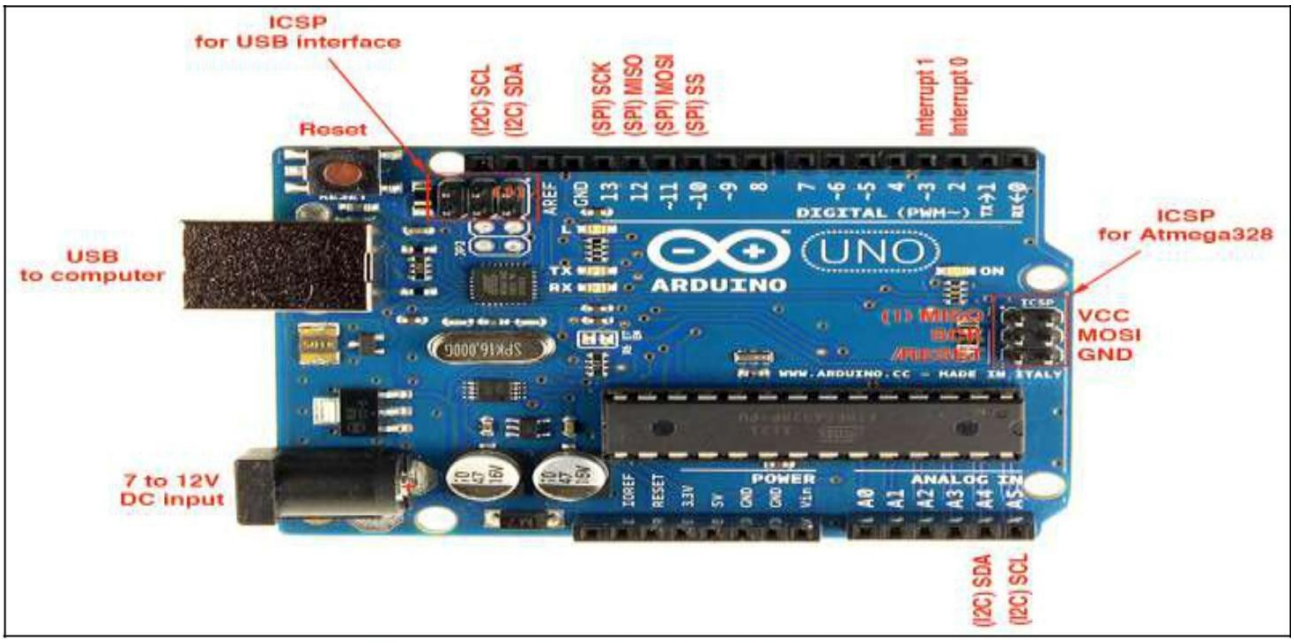
AUTOMATIC SMART STREET LIGHT SENSORS

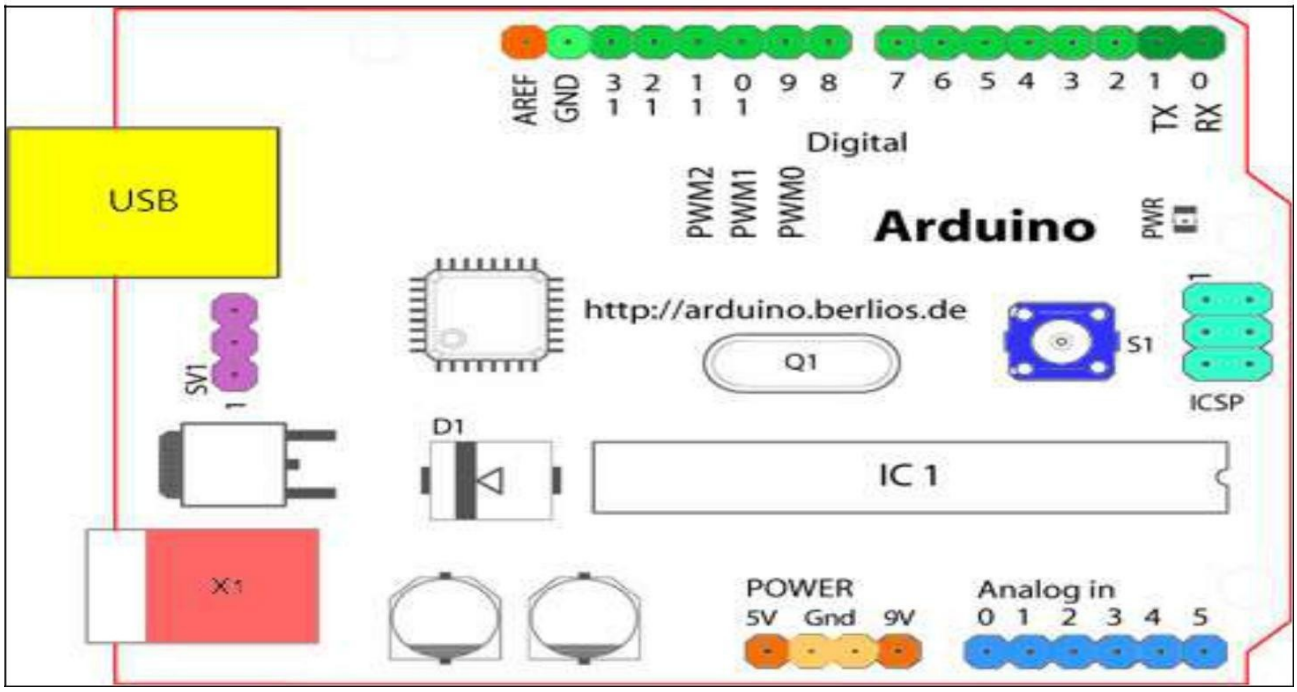
Introduction

ARDUINO

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on the Processing project, which includes support for the C and C++ programming languages. The first Arduino was introduced in 2005, aiming to provide an inexpensive and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. The hardware design specifications are openly available, allowing the Arduino boards to be manufactured by anyone. Adafruit Industries estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced, and in 2013 that 700,000 official boards were in users' hands.

Arduino pins:





- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital Pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out - TX/RX (dark green)
- Reset Button - S1 (dark blue)
- In-circuit Serial Programmer (blue-green)
- Analog In Pins 0-5 (light blue)
- Power and Ground Pins (power: orange, grounds: light orange)
- External Power Supply In (9-12VDC) - X1 (pink)

- Toggles External Power and USB Power - SV1 (purple)
- USB (used for uploading sketches to the board and for serial communication between the board and the computer; can be used to power the board)

Microcontroller Used: *ATmega328P* (used on most recent boards)

SOFTWARES USED:

1. **Arduino IDE (Integrated Development Environment):** The Arduino IDE (Integrated Development Environment) is the program used to write code and comes in the form of a downloadable file on the Arduino website. The Arduino board is the physical board that stores and performs the code uploaded to it. Both the software package and the board are referred to as "Arduino." Options available in IDE:

Writing Sketches (later can be uploaded into Arduino interface board)

a. File
b. Edit
c. Sketch
d. Tools
e. Help

Sketchbook

Tabs, Multiple Files, and Compilation

Uploading

Libraries

Third-Party Hardware

Serial Monitor

Preferences

Language Support

Boards

2. **PROCESSING SOFTWARE :** Processing is a flexible software sketchbook and a language for learning how to code within the context of the visual arts. Since 2001, Processing has promoted software literacy within the visual arts and visual literacy within technology. There are tens of thousands of students, artists, designers, researchers, and hobbyists who use Processing for learning and prototyping.

- Free to download and open source
- Interactive programs with 2D, 3D or PDF output
- OpenGL integration for accelerated 2D and 3D
- For GNU/Linux, Mac OS X, Windows, Android, and ARM
- Over 100 libraries extend the core software
- Well documented, with many books available

TECHNICAL DETAILS

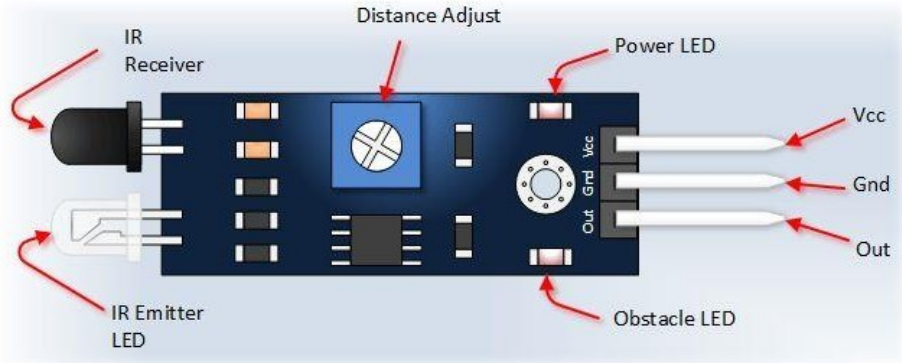
Arduino code:-

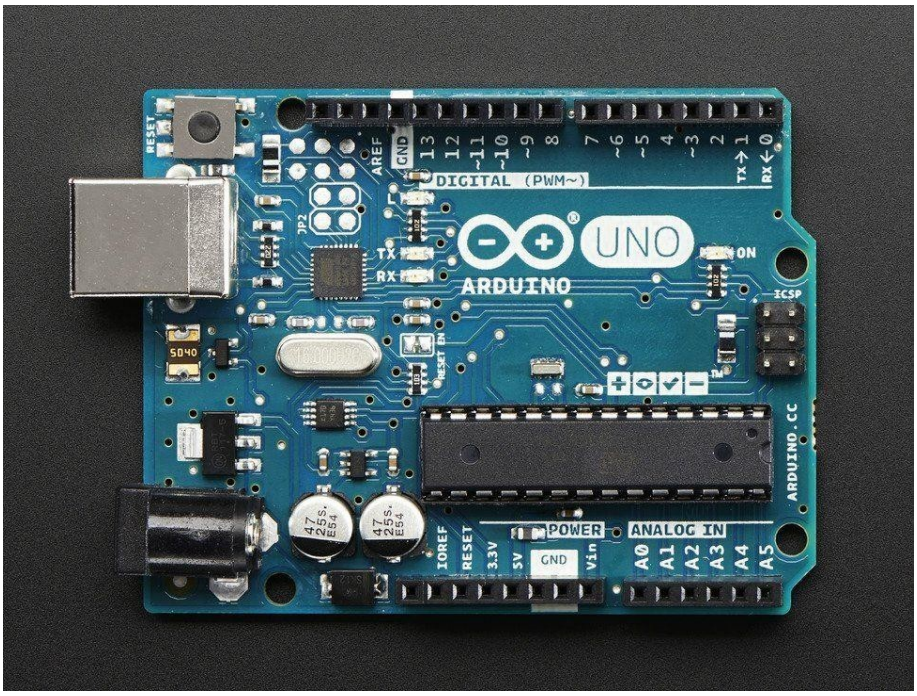
```
int ir1=2;
int ir2=3;
int ir3=4;
int ir4=5;
int led1=6;
int led2=7;
int led3=8;
int led4=9;
int led5=10;
int led6=11;
int proxy1=0;
int proxy2=0;
int proxy3=0;
int proxy4=0;
void setup()
{
pinMode(ir1,INPUT);
pinMode(ir2,INPUT);
pinMode(ir3,INPUT);
pinMode(ir4,INPUT);
pinMode(led1,OUTPUT);
pinMode(led2,OUTPUT);
pinMode(led3,OUTPUT);
pinMode(led4,OUTPUT);
pinMode(led5,OUTPUT);
pinMode(led6,OUTPUT);
}
void loop()
{ proxy1=digitalRead(ir1
);
proxy2=digitalRead(ir2);
proxy3=digitalRead(ir3);
proxy4=digitalRead(ir4);
if(proxy1==HIGH)
{
digitalWrite(led1,LOW);
digitalWrite(led2,LOW);
digitalWrite(led3,LOW);
}
else
{
digitalWrite(led1,HIGH);
digitalWrite(led2,HIGH);
digitalWrite(led3,HIGH);
```

```
}
if(proxy2==HIGH)
{
digitalWrite(led2,LOW);
digitalWrite(led3,LOW);
digitalWrite(led4,LOW);
}
else
{
digitalWrite(led2,HIGH);
digitalWrite(led3,HIGH);
digitalWrite(led4,HIGH);
}
if(proxy3==HIGH)
{
digitalWrite(led3,LOW);
digitalWrite(led4,LOW);
digitalWrite(led5,LOW);
}
else
{
digitalWrite(led3,HIGH);
digitalWrite(led4,HIGH);
digitalWrite(led5,HIGH);
}
if(proxy4==HIGH)
{
digitalWrite(led4,LOW);
digitalWrite(led5,LOW);
digitalWrite(led6,LOW);
}
else
{
digitalWrite(led4,HIGH);
digitalWrite(led5,HIGH);
digitalWrite(led6,HIGH);
}
}
```

MATERIALS

1. Arduino UNO
2. IR sensor (4)
3. 10mm LEDs (6)
4. connecting wires
5. foam board
6. Bread board





CONSTRUCTION:-

Connect all the components as given in the circuit diagram. Connecting To ARDUINO:

ir sensor 1 ---> 2

ir sensor 2 ---> 3

ir sensor 3 ---> 4

ir sensor 4 ---> 5

connect all ir sensor's to +5v and ground.

the positive pin of leds are connected to these pins of arduino.

led 1------> 6

led 2------> 7

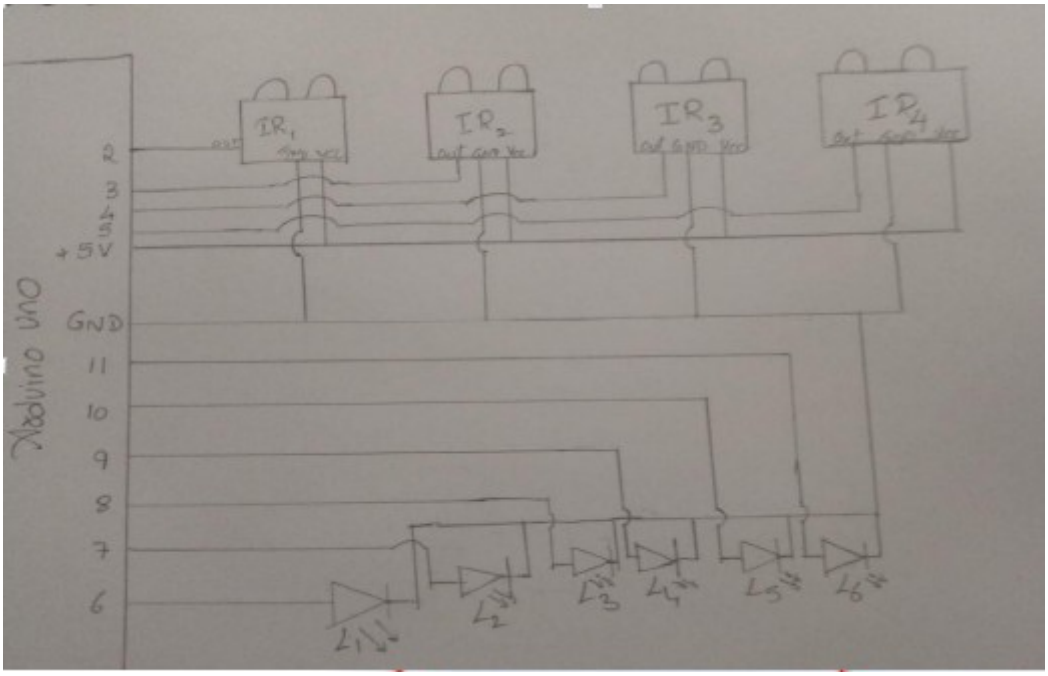
led 3------> 8

led 4------> 9

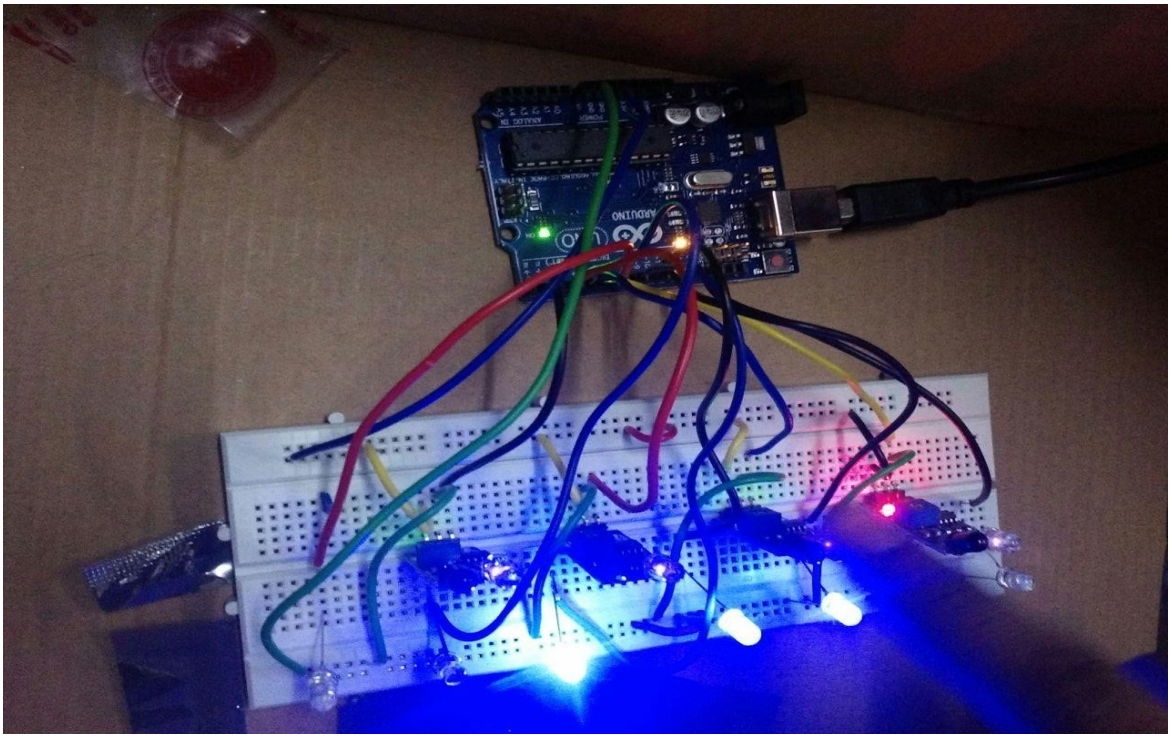
led 5------> 10

led 6------> 11

and finally all ground pins of led connect to the ground of arduino.



This figure shows the working of the project model

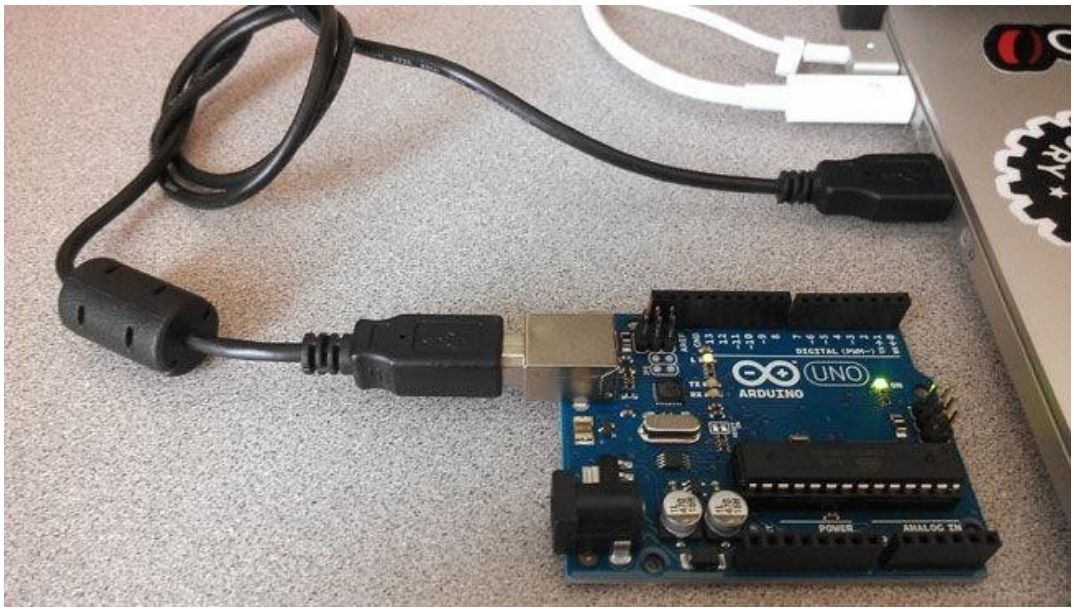


Programming:

Download the Arduino sketch and Processing sketch from internet sources.

From the Arduino IDE Software, upload the sketch to the Arduino. Keep the USB cable connected to the Arduino, then install and load the Processing sketch.

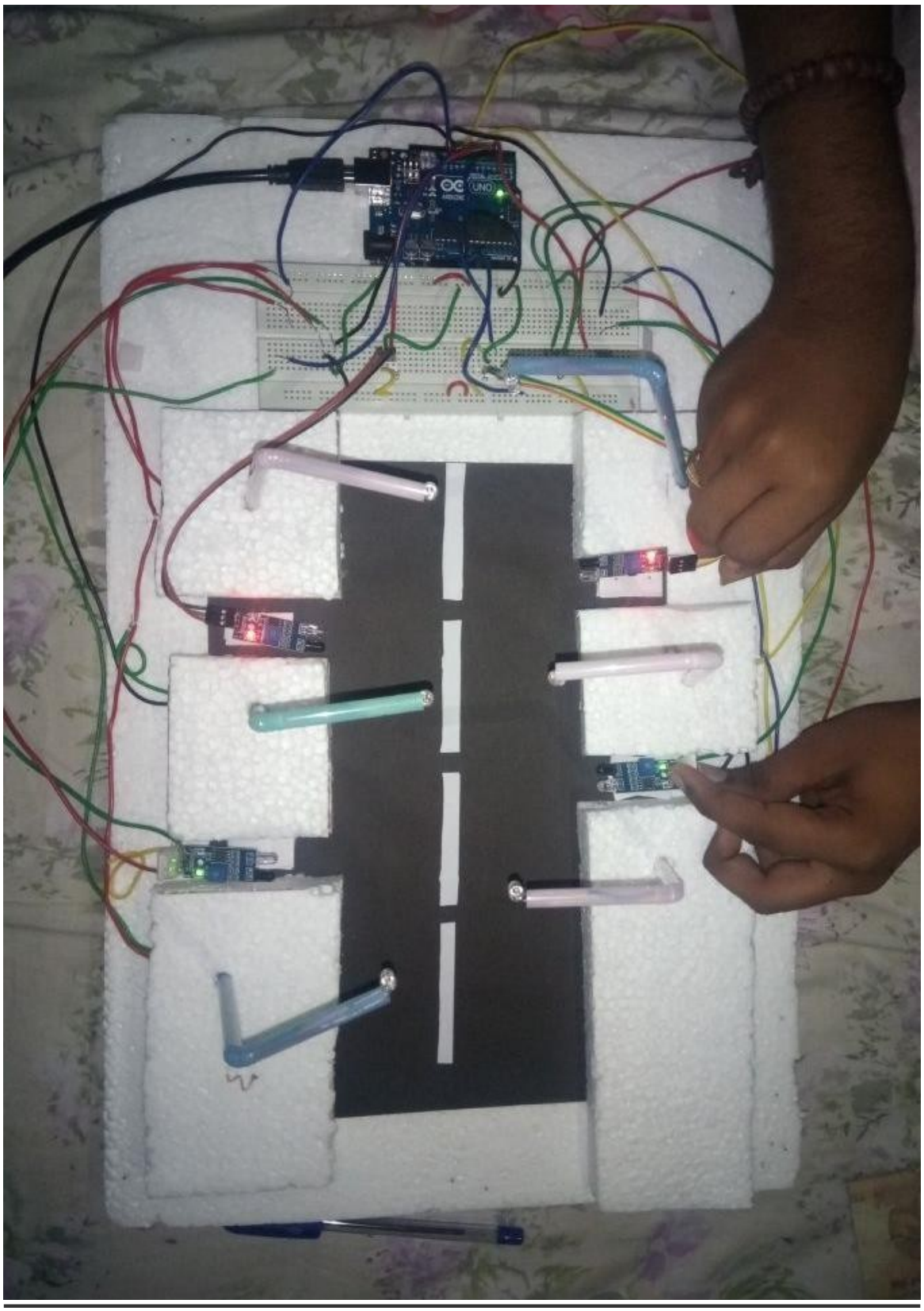
It is important that your computer is plugged for this to work properly. If the circuit isn't connected to earth ground (at least indirectly though your computer) you may find that your computer itself will affect the circuit.

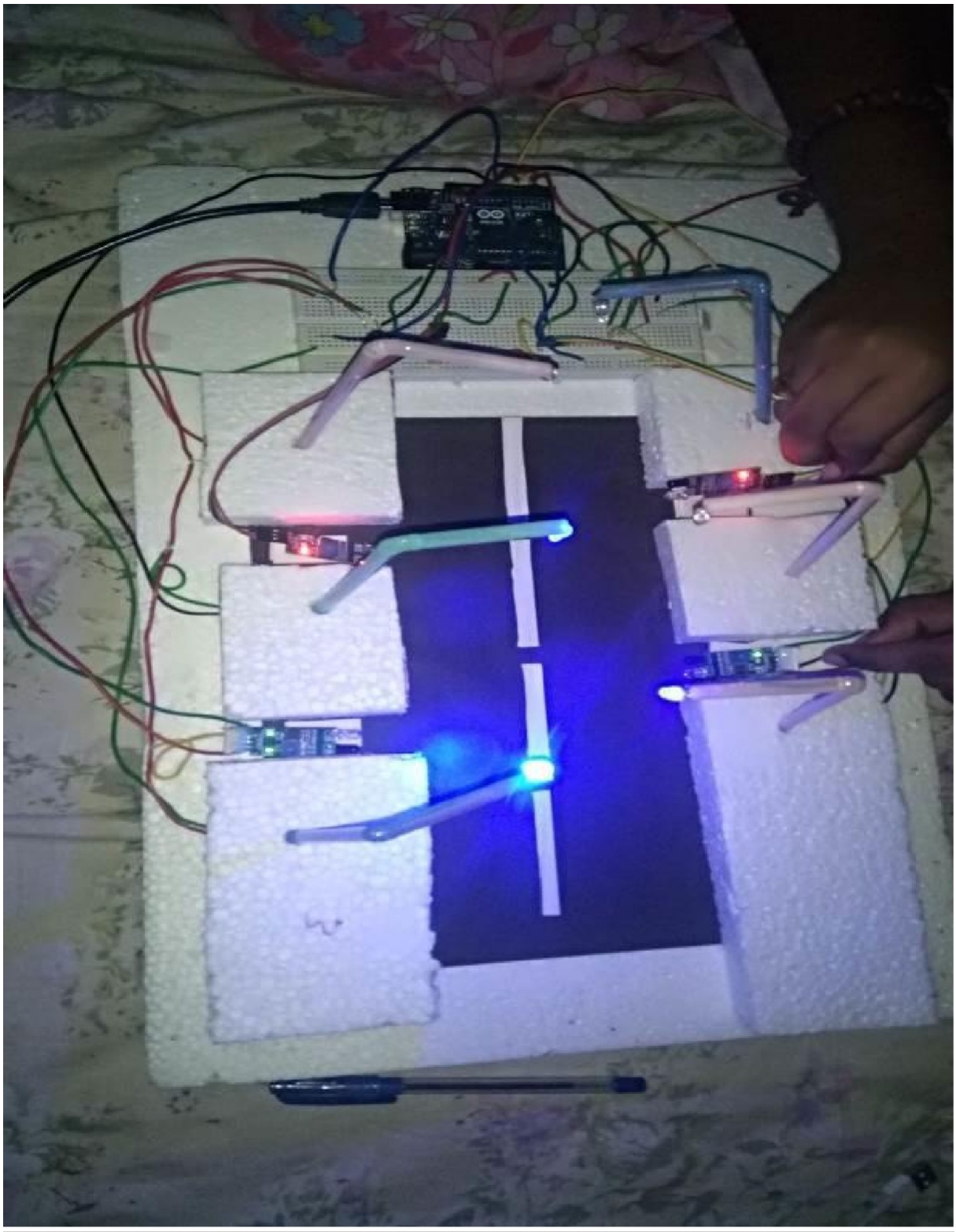


OPERATION

All objects which have a temperature greater than absolute zero (0 Kelvin) possess thermal energy and are sources of infrared radiation as a result. Sources of infrared radiation include black body radiators, tungsten lamps and silicon carbide. Infrared sensors typically use infrared lasers and LEDs with specific infrared wavelengths as sources. A transmission medium is required for infrared transmission, which can be comprised of either a vacuum, the atmosphere or an optical fiber. Optical components, such as optical lenses made from quartz, CaF2, Ge and Si, polyethylene Fresnel lenses and Al or Au mirrors, are used to converge or focus the infrared radiation. In order to limit spectral response, band-pass filters can be used. Next, infrared detectors are used in order to detect the radiation which has been focused. The output from the detector is usually very small and hence pre-amplifiers coupled with circuitry are required to further process the received signal

Our project model:





Conclusion

By using Smart Street light, one can save surplus amount of energy which is done by replacing sodium vapor lamps by LED and adding an additional feature for security purposes. It prevents unnecessary wastage of electricity, caused due to manual switching of streetlights when it's not required. It provides an efficient and smart automatic streetlight control system with the help of IR sensors. It can reduce the energy consumption and maintains the cost. The system is versatile, extendable and totally adjustable to user needs.

a) The system is now used only for one way traffic in highways.

i) Continuous use of IR sensors even in day time.

ii) Not switched on before the sunset The Smart light system can be further extended to make the current system in two-way traffic, making the system more flexible in case of rainy days and introduction of ways to control the lights through GSM based service.

REFERENCES

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3. K.Santha Sheela,S.Padmadevi, Survey on Street Lighting System Based On Vehicle Movements
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