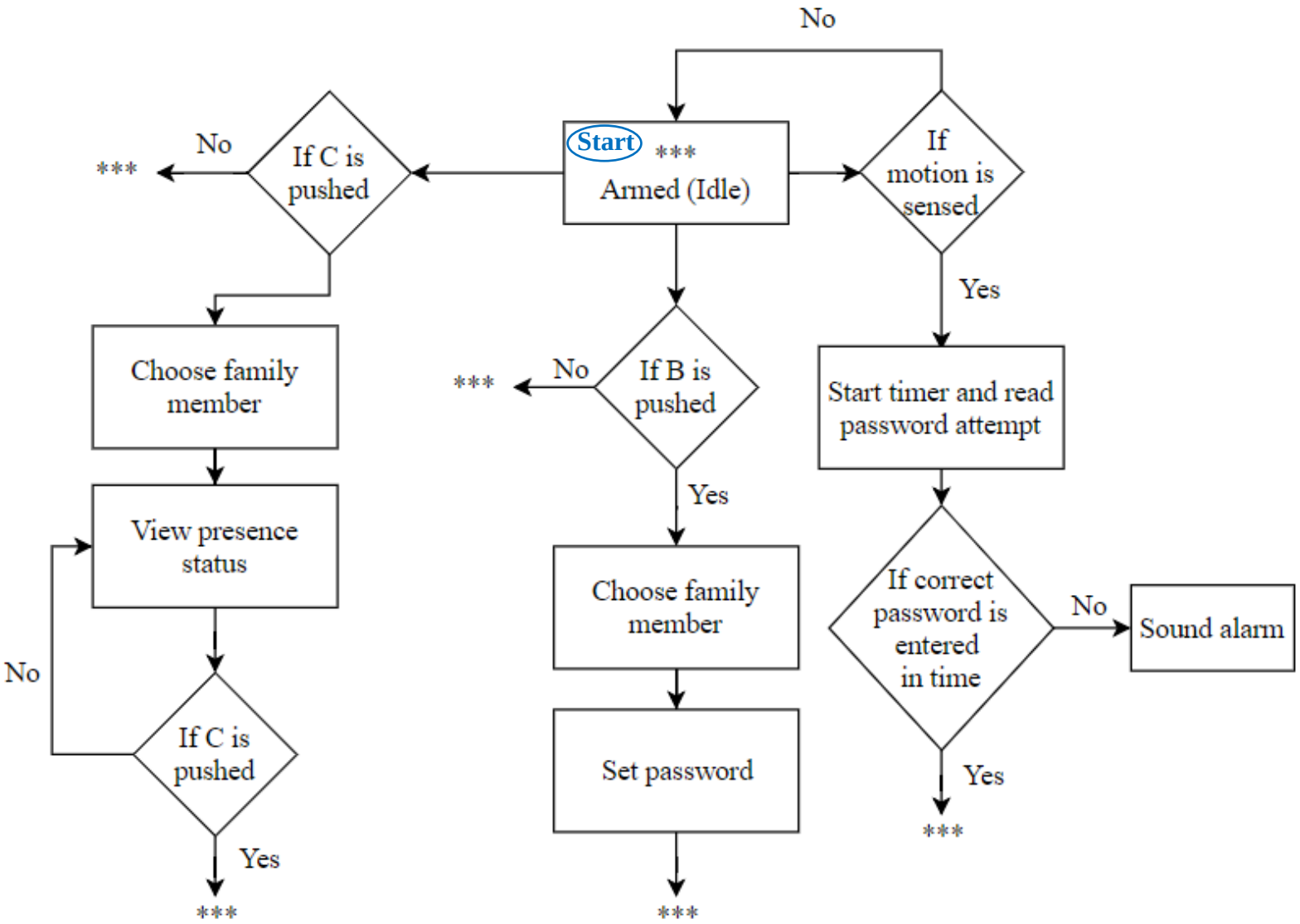
WBS	Tasks	Start	End	Duration (Days)	% Complete	Working Days
0.1	Research Topic	10/10/18	10/17/18	8	100%	6
0.2	Planning/Proposal GPS	10/10/18	10/17/18	8	100%	6
0.3	Set up serial communication for	10/17/18	11/13/18	28	50%	20
0.4	Research New Topic	11/13/18	11/17/18	5	100%	4
0.5	Plan Secuirty System	11/17/18	11/21/18	5	100%	3
0.6	LCD, Keypad, and Speaker	11/21/18	11/25/18	5	100%	3
0.7	Code for storing and manging passwords	11/26/18	11/29/18	4	100%	4
0.8	motion sensor	11/28/18	12/1/18	4	100%	3
0.9	Test/Debug	11/25/18	12/1/18	7	100%	5
3.2.1	Final Presentation and Report	12/1/18	12/6/18	6	100%	4



Budget

Part	Price
Microchip Curiosity Board	$20.00
PIR Sensor	$2.62
Piezoelectric Speaker	$1.48
LCD Display	$6.40
4x4 Keypad	$3.95
Resistors (5)	$0.15
	Total = $34.60

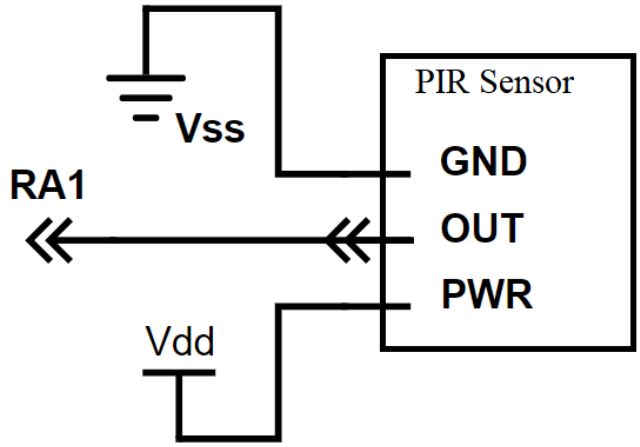
Flow Chart



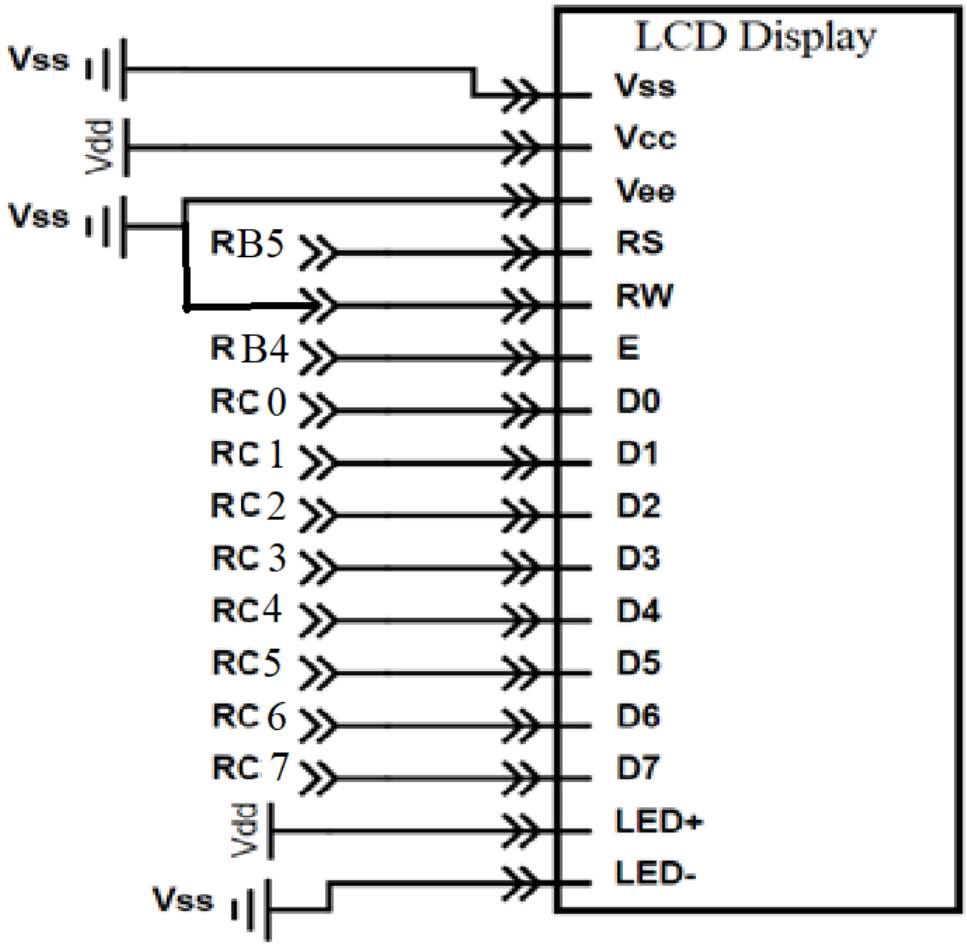
*** Means go to Armed mode

Circuit Diagrams

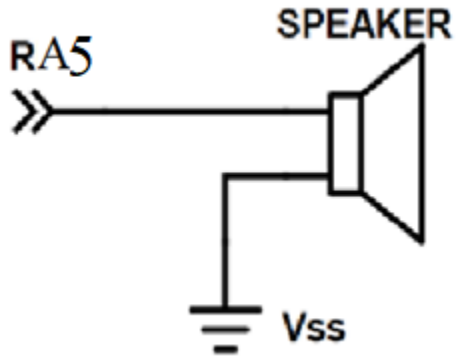
PIR Sensor



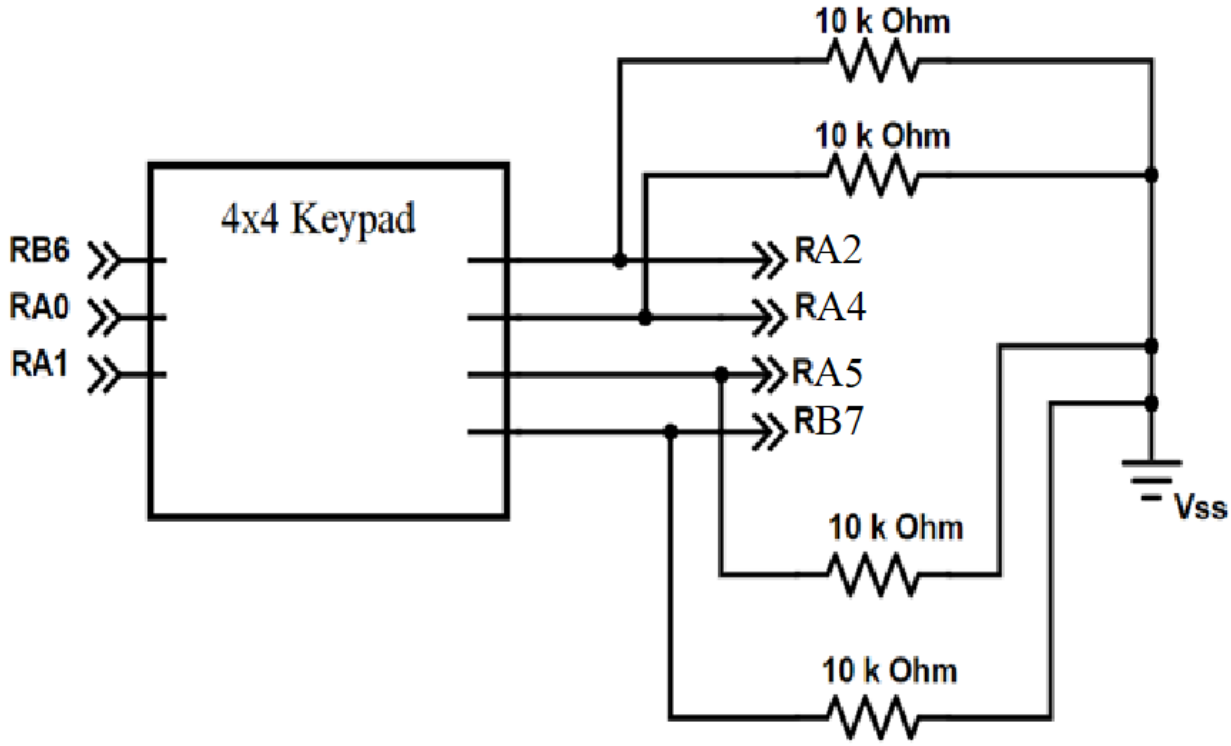
LCD Display



Piezo Electric Speaker



4x4 Keypad



Detailed Design

Change of Modes – Flags are used to change the mode that the system is in. These flags are switched based on inputs to the keypad by the user.

Passwords – Passwords are stored in char arrays. There are 5 arrays, one for each family member. The default passwords are 00000.

Motion Sensing – Motion is sensed using a PIR sensor.

Entering Password – Password attempts are compared to all stored arrays. If there is a match, the system goes back to armed mode. The corresponding family member's status of presence is reversed.

Checking Members' Presence Status – Following the steps in the user manual, the user can view if other members are clocked in or out of the house. This is determined by the value of the flag designated to each member. This value is flipped every time a user enters his or her password to leave or enter the house.

User Manual

Setup

When first installed, the system is armed and ready. The default passwords are all set to 00000. To set a password, press B. Now choose the family member for who's password is to be set. Enter password to be set and press A to submit. The system will then go back to armed mode. The default presence of each family member is set to present (is home).

Alarm

When motion is detected through the doorway, the user will have 15 seconds to enter his corresponding password. Entering the correct password will flip the family member's presence status. (i.e. If he was home, now he is not and vice versa.) If the correct password is not entered in time, the alarm will sound.

View Presence Status

When armed, press C. Then enter family member of who's status is to be viewed. Presence will now be shown. Press B to go back and choose another family member. When given the option to choose a family member, press C to go back to armed mode.

Test Plan

1. Wave hand in front of PIR sensor to make sure it is functioning properly.
2. Enter password. Check that system goes to armed stage after submitting.
3. Trigger PIR sensor. Enter password and check that system goes to armed stage.
4. Check who is present in the house. The member whose password was used should not be home. Everyone else should be home.
5. Trigger sensor and enter incorrect password. System should display “Incorrect” and then ask for password again.
6. When system is asking for password. Do not enter correct password for 15 seconds. Alarm should sound.

Test Results

1. PIR sensor works properly.
    a. Sensitivity had to be adjusted. Reasoning is discussed in Bugs/Issues section.
2. Password is saved.
    a. Numbers entered sometimes show up twice. Reasoning is discussed in Bugs/Issues section.
3. Password is accepted.
4. Members’ presence is stored and determined properly.
5. Incorrect passwords are not accepted.
6. Alarm sounds when correct password is not entered in 15 seconds.

Bugs/Issues

<u>PIR Sensor</u>

The first PIR sensor used did not operate properly. It was replaced by a functioning sensor. Initially, the new sensor was too sensitive. The sensitivity had to be adjusted by turning the potentiometers on the PIR sensor.

<u>Number of Pins</u>

The number of pins were too low for each input and output to have its own pin. Some pins had to be shared. This was done by changing the input/output mode of pins during the operation.

<u>Keypad Entries</u>

Some keypad entries caused multiple numbers to show up on the LCD. This was due to noise from the signal. This could be fixed by implementing a debouncer.