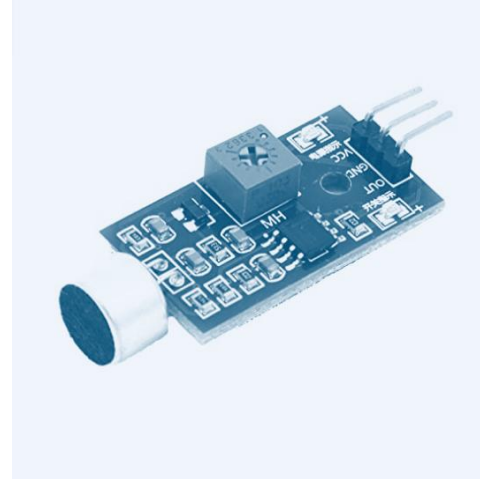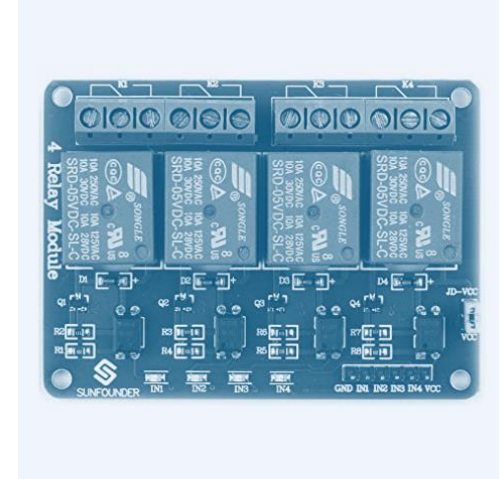# HOME AUTOMATION

MAKING THE SYSTEM POWER EFFICIENT AND SAFE FROM FALSE TRIGGERING

PIR Motion Sensor

Sound Sensor Module

Relay Module

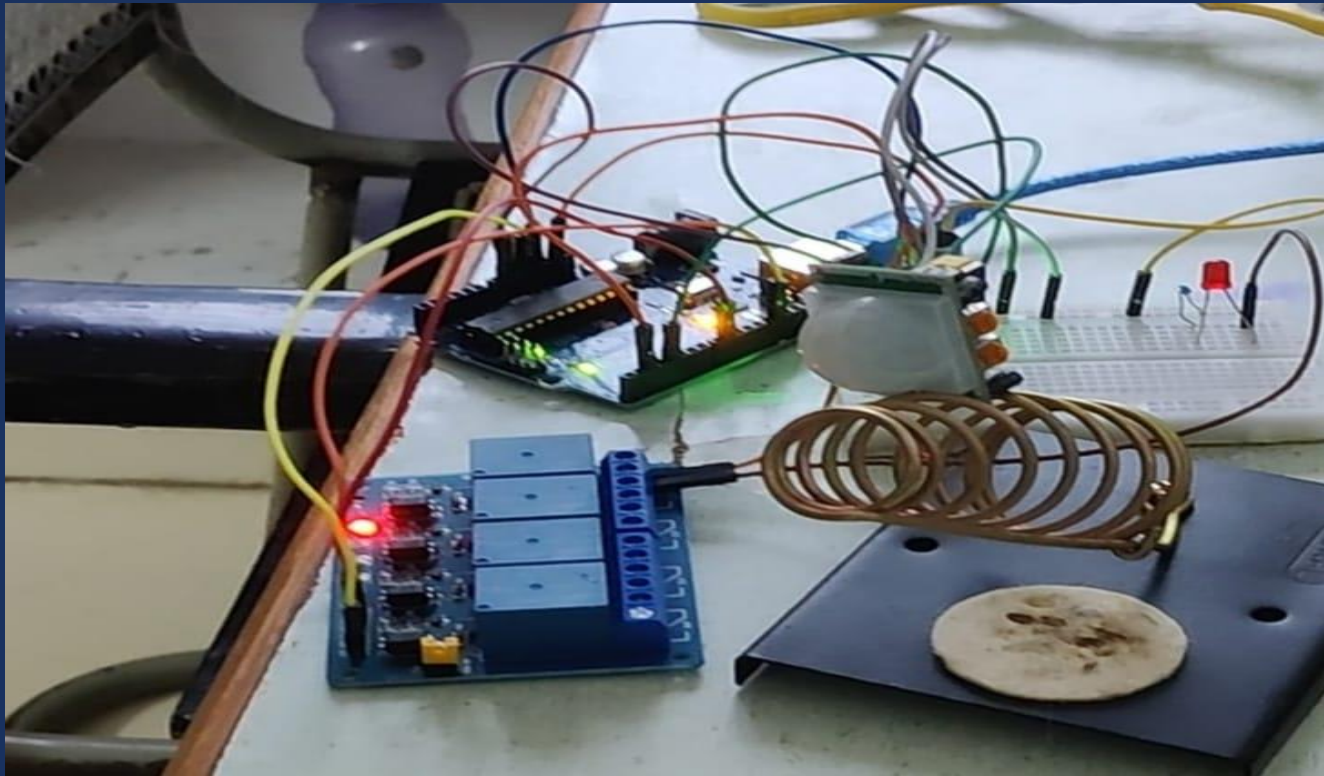COMPONENTS FOR AUTOMATION STAGE - WISE.

MECHANISM-FLOW

PIR motion sensor senses Motion

The Sound Sensor starts taking input form the user.

The Sound sensor output actuates the relay module.

CIRCUIT DIAGRAM

- We wish to implement the Home Automation System using digital Sensors.

- We wish to make the system more robust and power efficient using another sensor as a filter to decide when to and when not to take inputs.

- In our project we have used the PIR sensor module as the filter sensor. Meaning the PIR sensor will indicate the sound the sensor when to take meaningful inputs and when not to.

- For an instance say a person is outside the room and is making noise. In this case the PIR sensor would sense no change inside the room.

- As a result the sound sensor would not take input and change the state of the electrical appliance.

- Whereas if the person is inside the room and made some movement in front of the sensor and he/she is clapping to turn the appliance.

- The PIR sensor would detect the motion and instruct sound sensor to take input and actuate the relay module.

AUTOMATION STAGE - WISE.

```cpp
int mic = 2;          // microphone module
int indicLED = 13; // indication pin
int lightPin = 9;   // relay (lights control)
bool lightState = true;
bool ignoreInt = false;
bool ClapDetected = false;
uint32_t ClapDetetedTime [3] {};
long long t;

void setup() {
  Serial.begin(115200);
   pinMode(pirPin, INPUT);
  pinMode(indicLED, OUTPUT);
  pinMode(lightPin, OUTPUT);
  digitalWrite(lightPin, lightState);
  attachInterrupt(digitalPinToInterrupt(mic), ISR_ClapDetected, FALLING);
}

void loop() {
delay(2);
 pirStat = digitalRead(pirPin);
 if (pirStat == HIGH){
    t = millis();
      Serial.println("Hey I got you!!!");
  }
if(millis() - ClapDetetedTime[2] >= 800)
{
  digitalWrite(indicLED, LOW);
}

if(millis() - ClapDetetedTime[2] < 8000 && millis() - ClapDetetedTime[1] < 8000 && ClapDetected && ClapDetetedTime[1] - ClapDetetedTime[0]>=800 && millis() - t < 5000)
    {
      Serial.println("double clap detected");
      digitalWrite(indicLED, LOW);
      Serial.print("Setting light to ");
      Serial.println(String(!lightState));
      digitalWrite(lightPin, lightState);
      lightState=!lightState;
      ClapDetected = false;
    }
}
void ISR_ClapDetected()
{
  if(millis() - ClapDetetedTime[2] > 200){ // debounce

  for (int i = 0; i != 2; i++) {
  ClapDetetedTime[i] = ClapDetetedTime[i + 1];
  }

  ClapDetetedTime[2] = millis();
  ClapDetected = true;
  Serial.println("clap detected");
  digitalWrite(indicLED, HIGH);
```

- In our code we've used Arduino's internal timer interrupt to control the sound input interval.

- The code makes sure that the time interval between the two claps/sound sample is from 0.2 to 0.8 seconds. Only then it would treat them as separate sounds.

- Otherwise it would treat them as one or would start taking input over again. This makes the system robust towards continuous sounds such as continuous talking chatter etc.

- The code makes sure that the system activates/turns off the appliance in two claps instead of one. This helps in preventing false start ups.

- After the PIR sensor detects motion the user has a time gap of 5 seconds to give input and after that the system holds the state even if there is noise.

- As long as there is motion the Sound sensor and relay change the state according to input.

- But when the motion stops there's a delay of 5 seconds. Within that 5 seconds too the user can change the state.

- After that the system holds the last state as mentioned above.

CODE EXPLANATION

- This makes the system power as well as error efficient.

- The system is somewhat error resistant. For example continuous clap with time gap less than 0.2 sec does not induce any change in the appliance state (on/off state).

- Same applies for continuous noise as well. It does not have any effect on the appliance state.

- This saves the device from constantly switching states back and forth, hence preventing any damage from such activities.

- The PIR sensor as a filtering sensor has manyfold benefits. For example any outside noise (source not in room) will not be able to control the switching.

- This is particularly useful for someone living in noisy surroundings.

- Can be used to automate at a larger scale with improvements such as voice recognition.

- Not only this we can also move towards visual recognition (face, IR etc.).

- Can also be improved to sense the number of people in a room and set the temperature of AC or speed of fan or to turn the number of lights in a room etc.

BENEFITS AND FUTURE PLANS

THANK YOU

MN VENKATA RAMANA (2020102043)

SHUBHAM PRIYADARSHAN (2020102027)