

Lab 6 - Smart Home Monitoring System

1. Introduction

1

2. Exercise 1

2

3. Submission

6

1. Introduction

In this lab we will learn how to:

- Connect, collaborate and use different grove sensors available for Arduino.
- Create a home monitoring system.

2. Exercise 1

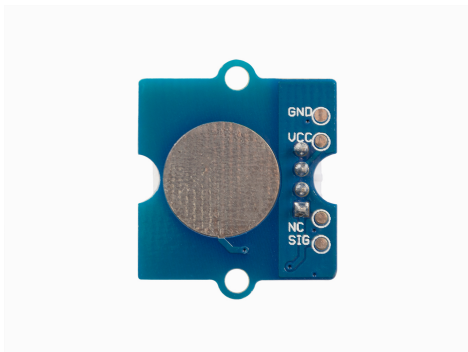
Monitor the home with Arduino device using different sensors, define alerts and set alerts to trigger on different conditions and actions.

Sensors required :

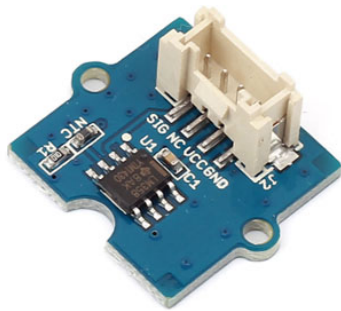
- Grove ultrasonic distance sensor.



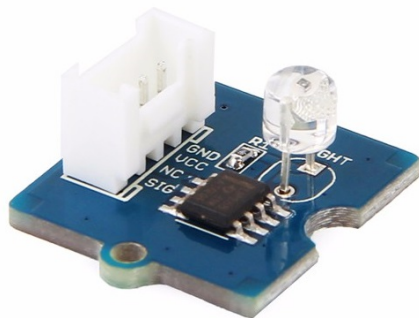
- Grove touch sensor.



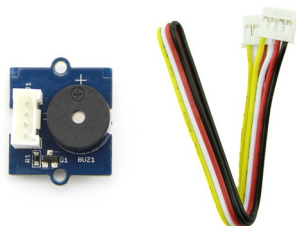
- Temperature sensor.



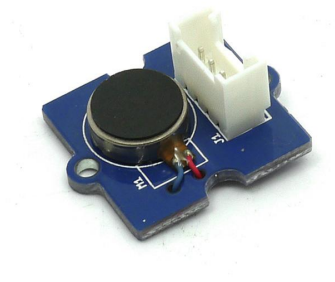
- Light sensor.



- Buzzer.



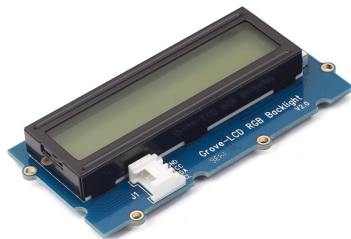
- Vibration motor.



- Red LED Bulb.



- Grove LCD RGB backlight Display - use I2C port on the grove shield to connect the display



- Grove Sound sensor



Read the specifications of each sensor mentioned above in the website

<https://wiki.seeedstudio.com>, go through the example modules for each sensor, learn how they work and think of how they can be used to design the monitoring system for the below mentioned exercise.

Example: Light Sensor

Specification

Item	Value
Operating voltage	3~5V
Operating current	0.5~3 mA
Response time	20-30 milliseconds
Peak Wavelength	540 nm
Weight	4 g

Download the LCD display library from the give link

https://github.com/Seeed-Studio/Grove_LCD_RGB_Backlight/archive/master.zip

Download the Untrasonic Sensor Library from the below link:

https://github.com/Seeed-Studio/Seeed_Arduino_UltrasonicRanger/archive/master.zip

And add the downloaded libraries to Arduino IDE as follows

In the Toolbar Select **Sketch > Include Library > Add .Zip library**, select the downloaded zip file and click Open.

TASK

- Write a program to create two modes namely, Active monitoring and Passive monitoring for smart home monitoring system.
- By default, the Arduino should start with passive monitoring mode, to switch to active monitoring mode, the user should press the touch sensor for THREE seconds, the vibration motor should give (1500ms) long beep, to switch back to passive mode, the user should press the touch sensor for TWO seconds, the vibration motor should give TWO short (500 ms each) beeps upon successful switch.

- After the device starts in passive mode, it should calibrate the sensors initially for FIVE seconds, during calibration, record the current room parameters (AMBIENT_LIGHT, SOUND_LEVEL, TEMPERATURE, DISTANCE BETWEEN WALL AND ULTRASONIC RANGE SENSOR) for five seconds and take average and store the values obtained and should be displayed on the backlight display later after calibration is complete, and it should display "Calibration Successful". If the room parameters like temp, distance between sensor and wall are out of the sensor's working range (check the working range of each of the above sensors and define your own threshold values), then display "Calibration failure, room parameters out of range."

Calibrated values should only be used in ACTIVE MODE.

- In passive monitoring, the device should monitor the temperature, ambient light and sound intensity with TWO second DELAY
- and display the values on the RGB backlight. The color of the Backlight display should be white (use R, G, B to max values to obtain white color, use R value to max, G to ZERO and B to ZERO, to obtain RED) Report any high sound levels or temperature beyond optimal level (for temperature below 10 deg C or above 35 deg C) in the backlight display with alternating background light between red and white with delay of 750 ms.
- The LCD backlight screen should change to red backlight when changed to active mode.
- In active monitoring, the device should monitor temperature, ambient light and distance using an ultrasonic sensor (similar to tripwire) between the sensor and the nearest wall facing the sensor, the sensors should report the values very frequently (check each sensor specifications on the grove seed website. For example, light sensor reporting time is 30 milliseconds), display them on RGB LCD screen and monitor for any abrupt changes (compare the current values with the values obtained from calibration) in the environment according to the current room parameters.
- For Example: Consider the device is switched to active monitoring, If a person intrudes a home, through a window, the temperature may change inside the home quickly (in case of during winters), if person flashes a torch light while sneaking through the house, the light sensor should pick up the sudden change and trigger the alarm, If person walks in front of ultrasonic sensor, it should pick up the movement and trigger the alarm. The alarm should consist of Buzzer tone (with 500 ms delay), flashing red led bulb (300 ms delay) and backlight display should show intrusion detection from which event (abrupt change in temperature or light or movement).

NOTE: You are free to use any external support like cardboard to place the sensors in specific direction or position. Any clarification needed in the flow of task, you are free to contact TA at vs7411@rit.edu

Submission

Make sure that any functions in your code contain a brief description, parameters and return value descriptions.

You must submit the following on myCourses:

- Exercise 1 - Demonstration Video and Code.

ZIP Folder Structure

```
-- Lab6 - <First Name> <Last Name>
  -- lab6.pdf
  -- ex1
    -- ex1.ino
    -- ex1.video_format
```