Faculty of **Engineering**

AIN SHAMS UNIVERSITY

Third year mechatronics engineering

Design of measurement
Project :Smart Garage

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Smart Garage

- The target of the project is to produce a garage can interact with the surrounding environment.
- When a car approaches the garage's door by certain distance it tends to open automatically & close after the car enters the garage.
- After sunset the lights in the garage open automatically and the opposite is true.
- For safety if the temperature is raised above a certain degree that will operate the bulb as warning in addition to showing the temperature on LCD Periodically.
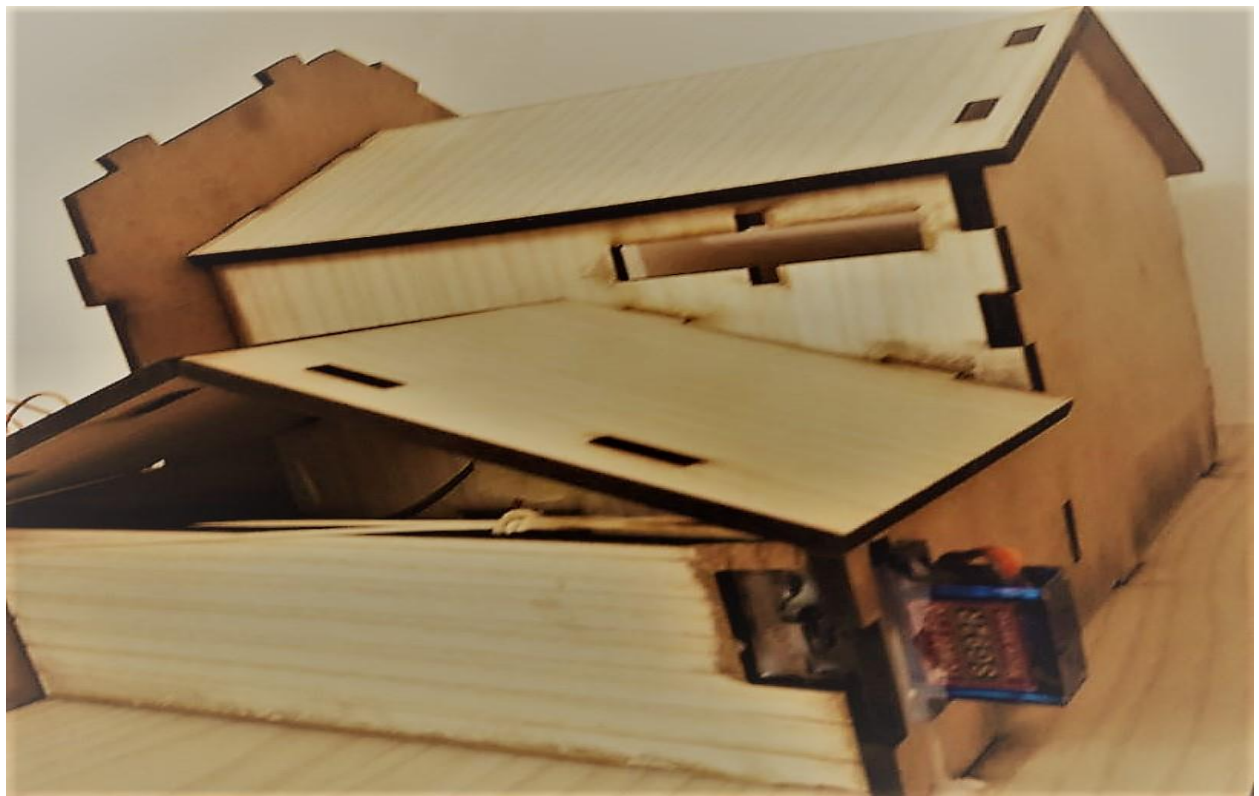
Sensors used:

- Digital sensor: Ultrasonic sensor.
- Analog with signal conditioning: temperature sensor (LM35).
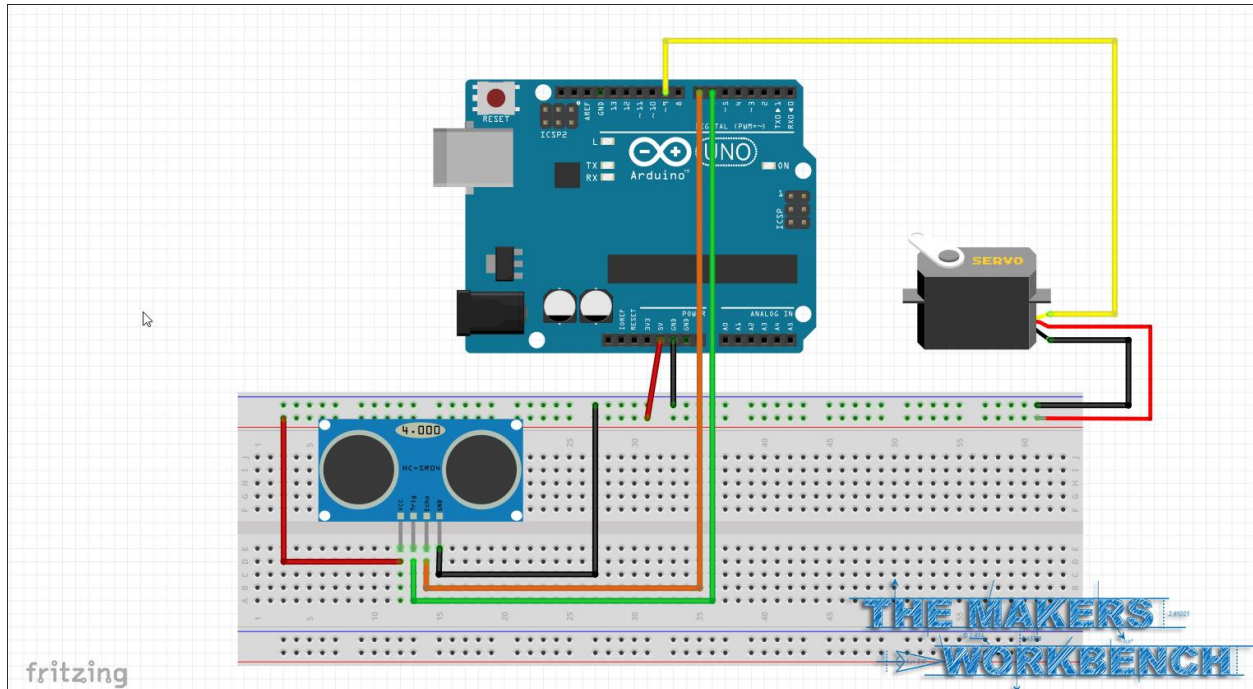- Analog sensor: Light sensor (LDR).

Microcontroller: Arduino Uno.

Display method: LCD

Opening the garage automatically:

Componants :

    1-   Ulatra-sonic sensor

    2-   servo motor

How it works ??

At first the servo calibrates itself by returning to 90 degree.

When the ultrasonic senses a body in rage of 20 – 25 mm in front of it , the servo motor moves the door to open clockwise from 90degree to 180 degree.
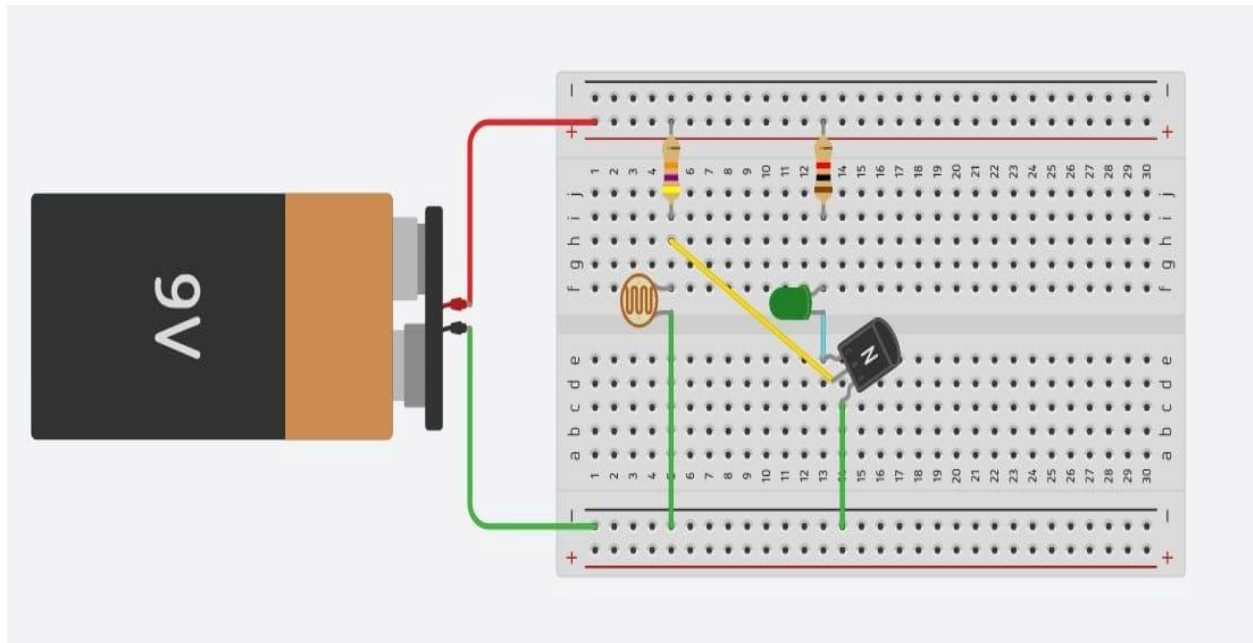
Then the door stays open for 10 seconds then close returning the servo shaft from 180 degree to 90 degree.

Controlling the lights(intensity) inside the garage:

Componants:

(LDR) sensor.

Transistor(PC547).

How it works ??

When there is light the resistance of LDR is being high so the voltage at the base of transistor is lowed and the collector current as well so the bulb turned off.
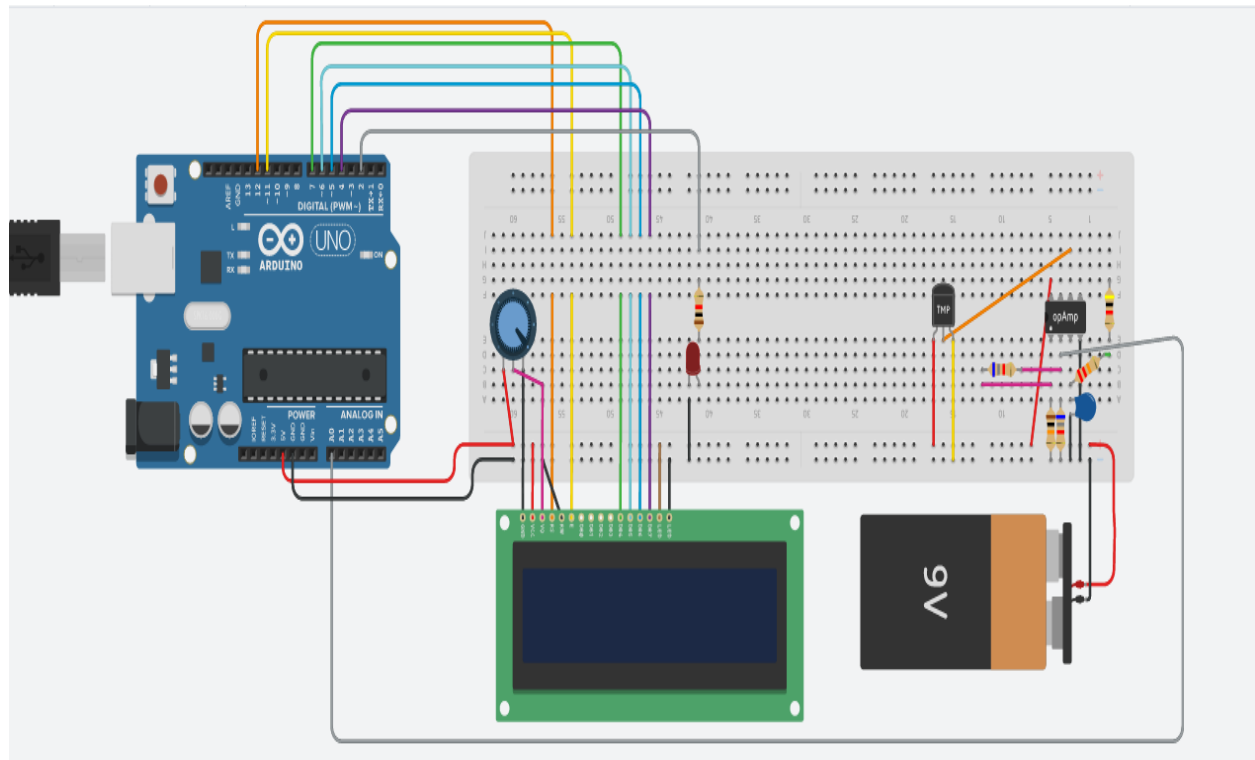
When there isn't light the resistance of LDR is being low so the voltage at the base of transistor is being high and the collector current as well so the bulb turned on.

Checking the temperature inside the garage:

Componants:

(LM35) sensor.

Op-Amp(LM358).

How it works ??

Lm35 sensor read the Temp. as signal then it is filtered and amplified by op-amp.

The calibration is done to the sensor using the micro controller.

The exact temperature is shown on LCD.

If the temperature is raised above 60°c,the bulb will be operated.

The circuit for the whole system:

The Arduino code for the whole system:

```
#include <Servo.h>
#include <LiquidCrystal.h>
Servo myservo;  // create servo object to control a servo

int pos = 0;    // variable to store the servo position
const int rs = 12, en = 11, d4 = 7, d5 = 6, d6 = 5, d7 = 4;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

//define ultrasonic pins
#define trigPin 9
#define echoPin 10
#define Warningbulb 2

// defines variables
long duration;
int distance;

void ultrasonic() {
// Clears the trigPin
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
// Reads the echoPin, returns the sound wave travel time in microseconds
duration = pulseIn(echoPin, HIGH);
// Calculating the distance

distance= duration*0.034/2;
// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}




//open function
void open(){
for (pos = 90; pos <= 180; pos += 1) {
    // goes from 0 degrees to 90 degrees
    // in steps of 1 degree
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
 }

 //close function
void close(){

  for (pos = 180; pos >= 90; pos -= 1) {
    // goes from 90 degrees to 0 degrees
    // in steps of 1 degree
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15ms for the servo to reach the position
  }
}
```

```arduino
void setup() {
  lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.print("The Temp is");
//motor pins mode
  myservo.attach(3);  // attaches the servo on pin 3 to the servo object
 myservo.write(90);
//ultrasonic pins mode
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(Warningbulb, OUTPUT);
  Serial.begin(9600); // Starts the serial communication


}

void loop() {
  float temp = analogRead(A0);
  temp= temp* 0.43945;
  if(temp>60){
    digitalWrite(2,HIGH);
  }
  else{digitalWrite(2,LOW);


  }
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):
  lcd.setCursor(0, 1);
  // print the number of seconds since reset:
  // print the number of seconds since reset:
  lcd.print(temp);
  lcd.setCursor(10,1);
  lcd.print("`C");
  ultrasonic();
  if(distance>=20&&distance<=25){
    delay(5000);
    if(distance>=20&&distance<=25){
     open();
    delay (10000);
  close();
    delay (10000);
  }
  }


}
```