

DSL 810 SPECIAL TOPICS IN DESIGN

SMART LAMP

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PRESENTATION OUTLINE



POINTS FOR DISCUSSION

- About the Lamp
- Features
- Mechanical Design
- Electrical Componentss
- Working of the Code
- Work Philosophy
- The Presenters

ABOUT THE LAMP

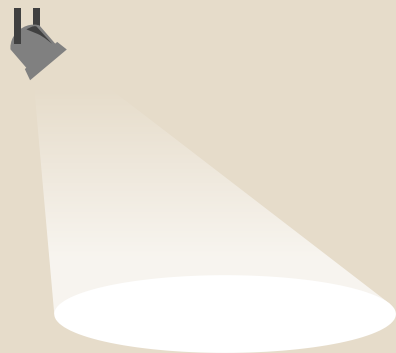
INTRODUCTION

A 4-way interactive smart lamp, that recognises the ambient light level and the presence of the user and accordingly personalise the lighting in small medium places as per the needs of the user

FEATURES



Energy Efficient



Personalised
Lighting

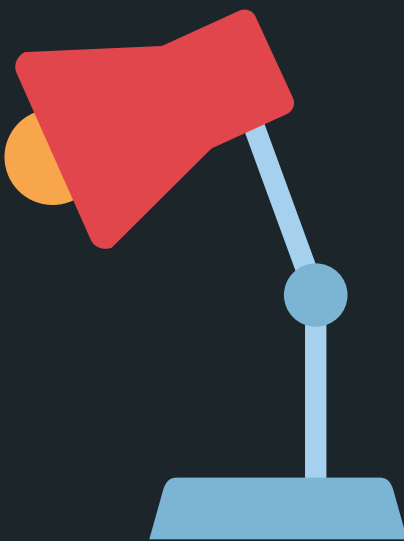


Attractive

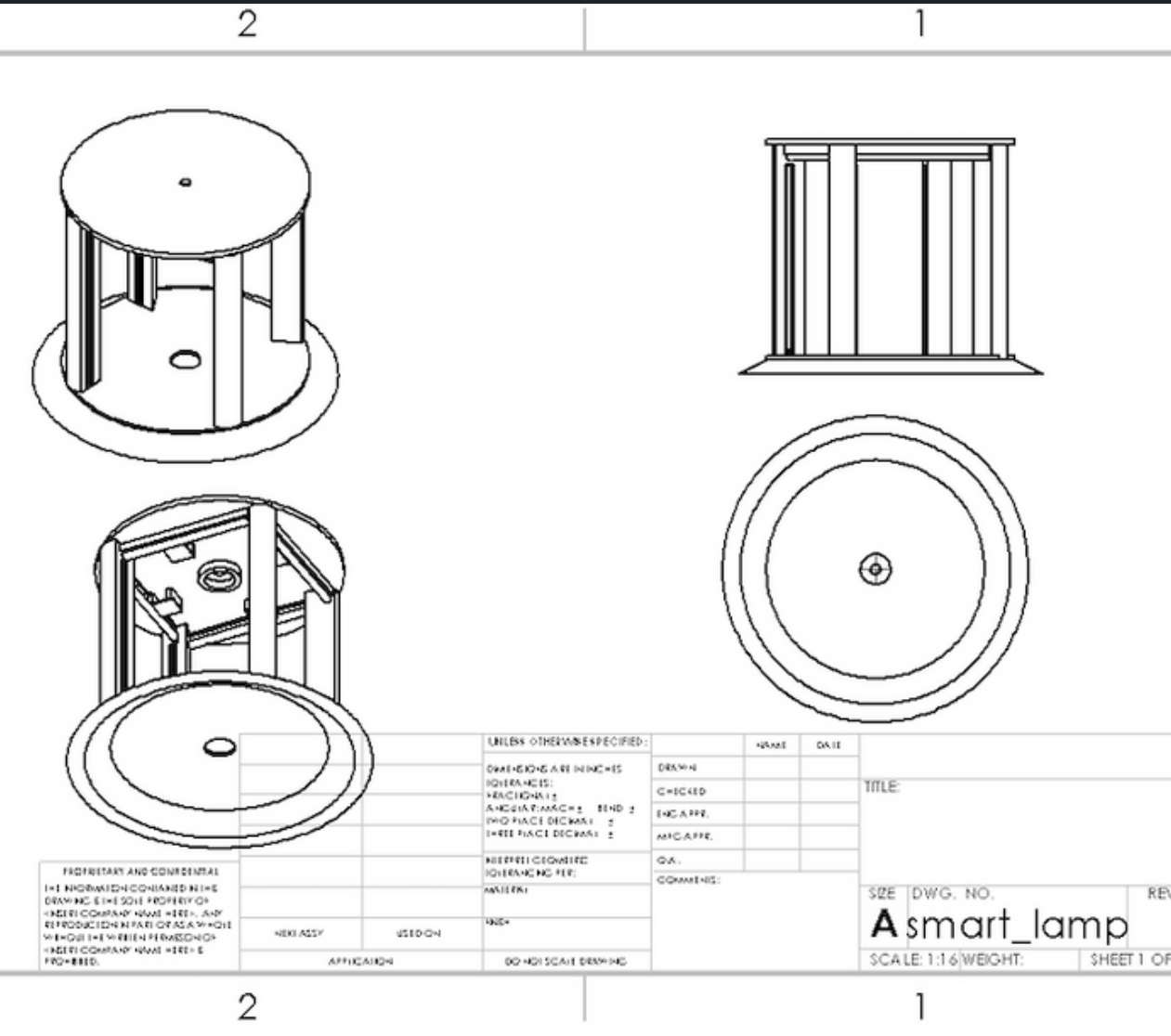


Easy to operate

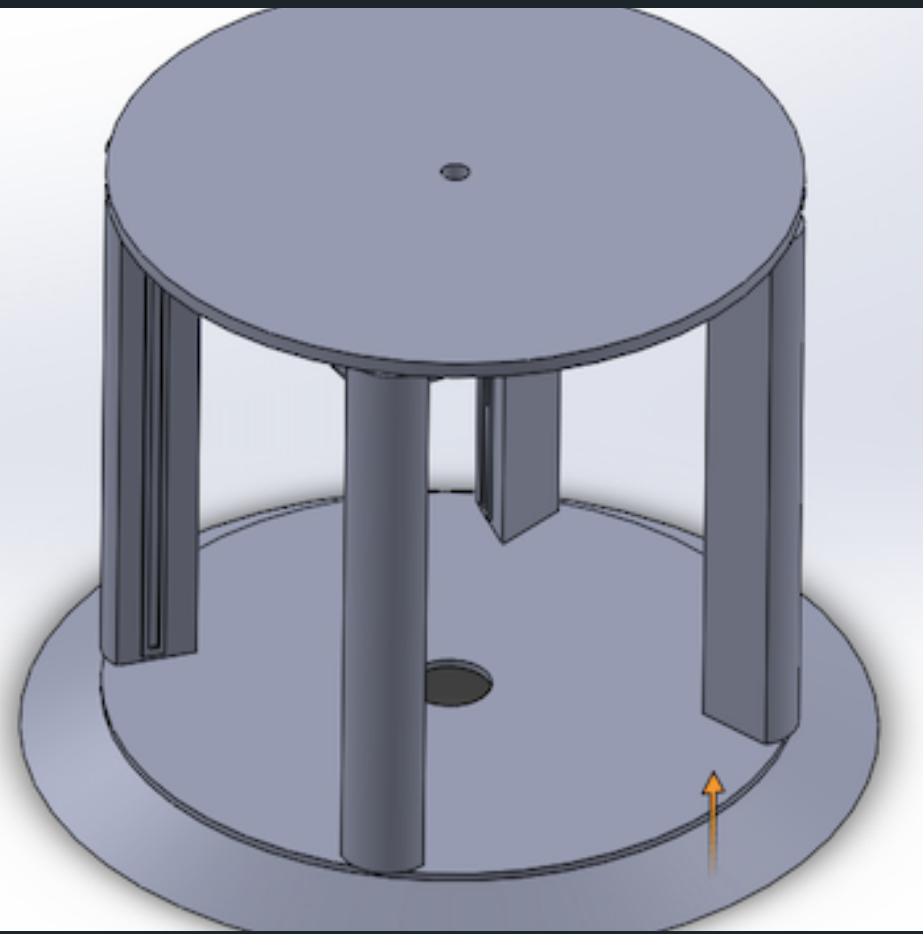
MECHANICAL DESIGN



For this prototype, the lamp was projected to be divided into four different sections which work in the same way but independently. The circuit was to be embedded in the lower part of the structure, through which Ultrasonic sensors will be popping out to know about the presence of the user. The phototransistor is to be placed at the top to have an unrestricted detection of ambient light. The middle structure would consist of the curtains controlled through servo motors, which are also the part of the lower structure. The curtains are controlled with the help of gears installed in the vertical structure that moves through the rods

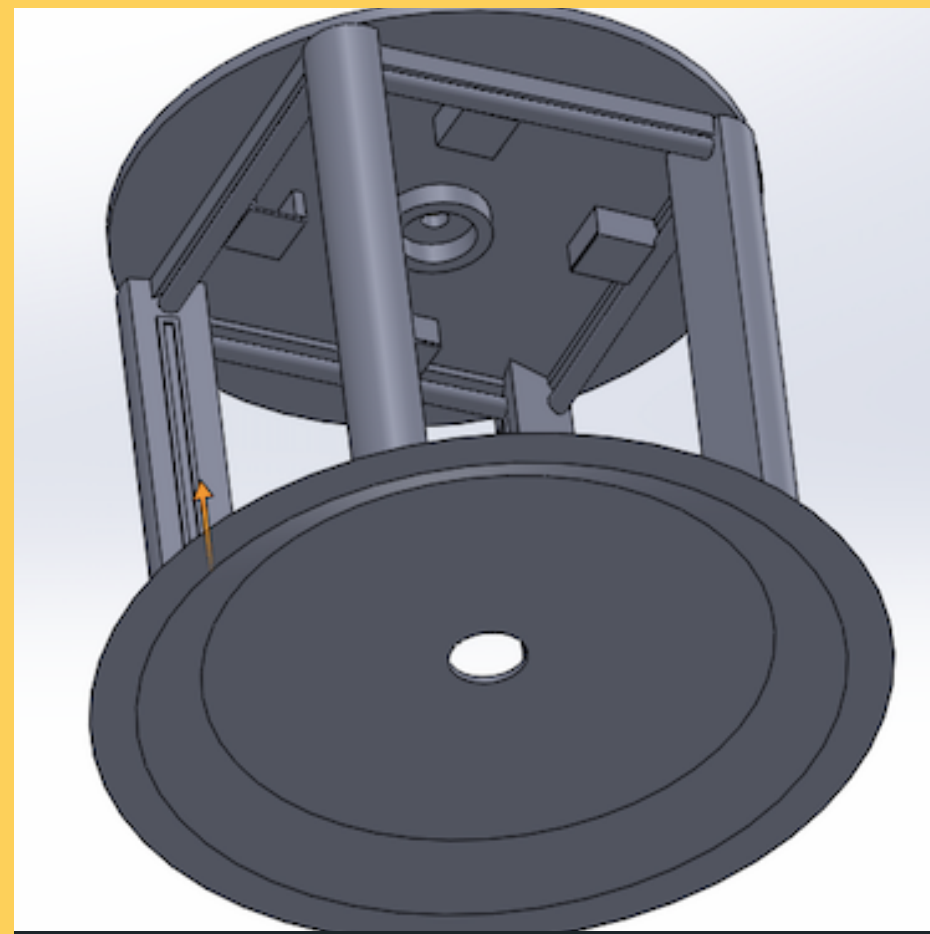


MECHANICAL STRUCTURE



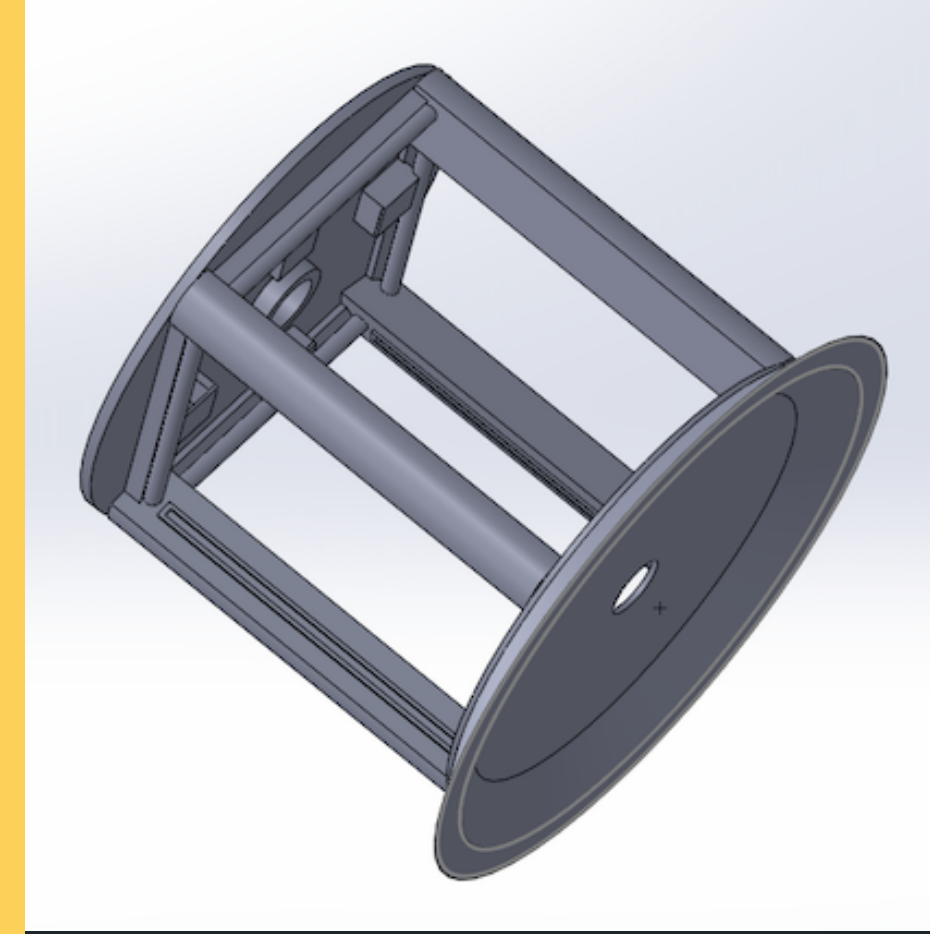
45 DEGREE VIEW

Top Hole
Phototransistor



BOTTOM VIEW

Bottom Hole
LED Lamp



SIDE VIEW

4 RODS
Engraving for the
curtains

ELECTRICAL COMPONENTS

INPUT DEVICES

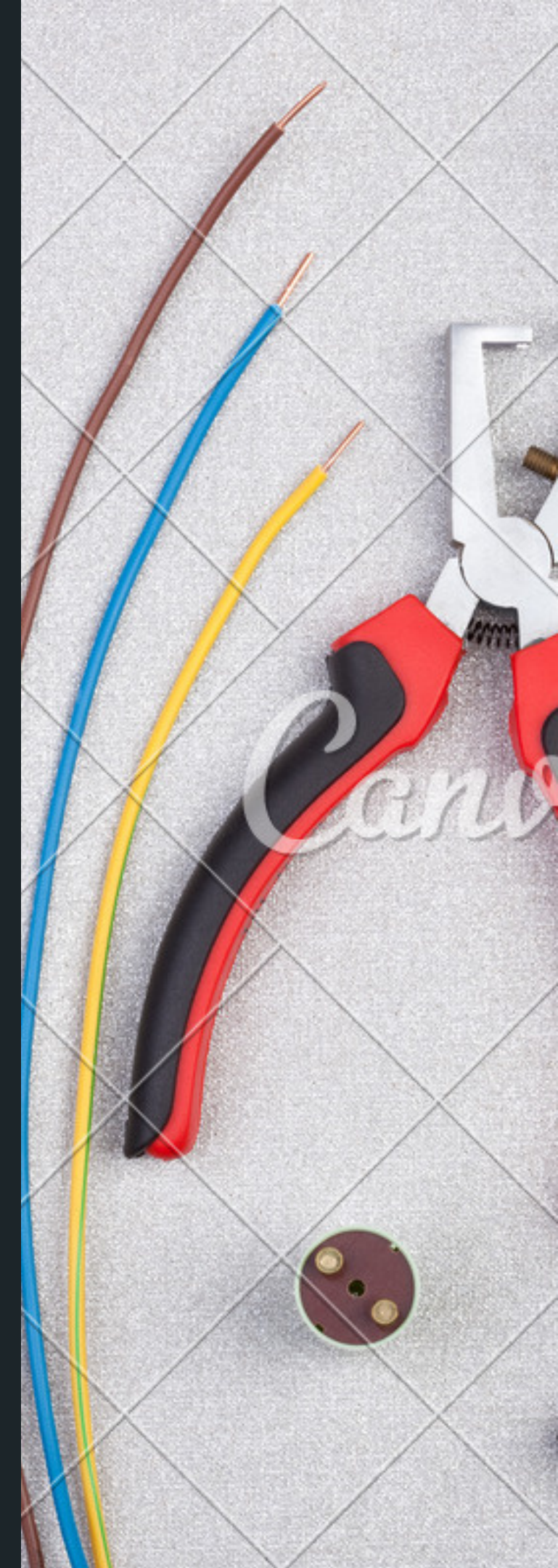
Phototransistors to measure the ambient light; ultrasonic sensors to detect the presence of the user

OUTPUT DEVICES

The output devices used is the LED Lamp and the servo motors which controls the Gear on the edge rod of lamp.

MICROCONTR- OLLER

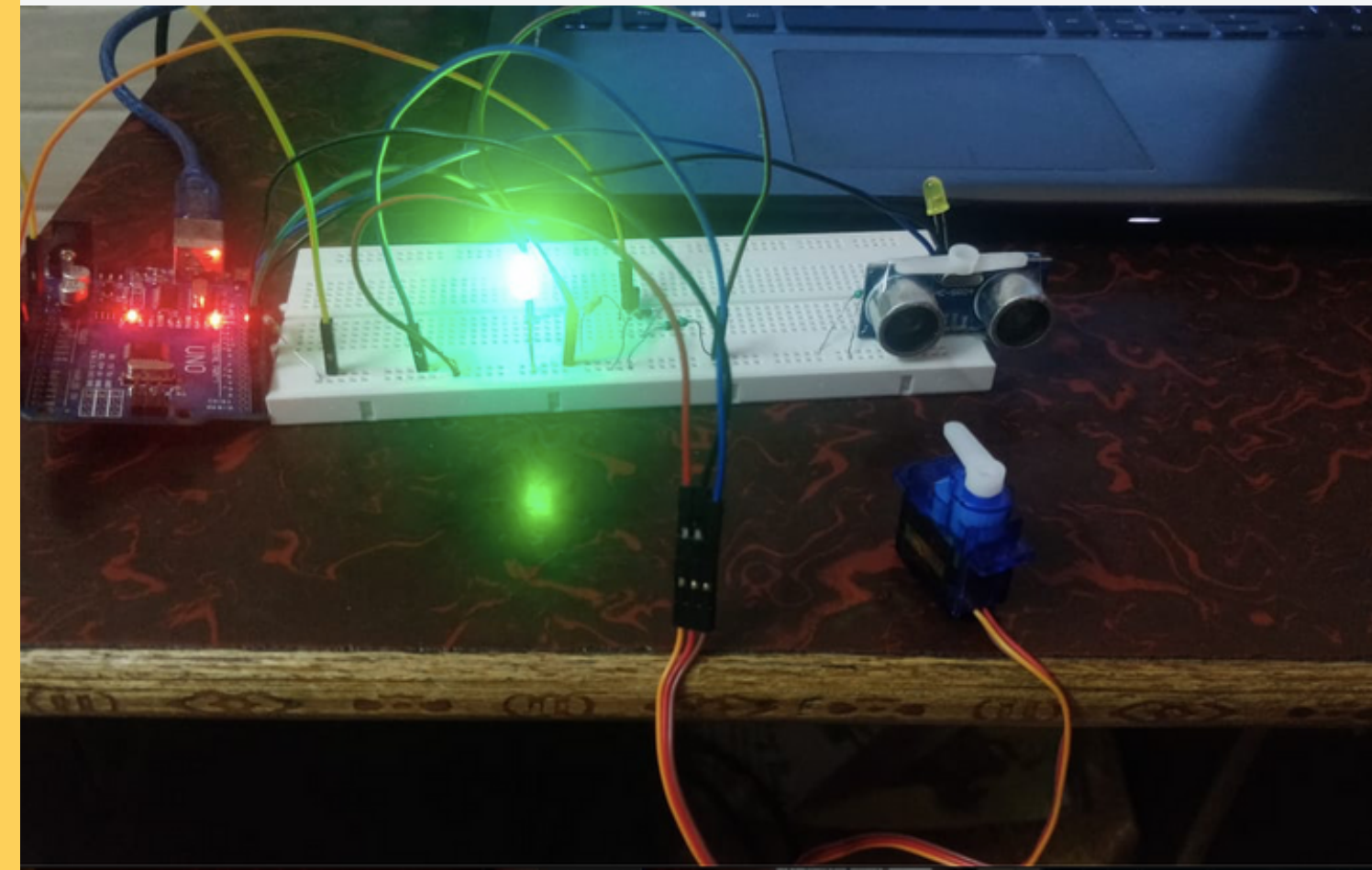
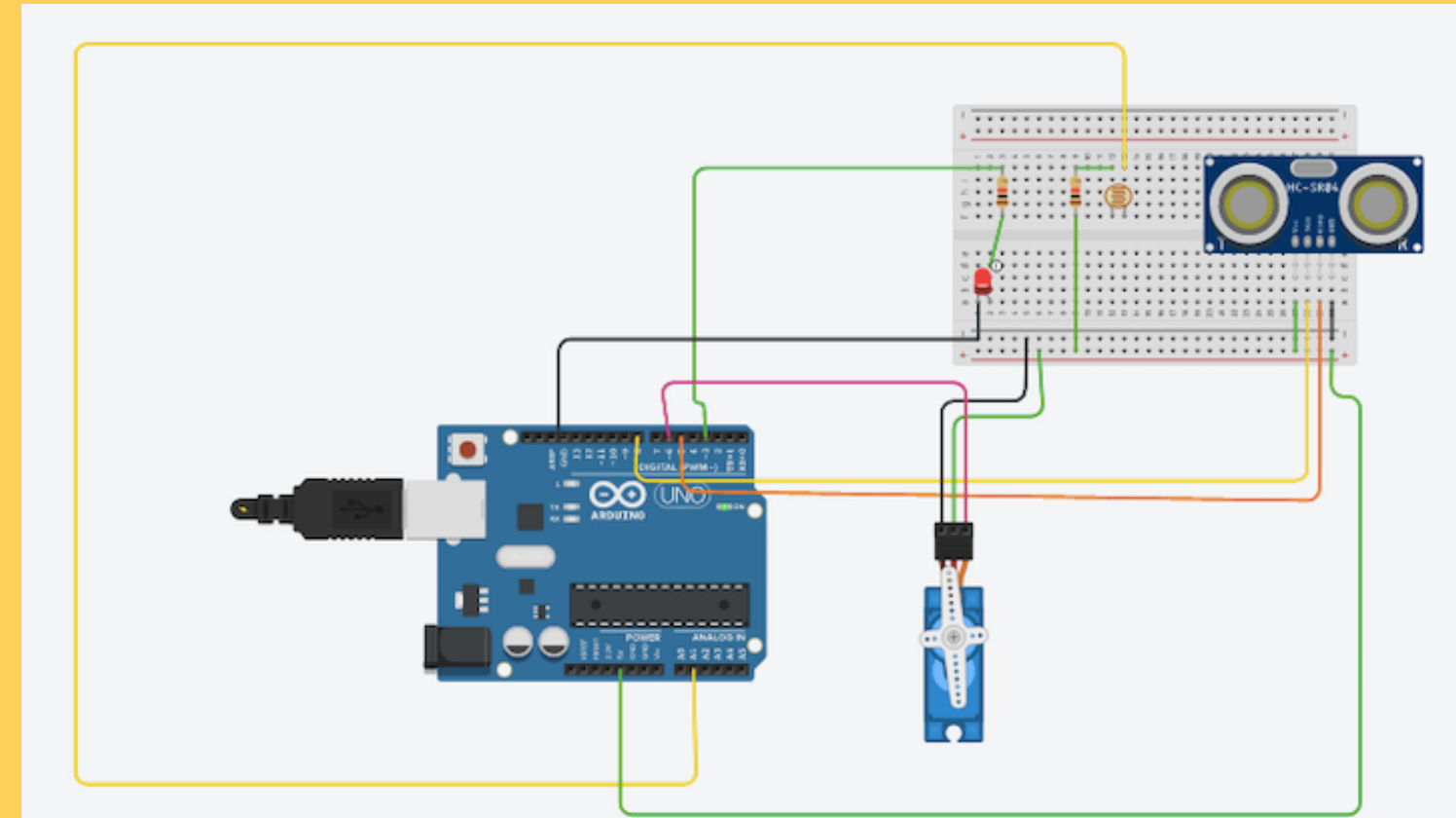
Microcontrollers used is Ardiuno uno: to Execute the Code and allot communication between devices.



WORK PHILOSOPHY

TINKER - CAD

Initially we thought to replicate the circuit on the tinker cad but this was not possible because we were not able to use the libraries in the tinker cad. However we found a way out where we could present a bit simpler model through it



WORKING OF THE CODE

THE CODE IS DIVIDED IN TWO PARTS



```

#include <SoftwareSerial.h>
#include <Servo.h>
Servo myservo;
int val;

const int relay = 3;
byte average;
int dist1;
const int pingPin = 8;
const int echoPin = 5;

const int numReadings = 10;

int readings[numReadings];
int readIndex = 0;
int total = 0;
int average1 = 0;
int sensorPin = A1;

#define IRPin1 A3
#define model 20150

void setup() {

  myservo.attach(6);
  pinMode(relay, OUTPUT);
  for (int thisReading = 0; thisReading < numReadings; thisReading++)
    readings[thisReading] = 0;
  Serial.begin(9600);
  pinMode(sensorPin, INPUT);
}

void loop() {
  total = total - readings[readIndex];
  readings[readIndex] = analogRead(sensorPin);
  Serial.print(readings[readIndex]);
  total = total + readings[readIndex];
  readIndex = readIndex + 1;

  if (readIndex >= numReadings)
    readIndex = 0;
  average1 = total / numReadings;
}

```

The first part consists of analysing the ambient conditions through phototransistor which takes the input of the ambient light conditions. A threshold was decided above which the ambient conditions are fair enough and does not require the lamp to switch on. If the ambient conditions are below this threshold then the lamp needs to be switched on if the presence of the user is detected. We used an algorithm which takes the average of 10 set of entries and if this average lies above the threshold then the lamp functions accordingly. This was majorly done to provide stable communication. An array was used of size 10 and the entries were successively filled into this array. Once the array is filled the average is taken and the output is used to determine how the lamp would function. After these entries are filled the array resets and the process continues..

```

delay(1000);

long duration, cm;
pinMode(pingPin, OUTPUT);
digitalWrite(pingPin, LOW);
delayMicroseconds(2);
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
pinMode(echoPin, INPUT);
duration = pulseIn(echoPin, HIGH);
cm = microsecondsToCentimeters(duration);
dist1=(int)cm;

```

```

if (dist1 < 40){
  myservo.write(155);
}
if (dist1 >= 40){
  myservo.write(0);
}

average = average1;

if (average > 100) {
  Serial.print("relay on ");
  digitalWrite(relay, HIGH);
}
else if (average <= 100) {
  Serial.print("relay off ");
  digitalWrite(relay, LOW);
}

```

```

}

```

```

long microsecondsToCentimeters(long microseconds) {
  return microseconds / 29 / 2;
}

```

The second part consists of taking input from the phototransistor sensor (average) and IR sensor from the three directions and accordingly instruct the servo motors to rotate the lamp curtains. Servo motors upon detecting the input from their respective phototransistors & close and open the curtains as per the requirements. The curtains material needs to be opaque so once the lamp is on and the light is required for a personalised lighting the light must not transmit from the other 2 directions. So once one of the three IR sensors detects the presence of the user in the vicinity by calculating the distance from the lamp the corresponding Servo Motors open the curtains if the ambient light is not sufficient and this process continues



**For the Love of Learning.
Thank you.**