NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
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"Vehicle Movement Based Street Lights Using ATMEGA"

A MINIPROJECT REPORT

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In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION

NEW HORIZON COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the mini project work entitled "**VEHICLE MOVEMENT BASED STREET LIGHTS USING ATMEGA**" carried out by **Nandankumar K(1NH18EC073), Rahul M R(1NH18EC090), Rohit Harikantra(1NH18EC098),Vinay Kumar K(1NH18EC121),** bonafide students of Electronics and Communication Department , New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

Project Guide HOD ECE

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External Viva

Name of Examiner Signature with Date

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ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr.Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, head of the department of Electronics and Communication Engineering. We extend sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance to us by our beloved guide **Mr Purvirajan T** to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Vehicle movement based street light is an automated system which automates the street light. The main aim of our project is to reduce the power consumption when there are no vehicle movements on the road. The street light will glow with high intensity when there are vehicles on the road otherwise the lights will remain OFF. With advancement of technology, things are becoming simpler and easier for everyone in the world today. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services in society. In the light of industrialization, automation is a step beyond mechanization, whereas mechanization provides human operators with machinery to assist the users with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual systems. The research work shows automatic control of streetlights as a result of which power is saved to an extent. The smart street light which we are intending provides a solution for energy saving which is achieved by sensing an approaching vehicle using the IR sensors and then switching ON a block of street lights ahead of the vehicle with high intensity. As the vehicle passes by, the trailing lights turn OFF automatically. Thus, we save a lot of energy. So when there are no vehicles on the highway, then all the lights will remain OFF.For safety precautions we are setting 1 street light for every 10 street lights to remain ON continuously during night.

CHAPTER 1

INTRODUCTION

Automation is playing an increasingly important role in the world economy and in everyday life. Automatic systems are preferred over any type of manual system. We can also call it "smart street lights." Intelligent light detection refers to public lighting that adapts to movement by pedestrians, cyclists, cars and other vehicles. Smart street lighting, also called adaptive street lighting, goes out when no activity is detected, but lights up when motion is detected. This type of lighting is different from traditional street lighting, stationary and lighting, or adjustable street lighting, which dims at preset times. In the field of industrialization, automation is a step beyond mechanization. While mechanization has made machines available to human operators to help users with muscular work requirements, automation also decreases the need for human sensory and mental requirements. Basically, street lighting is one of the important parts. Therefore, street lamps are relatively simple, but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors to consider when designing a good street lighting system, such as night safety for community members and road users, providing cost-effective street lighting, reducing crime and minimizing its effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps which is called the first generation of the original street light. After that, another method that has been used was an optical control method done using a high pressure sodium lamp in their system. Nowadays, it is seen that the method is widely used in the country. The method operates by setting up an optical control circuit, changing the resistance by using a light sensitive device to control street lamps light up automatically at 8dusk and turn off automatically after dawn in the morning. Due to technological development nowadays, road lighting can be categorized according to the installation area and performance, for an example, lighting for traffic routes, lighting for subsidiary roads and lighting for urban centers and public amenity areas. The WSN helps in improving the network sensing for street lighting. Meanwhile, street light system can be classified according to the type of lamps used such as incandescent light, mercury vapor light, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light. Different types of light technology used in lighting design with their luminous efficiency,

lamp service life and their considerations. The LED is considered a promising solution to the modern street lighting system due to its behavior and advantages. Apart from that, the advantages of LED are likely to replace the traditional street lamps such as the incandescent lamp, fluorescent lamp and high-pressure Sodium Lamp in future but LED technology is an extremely difficult process that requires a combination of advanced production lines, top quality materials and high precision manufacturing process. Therefore, the research work highlights the energy efficient system of the street lights system using LED lamps with IR sensor interface for controlling and managing

CHAPTER 2

LITERATURE SURVEY

S.Suganya has proposed about Street Light Glow on detecting vehicle movement using sensor is a system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity to develop flow based dynamic control statistics using infrared detection technology and maintain wireless communication among lamppost and control terminal using ZigBee Wireless protocol. It also combines various technologies: a timer, a statistics of traffic flow magnitude, photodiodes, LED, power transistors.

K.Santha has surveyed the Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness algorithm and light intensity. The control can be made according to the seasonal variation. It includes a time cut-out function and an automatic control pattern for conserving more electricity. The whole project was implemented using a PIC microcontroller.

Srikanth proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed with the help of ZigBee modules that helps in detecting the faulty lights and control the light. It also discusses an intelligent system that makes automatic decisions for ON/OFF/DIMMING considering the vehicle movement or pedestrian and also the surrounding environment. PIR motion sensor is used to detect movement of both living and nonliving things.

M.Abhishek has implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting. They have also used 8052 series microcontrollers and are developed by replacing the normal bulbs with the LEDs due to which the power consumption is reduced by 3 times. Sensors are placed on either side of the road which senses the vehicle movement and sends the commands to the microcontroller to switch ON and OFF the lights. Here all the street lights remain switched off and it glows only when it senses the vehicle movement. Hence, because of the microcontroller, even when it is night the lights are switched off.

C.Bhuvaneshwari has analyzed the street light with an auto tracking system by which one can increase the conversion efficiency of solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun from time to time and gives the output to the amplifier based on light density of the sun. Sun tracking sensor is LDR, an amplifier unit is used to amplify the LDR signals which converts low level signals to high level signals and the output is given to the comparator. The LM324 IC is used as an amplifier. Comparator compares the signals and gives the command to AT89C51 microcontroller.

Steve Chadwick reports on the two installation case studied in Scotland and Wales and explains the details and benefits of the technology. The system was called MINOS that had a track record of over 100,000 units installed and working successfully.

SomchaiHiranvarodom describes a comparative analysis of photovoltaic (PV) street lighting systems in three different lamps. Namely, a low pressure sodium lamp, a high pressure sodium lamp and a fluorescent lamp have been used for installation in each mast to determine the suitable system to install in a typical rural area of Thailand. All three systems have been mounted with the same module type and wattage in different places within the Rajamangala Institute of Technology, Thanyaburi district, Pathumthani province of Thailand. An operation of a solar street lighting system can be divided into 2 periods of time, namely, at 18.00-22.00 hours and 05.00-06.00 hours. The design of a control circuit was experimentally done in this work. The aim of this work is to determine the appropriate system to install in a typical rural area or a typical rural village of Thailand.

CHAPTER 3

PROPOSED METHODOLOGY

The vehicle movement based street light control system adopts a dynamic control methodology. According to the proposed plan, initially when it becomes dark only one streetlight for every 10 street lights remains switched on for security concerns. When a vehicle passes by, the IR sensor placed senses the vehicle and a block of street lights glows and as the vehicle moves forward, the next block of lights starts glowing where the previous block switches off.

- LDR is connected to the arduino as analog input (A1).
- In the morning the LDR senses the light and out circuit remains OFF.
- Whenever the LDR senses low light i.e, during night and trunks on 1 street light for every 10 street lights for security reasons .
- Only when LDR sends input to arduino the remaining circuit comes into play.
- The IR sensors input is connected to analog input pins in Arduino and the LEDs are connected to output pins (D2 to D11).
- We programmed ATMEGA in such a way that when IR senses a vehicle passing by the consecutive three lights turns ON.
- As the vehicle moves forward the lights behind the vehicle turns OFF as the IR senses no obstruction.

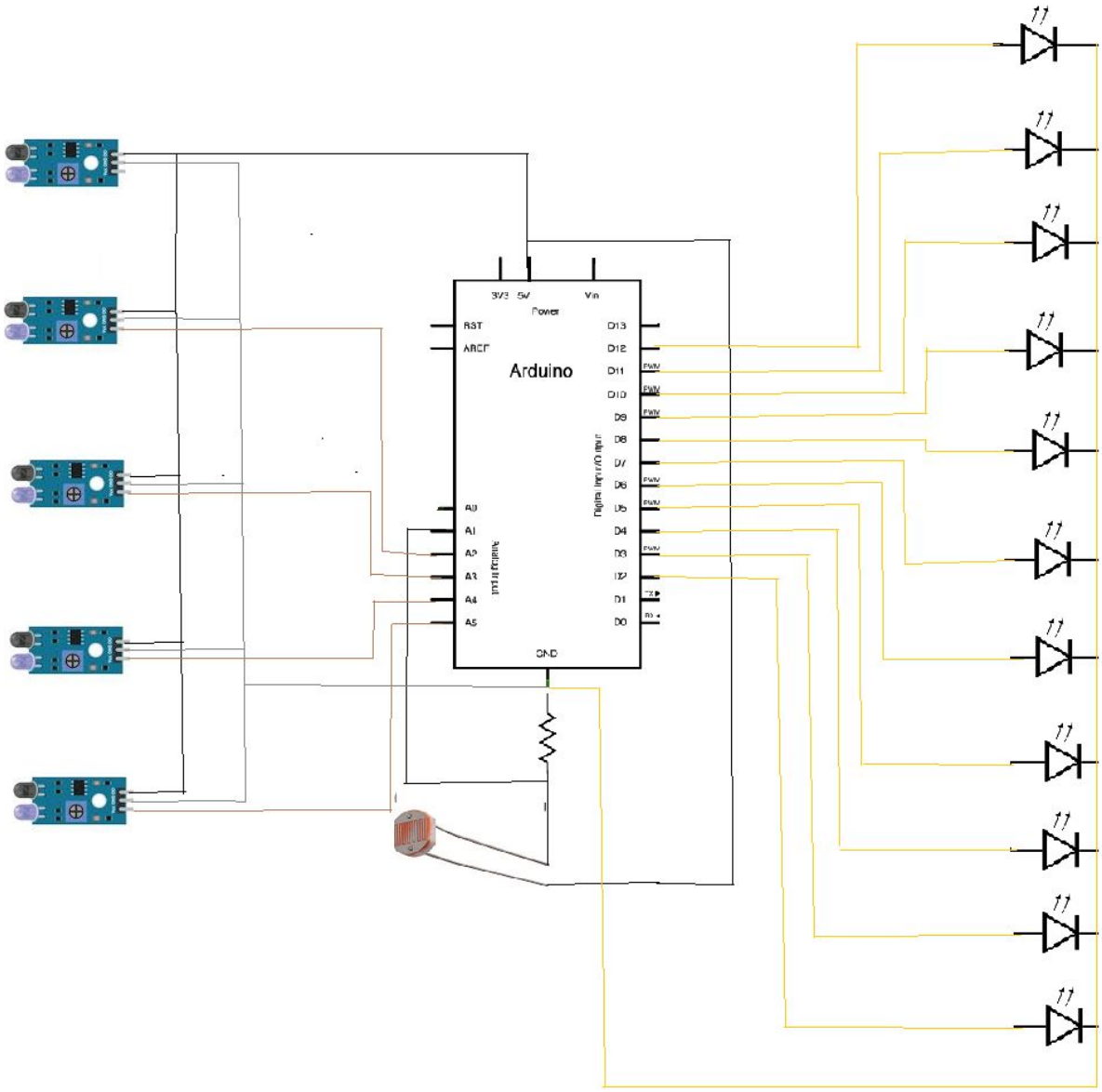

Fig 3.1: Circuit Diagram

CHAPTER 4

PROJECT DESCRIPTION

Project is mainly based on the components LDR and IR sensors and the main aim of the project is to save energy by switching OFF street lights when there is no use . But for safety purposes we are switching ON one street light for every 10 street lights to maintain some light on the road even when there is vehicle passing.

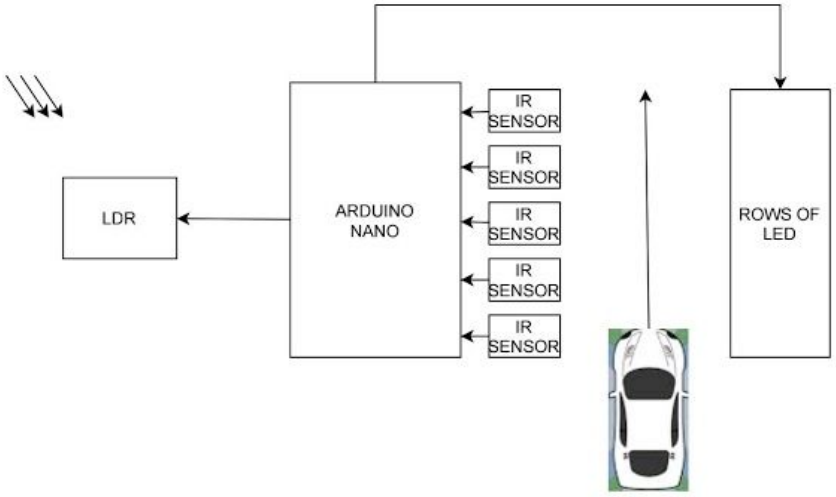

Fig 4.0.1 : Block Diagram

The above block diagram gives the basic idea how out model looks.LDR and IR sensors are connected as inputs to ATMEGA and where as LEDs are connected as the output from ATMEGA.When there is a movement the IR sensors senses and the corresponding LEDs as programmed turn on .

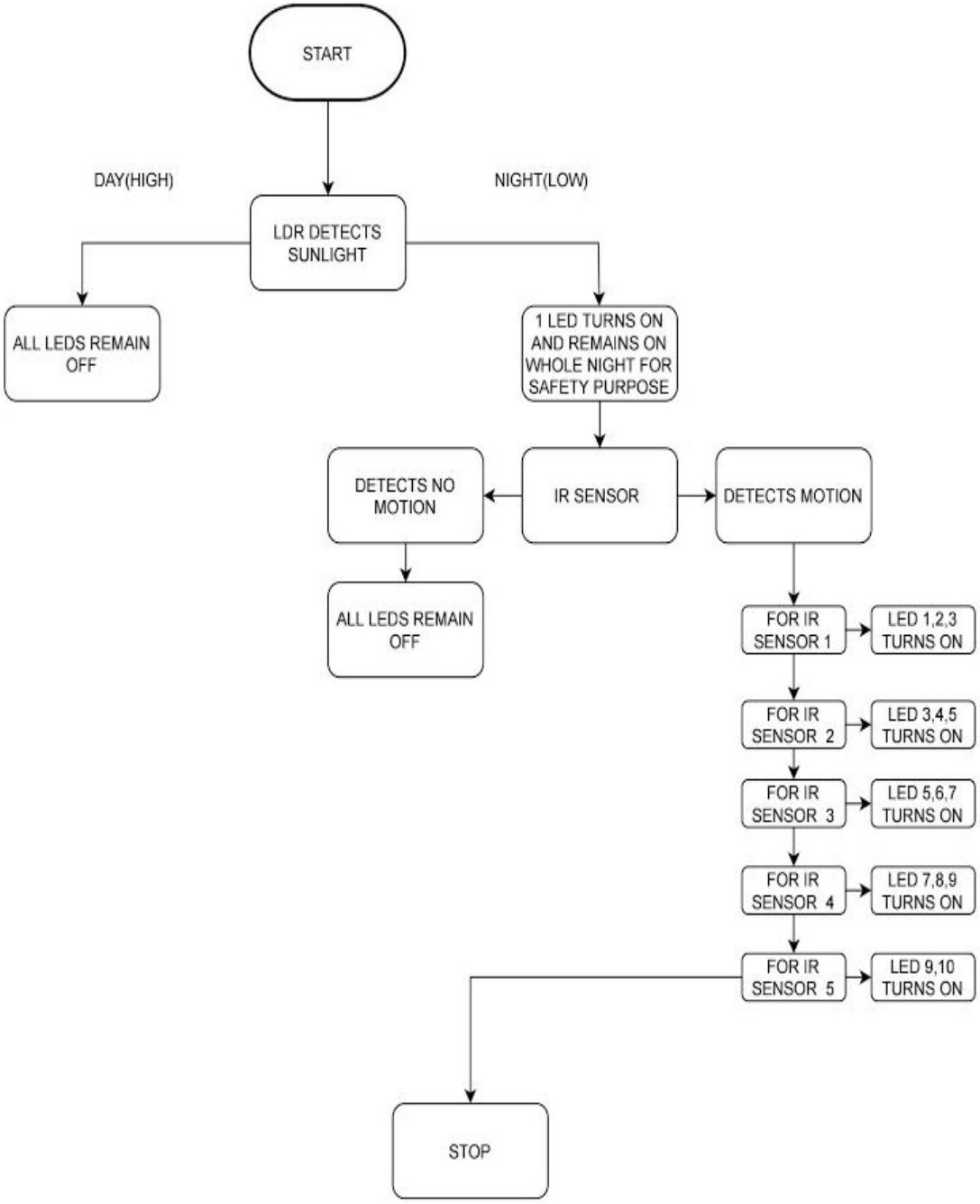

Fig 4.0.2 : Flow Chart

4.1 HARDWARE DESCRIPTION

1. ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

PIN DESCRIPTION:(Table 5.1)

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to nano when using an external powersource(6-12V). 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: Ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A7	Used to measure analog voltage in the range of 0-5V

Input/Output Pins	Digital Pins D0 - D13	Can be used as input or output pins. 0V (low) and 5V (high)
Serial	Rx, Tx	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
IIC	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

TECHNICAL SPECIFICATIONS: (Table 5.2)

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage for Vin pin	7-12V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (2 KB is used for Bootloader)

SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz
Communication	IIC, SPI, USART

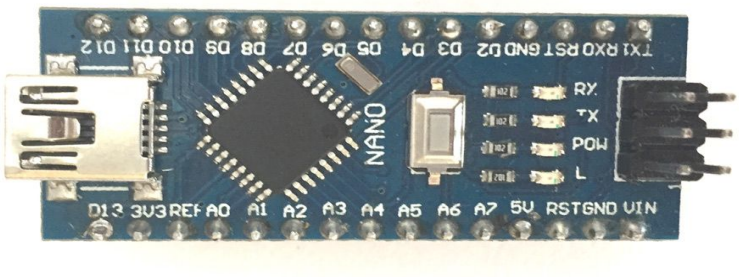

Fig 4.1.1.1: Arduino Nano

2. IR SENSOR

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion as well as the presence of an object due to movement or interruption. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages change in proportion to the magnitude of the IR light received. An IR sensor is a device which detects IR radiation falling on it. There are numerous types of IR sensors that are built and can be built depending on the application. Proximity sensors (Used in Touch Screen phones and Edge Avoiding Robots), contrast sensors (Used in Line Following Robots) and obstruction counters/sensors (Used for counting goods and in Burglar Alarms) are some examples, which use IR sensors.

Working Mechanism

An IR sensor is basically a device which consists of a pair of an IR LED and a photodiode which are collectively known as photo-coupler or an opto-coupler. The IR LED emits IR radiation, reception and/or intensity of reception of which by the photodiode dictates the output of the sensor.

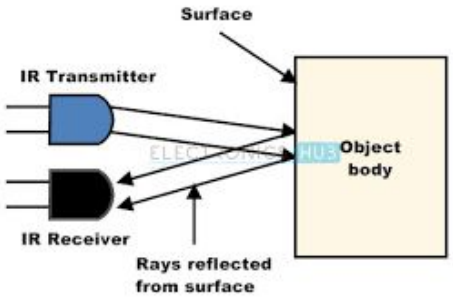

Fig 4.1.2.1: Working Of IR Sensor

Direct incidence

We may hold the IR LED directly in front of the photodiode, such that almost all the radiation emitted, reaches the photodiode. This creates an invisible line of IR radiation between the IR LED and the photodiode. Now, if an opaque object is placed obstructing this line, the radiation will not reach the photodiode and will get either reflected or absorbed by the obstructing object. This mechanism is used in object counters and burglar alarms.

Indirect Incidence

High school physics taught us that black color absorbs all radiation, and the color white reflects all radiation. We use this very knowledge to build our IR sensor. If we place the IR LED and the photodiode side by side, close together, the radiation from the IR LED will get emitted straight in the direction to which the IR LED is pointing towards, and so is the photodiode, and hence there will be no incidence of the radiation on the photodiode.

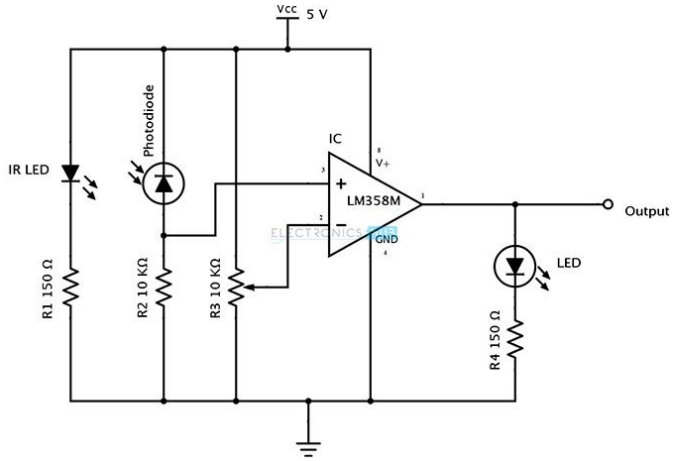

Fig 4.1.2.2: Circuit Diagram Of IR Sensor

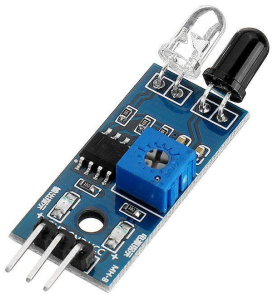

Fig 4.1.2.3: IR Sensor

3. Light Dependant Resistor Circuit

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics, in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the phototransistors. Light dependent resistor as the name suggests depends on light for the variation of resistance. LDR are made by depositing a film of cadmium sulphide or cadmium selenide on a substrate of ceramic containing no or very few free electrons when not illuminated .The longer the strip the more the value of resistance. When light falls on the strip, the resistance decreases. In the absence of light the resistance can be in the order of 10K ohm to 15K ohm and is called the dark resistance. Depending on the exposure of light the resistance can fall down to a value of 500 ohms. The power ratings are usually smaller and are in the range 50mw to .5w. Though very sensitive to light, the switching time is very high and hence cannot be used for high frequency applications. They are used in chopper amplifiers. Light dependent resistors are available as discs 0.5cm to 2.5cm. The resistance rises to several Mega ohms under dark conditions.

The device consists of a pair of metal film contacts separated by a snakelike track of cadmium sulphide film, designed to provide the maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case, to provide free access to external light. Practical LDRs are available in a variety of sizes and packages styles, the most popular size having a face diameter of roughly 10mm. When an LDR is brought from a certain illuminating level into total darkness, the resistance does not increase immediately to the dark value. The recovery rate is specified in k ohm/second and for current LDR types it is more than 200k ohm/second. The recovery rate is much greater in the reverse direction, e.g. going from darkness to illumination level of 300 lux, it takes less than 10ms to reach a resistance which corresponds with a light level of 400 lux. A LDR may be connected either way round and no special precautions are required during the time of soldering. Darkness: Maximum resistance, about 1Mega ohm.

Fig 4.1.3.1: LDR

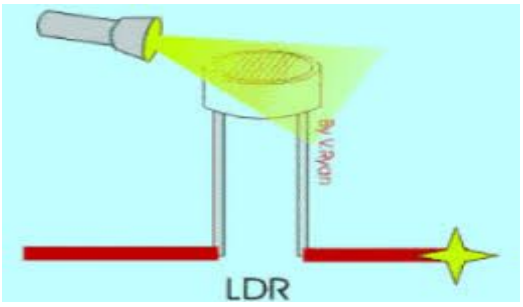

Fig 4.1.3.2: Working Of LDR

4.LIGHT EMITTING DIODE

A light-emitting diode (LED) is a two-lead semiconductor light source. It is p-n junction diode that emits light when activated. The long terminal is positive and the short terminal is negative. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 mm2) and integrated optical components may be used to shape the radiation pattern. LEDs are versatile semiconductors with a number of attributes which make them perfect for most applications. Their features include:

- Long Life: LEDs can last over 100,000 hours (10+ years) if used at rated current
- No annoying flicker as we experience with fluorescent lamps.
- LEDs are impervious to heat, cold, shock and vibration.
- LEDs do not contain breakable glass. Solid-State, high shock and vibration resistant Extremely fast turn on/off times
- Low power consumption puts less load on the electrical systems increasing battery life.

Here we have used the most common 5mm white light. White LEDs are perfect for replacing inefficient incandescent bulbs in night lights and path lights.

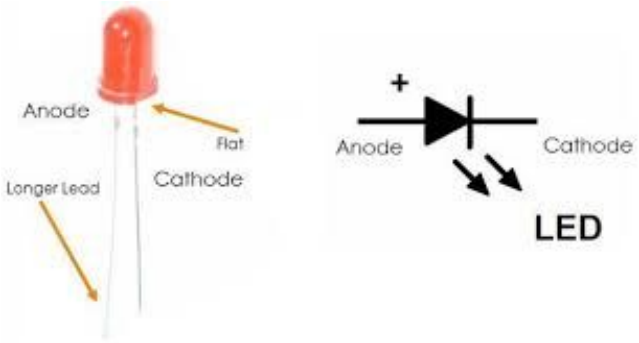

Fig 4.1.4.1: LED

4.2 SOFTWARE DESCRIPTION

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).

IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, and Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with

buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.

CODE

```
int led1 = 2;

int led2 = 3;

int led3 = 4;

int led4 = 5;

int led5 = 6;

int led6 = 7;

int led7 = 8;

int led8 = 9;

int led9 = 10;

int led10 = 11;

int ldr = A1;

void setup()

{

 Serial.begin (9600);

 pinMode (led1,OUTPUT);

 pinMode (led2,OUTPUT);

 pinMode (led3,OUTPUT);
```

```
 pinMode (led4,OUTPUT);
 pinMode (led5,OUTPUT);
 pinMode (led6,OUTPUT);
 pinMode (led7,OUTPUT);
 pinMode (led8,OUTPUT);
 pinMode (led9,OUTPUT);
 pinMode (led10,OUTPUT);
 pinMode (ldr,INPUT);
}
void loop()
{
 int ldrStatus = analogRead (ldr);
 if (ldrStatus <=10)
 {
   digitalWrite(13,HIGH);
 if (analogRead(A2)<100) // IR 1 CODE
 {
 digitalWrite(led1,HIGH);
 digitalWrite(led2,HIGH);
 digitalWrite(led3,HIGH);
 delay(100);// micro second
```

```
}
else
{
 digitalWrite(led1,LOW);
digitalWrite(led2,LOW);
digitalWrite(led3,LOW);
delay(100);
}

if (analogRead(A3)<100) // IR 2 CODE
{
digitalWrite(led3,HIGH);
digitalWrite(led4,HIGH);
digitalWrite(led5,HIGH);
delay(100);// micro second
}
else
{
 digitalWrite(led3,LOW);
digitalWrite(led5,LOW);
digitalWrite(led4,LOW);
```

```
delay(100); ;


}
if (analogRead(A4)<100) // IR 3 CODE
{
digitalWrite(led5,HIGH);
digitalWrite(led6,HIGH);
digitalWrite(led7,HIGH);
delay(100);// micro second
}
else
{
 digitalWrite(led5,LOW);
digitalWrite(led6,LOW);
digitalWrite(led7,LOW);
delay(100);


}
if (analogRead(A5)<100) // IR 4 CODE
{
 digitalWrite(led7,HIGH);
```

```
digitalWrite(led8,HIGH);
digitalWrite(led9,HIGH);
delay(100);// micro second
}
else
{
 digitalWrite(led7,LOW);
digitalWrite(led8,LOW);
digitalWrite(led9,LOW);
delay(100);
}



if (analogRead(A6)<100) // IR 5 CODE
{
digitalWrite(led9,HIGH);
digitalWrite(led10,HIGH);
delay(100);// micro second
}
else
```

```
{
 digitalWrite(led9,LOW);
digitalWrite(led10,LOW);
delay(100);

}}

else
{
digitalWrite(led1, LOW);
digitalWrite(led2, LOW);
digitalWrite(led3, LOW);
digitalWrite(led4, LOW);
digitalWrite(led5, LOW);
digitalWrite(led6, LOW);
digitalWrite(led7, LOW);
digitalWrite(led8, LOW);
digitalWrite(led9, LOW);
digitalWrite(led10, LOW);
digital write(13,LOW)
}}
```

CHAPTER 5

RESULTS AND DISCUSSION

In this section, the setup of the whole research work is depicted in a step by step manner. Sample screenshots are displayed once the components are fixed and connected to each other. All the components are connected to each other and thus completes the system setup which helps one to understand the steps in a simple and easy way. With these steps, even when a person who is trying to implement the same, it makes it simple, clear and easy. The following are the screenshots in an orderly way:

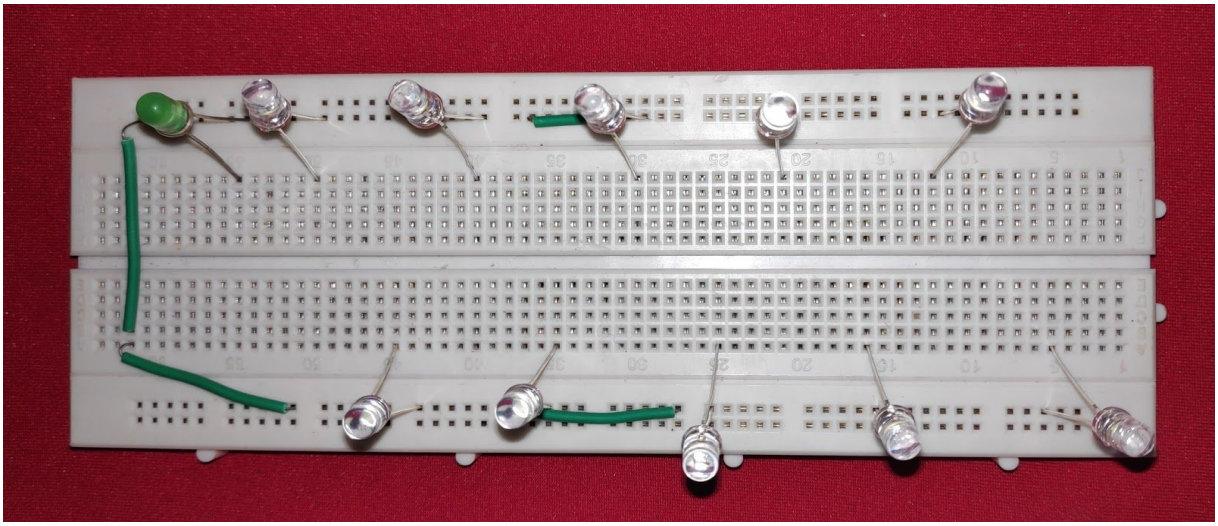

Fig 5.1: LED Arrangement On Breadboard

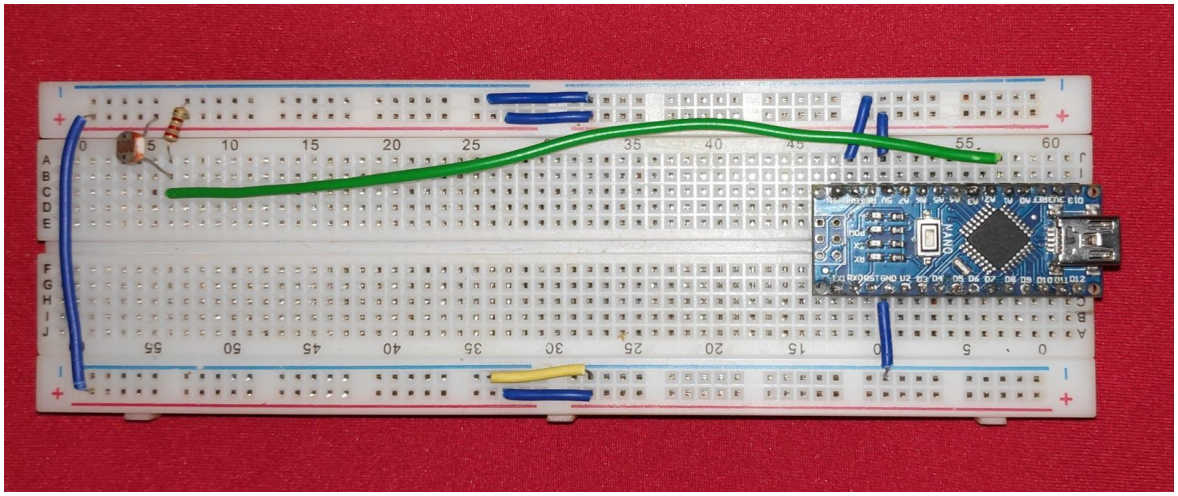

Fig 5.2: Arduino Placed On Breadboard With LDR

IR sensors are kept side to the road by keeping uniform distance between them

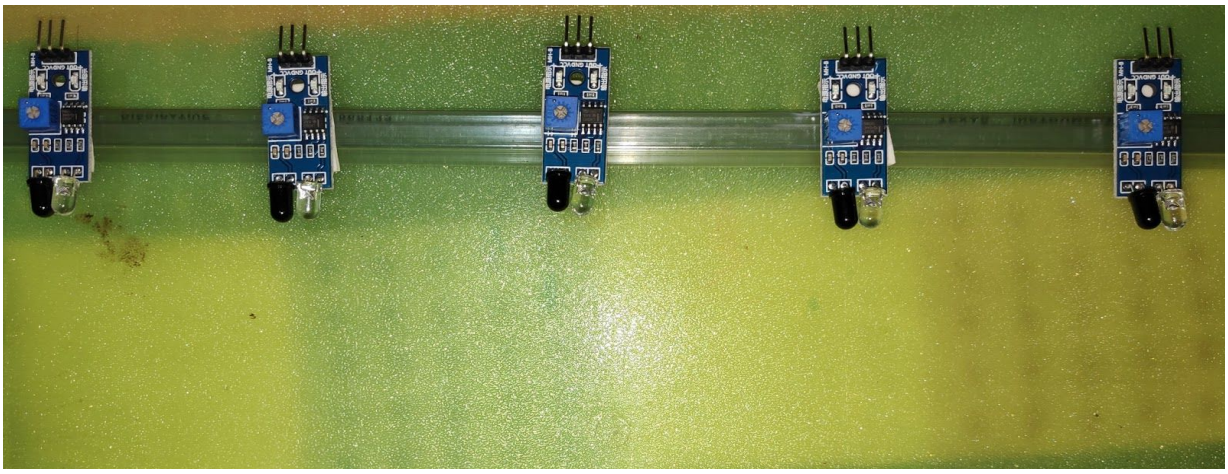

Fig 5.3: IR Sensors Arrangement

This picture shows the complete circuit with connections made

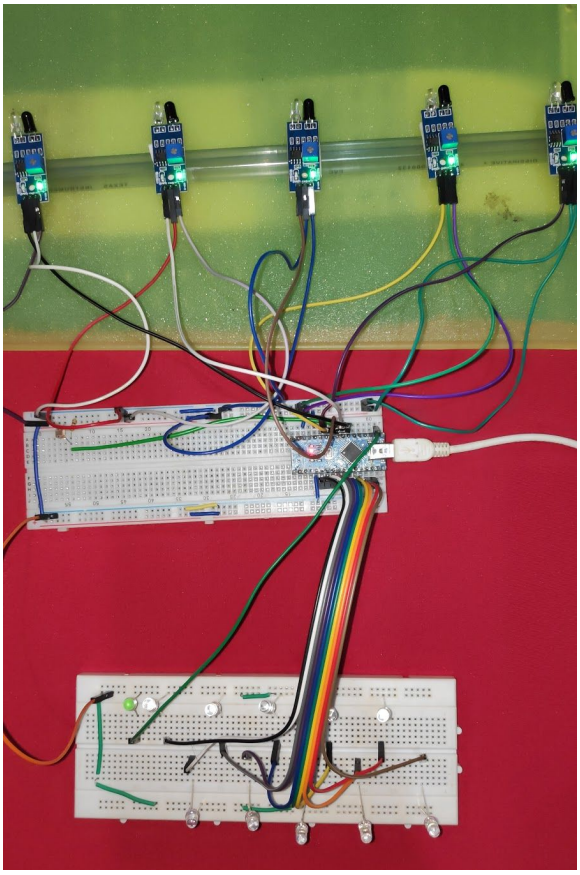

Fig 5.4: Model With Full Connections Made

This picture shows there is no light turned on during day time even when the vehicle passes IR sensor

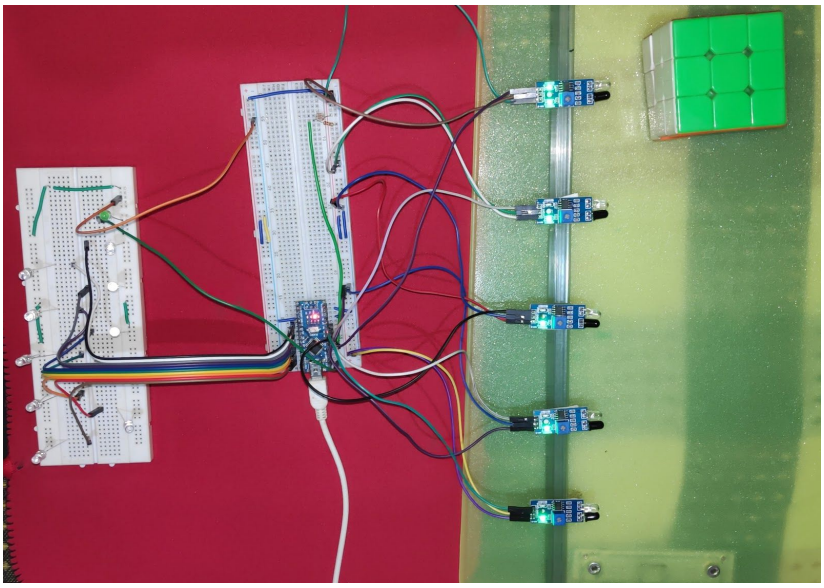

Fig 5.5: During Morning

LDR is covered to recreate night and we can see that a single LED is turned on for security.

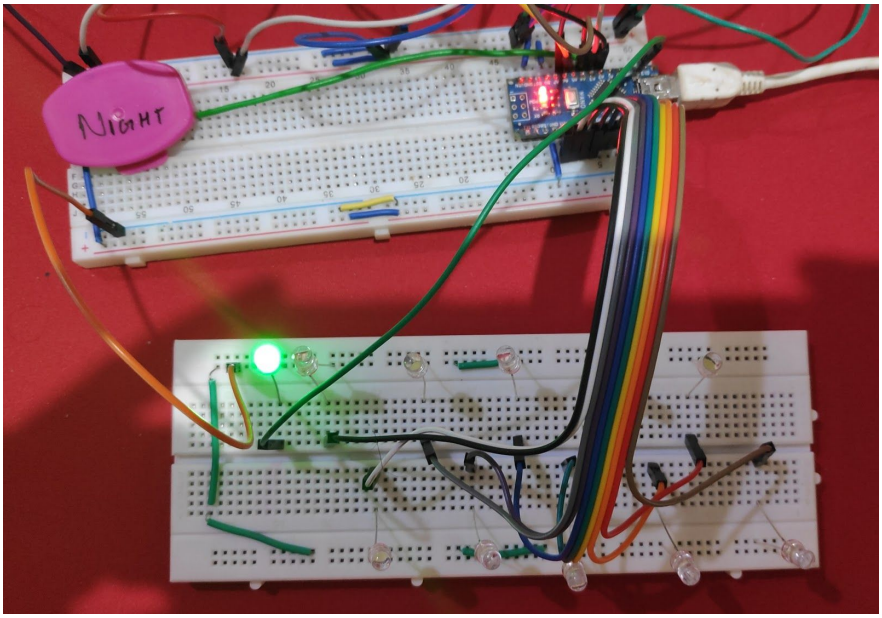

Fig 5.6: LDR Covered To Recreate Night

The following picture shows the corresponding street lights being turned ON when the vehicle passes corresponding IR sensors

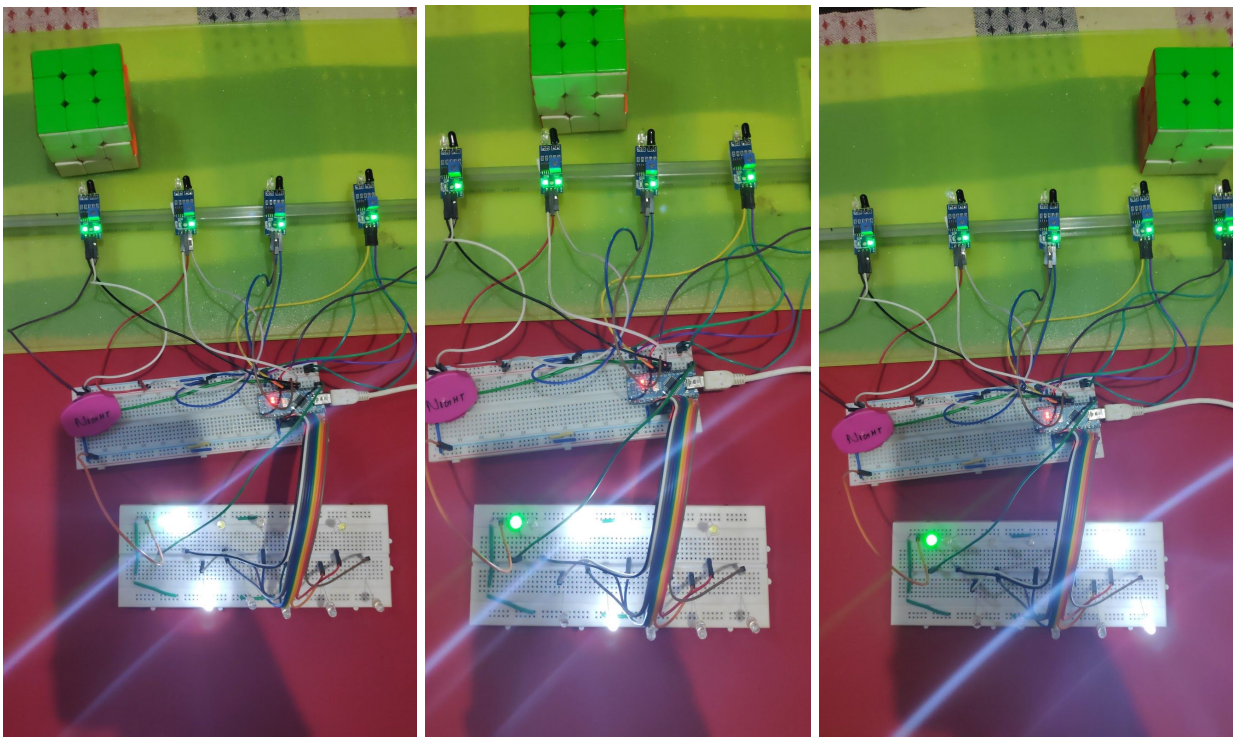

Fig 5.7: Pictures Showing Model Working During Night

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1.1 CONCLUSION

By using Smart Street light, one can save a 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 energy consumption and maintain the cost.

6.1.2 FUTURE SCOPE

The system is versatile, extendable and totally adjustable to user needs. The system is now used only for One way traffic on highways. Continuous uses of LDR and IR sensors even in day time. Not switched on before the sunset. The 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.

1. A framework for Smart Street Lighting System with sensors, wireless can be added with a module, GPS device and GSM module.
2. Further the project can be enhanced by using appropriate sensors for detecting the failed Street light and then sending an SMS to the control department via GSM module.
3. The objective of this framework is to reduce the cost and energy. This framework could be improved by adding other modules such as WiFi that gives free hotspot to the pedestrians and Emergency button meant for the public in case of medical emergencies as well as other emergencies. We can fix the taxi call button.
4. Other sensors like water sensor, seismic sensor, sound sensor, image sensor etc. can be added along with the post for various purposes and most importantly security purposes.

6.2 REFERENCES

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6.3 APPENDIX

1.India’s largest deployment of smart street lights

Tata Communications plans to bring 15,000 smart street lights into effective action in Jamshedpur city that can be operated as well as controlled through the internet.Tata Communications is in partnership with an electronics and Internet of Things (IoT) firm, Motwane successful to complete and deliver end-to-end solutions of 300 smart street lights for (Jamshedpur Utilities and Services Co Ltd, which is India’s only comprehensive urban infrastructure service provider.)

“JUSCO’s project in Jamshedpur is the biggest smart city with 300 street lightning deployment of its kind in India. It will pave the way for a total of 15,000 lights that are to be installed in the city in the coming five years,”A Tata Communications official said in a statement.Switching the lights on, off or dimming them remotely are some of the smart features the system offers and most interestingly, it can be controlled from a central command Centre. It even helps in reducing manpower costs and lower the energy consumption with the unique feature of adjusting the lights in clusters depending on the requirement of each location, the statement added.

“Smart Street lighting system is highly needed in India that will help us in saving energy effectively, get real-time reports, reduce CO2 emissions, complete control over the light intensity and lower down the maintenance costs efficiently”.

Ashish Mathur, JUSCO Managing Director said “IoT will not only help us in reducing the carbon footprint but also it saves around 700 INR per light per year, because of its extremely lower power consumption”India’s smart street lighting market is estimated to grow at a CAGR of 42.2% between the years 2016-2022.

2.Success in Jamaica:LED Street Lights

The Jamaica Public Service Company Limited (JPS) is a power utility that also oversees public lighting services throughout the country. When the company was tasked with modernizing its nationwide streetlighting system, it turned to the U.S. Trade and Development Agency for new strategies and best practices to achieve this important goal.

JPS set out an ambitious plan for its Smart Streetlights Project: Implement 110,000 light emitting diode (LED) streetlights, as well as intelligent controls and metering capabilities for revenue generation. LED streetlights deliver enhanced reliability and significantly longer lifespans than traditional streetlights. When networked, LED streetlights can alert utilities of outages, which improves response times for repairs and helps address non-technical losses