STREET LIGHTS THAT GLOW ON DETECTING VEHICLE MOVEMENT

by

Name	Roll No.	Registration No:
ANANDADEEP KONCH	**11700314011**	**141170110193** of 2014-2015
RATUL GANGULY	**11700314066**	**141170110248** of 2014-2015
SONU KUMAR	**11700314101**	**141170110283** *of 2014-2015*
SONU SINGH	**11700314102**	**141170110284** *of 2014-2015*

A comprehensive project report has been submitted in partial fulfillment of the requirements for the degree of

Bachelor of Technology

in

ELECTRONICS & COMMUNICATION ENGINEERING

Under the supervision of

Mr. ANINDYA BASU

Assistant Professor

Department of Electronics & Communication Engineering
RCC INSTITUTE OF INFORMATION TECHNOLOGY
Affiliated to Maulana Abul Kalam Azad University of Technology, WestBengal
CANAL SOUTH ROAD, BELIAGHATA, KOLKATA – 700015

MAY,2018

CERTIFICATE OF APPROVAL

This is to certify that the project titled **"STREET LIGHTS THAT GLOW ON DETECTING VEHICLE MOVEMENT"** carried out by

Name	Roll No.	Registration No:
ANANDADEEP KONCH	**11700314011**	**141170110193** of 2014-2015
RATUL GANGULY	**11700314066**	**141170110248** of 2014-2015
SONU KUMAR	**11700314101**	**141170110283** of 2014-2015
SONU SINGH	**11700314102**	**141170110284** of 2014-2015

for the partial fulfillment of the requirements for B.Tech degree in **Electronics and Communication Engineering** from **Maulana Abul Kalam Azad University of Technology,West Bengal** absolutely based on his own work under the supervision of

Mr. ANINDYA BASU. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Optional in case of External Supervisor

.....
Dr./Mr./Ms./Mrs.
Designation and Department
Institute

.....
Mr. ANINDYA BASU
Professor , Dept. of ECE
RCC Institute of Information Technology

.....
Dr.Abhishek Basu
Head of the Department (ECE)
RCC Institute of Information Technology

DECLARATION

"We Do hereby declare that this submission is our own work conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute and that, to the best of our knowledge and belief, it contains no material previously written by another neither person nor material (data, theoretical analysis, figures, and text) which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text."

.....

ANANDADEEP KONCH
Registration No:**141170110193** of 2014-2015
Roll No: **11700314011**

.....

RATUL GANGULY
Registration No:**141170110248** of 2014-2015
Roll No: **11700314066**

.....

SONU KUMAR
Registration No:**141170110283** of 2014-2015
Roll No: **11700314101**

.....

SONU SINGH
Registration No:**141170110284** of 2014-2015
Roll No: **11700314102**

Date:

Place: **KOLKATA**

CERTIFICATE OF ACCEPTANCE

This is to certify that the project titled "**STREET LIGHTS THAT GLOW ON DETECTING VEHICLE MOVEMENT**" carried out by

Name	Roll No.	Registration No:
ANANDADEEP KONCH	**11700314011**	**141170110193** of 2014-2015
RATUL GANGULY	**11700314066**	**141170110248** of 2014-2015
SONU KUMAR	**11700314101**	**141170110283** of 2014-2015
SONU SINGH	**11700314102**	**141170110284** of 2014-2015

is hereby recommended to be accepted for the partial fulfillment of the requirements for B.Tech degree in **Electronics and Communication Engineering** from **Maulana Abul Kalam Azad University of Technology, West Bengal**

Name of the Examiner Signature with Date

1. ……

2.…… ……..

3.…… ……

4. …… ……

ABSTRACT

In today's world, the trending demand of alternative sources of energy is required to the growing demands of the people. This can be achieved in 2 ways: 1) Finding an alternative resource to supply the power and 2) By reducing the energy consumption of the present resources available. This project supports the second statement.

The principle behind the working of the project lies in the functioning of transmissive type IR Sensor (IR TRANSMITTER AND RECEIVER).

The proposed system consists of At89C51 microcontroller, IR sensor, AT89SC51 programmer board and LED. This system controls the street lights using Photodiode and IR transmitter.

Function of At89C51 microcontroller*:*

This powerful microcontroller is suitable for many embedded control applications. The AT89C51is a low-**power**, high-performance CMOS 8-bit microcontroller with 4K bytes of Flash programmable and erasable read only memory. The device is manufactured using Atmel's high-density nonvolatile **memory** technology and the IR receivers are connected to PORT-0 of the microcontroller while the LEDs are connected to PORT-2 of the microcontroller.

Function of IR SENSOR:

As the resistance value is maximum in the midnights, real time clock comes into the play. The controller checks peak time during which there is no traffic and switch OFF the lights. When there is any vehicle on the road, it is detected by the PIR sensor.

Whenever IR sensor is detected it just indicates the microcontroller to switch on the street lights. Then lights are switched on for 2 to 3 minutes and switched off automatically.

Advantages:

- If the lighting system implements all LED lights, the cost of the maintenance can be reduced as the life span and durability of LEDs is higher than Neon based lights which are normally used as street lights.
- As the lights are automatically turned ON or OFF, huge amount of energy can be saved.

CONTENTS

LIST OF ABBREVIATIONS

LED	Light Emitting Diode
IR	Infra-Red
I/O	Input-Output
HID	High Density Discharge
CMOS	Complementary Metal Oxide Semiconductor
RAM	Random Access Memory

LIST OF FIGURES

Chapter 1

Introduction

1.1. Problem definition:

Street lights that glow on detecting vehicle movement

1.2Problem statement:

To design a circuit that would glow street lights on detecting vehicle movement for a particular period of time and then, would switch off automatically.

1.3 Analysis:

Street-lights are a large consumer of energy for cities using up to 50 percent of a city's energy budget. If every city installs the proposed system then a lot of power can be saved .Proposed system is power saving mechanism for street lights by using LED lamps as replacement of normal lamps and using special power savings mechanism for microcontroller. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. It turns out most reliable and time efficient way to switch ON/OFF streetlights.

Disadvantages of Existing System:• HID lamps consume more power. • The life time of the HID lamps is very less. • It cannot be used in all outdoor applications.

And the proposed system:

Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. To control and maintain complex street lighting system more economically, various street light control systems are developed. These systems are developed to control and reduce energy consumption of a town's public lighting system using different technologies. The main motive is to control switching of street light automatically according to light intensity to develop flow based ZERO.

Valid points: Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. Automation, Power consumption

and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. To control and maintain complex street lighting system more economically, various street light control systems are developed. This proposed system utilizes the latest technology for the sources of light as LED Lamps instead of generally used street lamps such as High Pressure Sodium Lamps, etc. And now, let's proceed to the working.

BRIEF DESCRIPTION OF THE COMPONENTS:

1) **AT89C51 MICROCONTROLLER:**

Pin configuration:

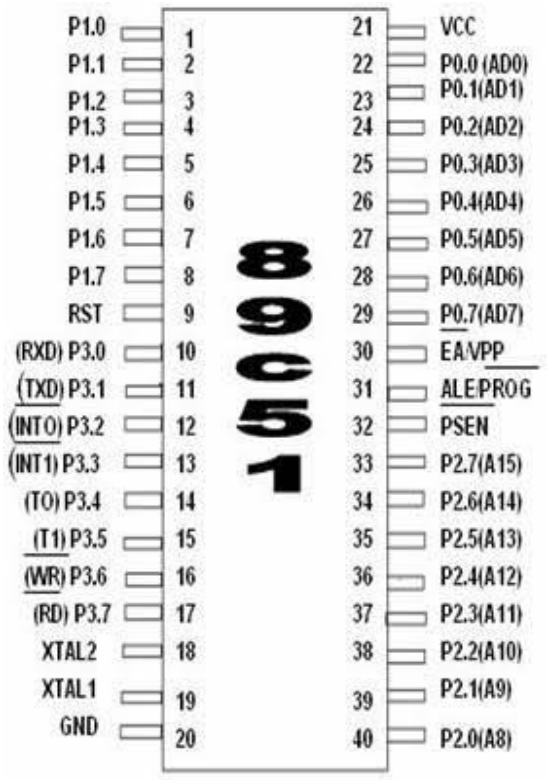

Fig: 1

8051 is the name of a big family of microcontrollers. The device which we used in our project was the 'AT89C51' which is a typical 8051 microcontroller manufactured by Atmel

The AT89C51 has 4K bytes of Flash Programmable and erasable read only memory (PEROM), 128 byes of RAM, 32 I/O lines, two 16-bit timers/counters, a 5 vector two-level interrupt architecture, a full duplex serial port, on chip oscillator and clock circuitry. The

device is manufactured using Atmel's high density non volatile memory technology and is compatible with the standard MC-51 instruction set and pin-out. The on-chip Flash allows the program memory to be reprogrammed in system by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many applications.

The AT89C51 supports 2 software selectable power saving modes. The IDLE mode stops the CPU while allowing the RAM, timer/counters, serial port, interrupt system to continue functioning. The POWER-DOWN Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset. Nowadays a more advanced version of this microcontroller is used known as AT89S52.

THE AT89C51 MICROCONTROLLER

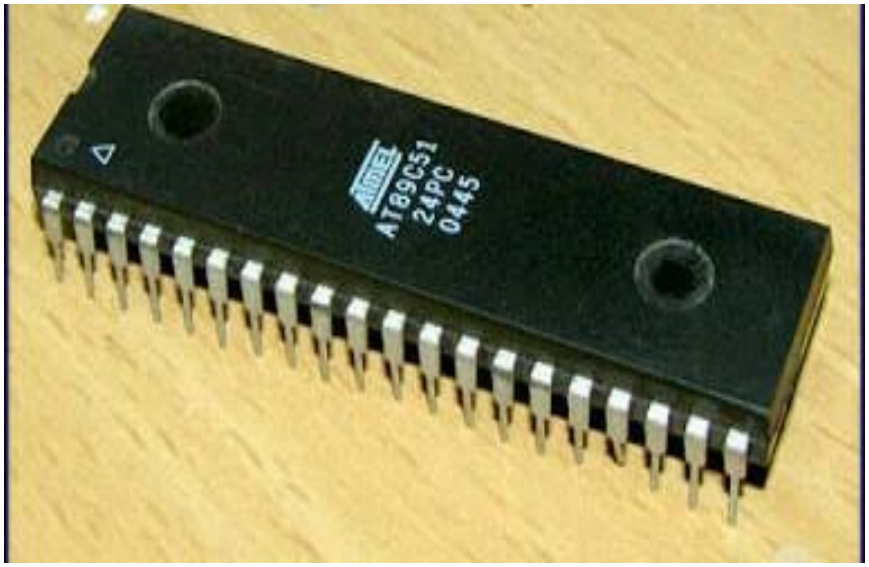

Fig: 2

2) IR TRANSMITTERS (IR LED)

An Infrared light emitting diode (IR LED) is a special purpose LED emitting infrared rays ranging 700 nm to 1 mm wavelength. Different IR LEDs may produce infrared light of differing wavelengths, just like different LEDs produce light of different colors. IR LEDs are usually made of gallium arsenide or aluminum gallium arsenide. In complement with IR receivers, these are commonly used as sensors.

The appearance of IR LED is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify if an IR LED is working. A camera on a cell phone camera solves this problem. The IR rays from the IR LED in the circuit are shown in the camera. Electric current is allowed to flow in only one direction indiodes. As thecurrent flows, electrons fall from one part of the diode into holes on another part. In order to fall into these holes, the electrons must shed energy in the form of photons, which An IR LED is a type of diode or simple semiconductor Electric current is produce light. IR LEDs are massively used in remote controls and safety alarm systems.

THE IR LED

Fig: 3

3) PHOTODIODE (IR RECEIVERS)

A semiconductor diode that, when exposed to light, generates a potential difference or changes its electrical resistance is known as a photodiode. A photodiode is a reverse biased Si or Ge pn junction in which reverse current increases when the junction is exposed to light.

When no light is incident on the pn junction of the photodiode, an extremely small amount of reverse current is detected known as DARK CURRENT. When light is incident on the pn junction of the photodiode there is a transfer of energy from the incident light (photons) to the atoms in the junction. This will create more free electrons which will in turn increase the reverse current. Whenever an obstacle (reflecting surface) comes in front of the photodiode, these rays are reflected back and captured. When the is no obstacle they are unable to be captured.

PHOTODIODE

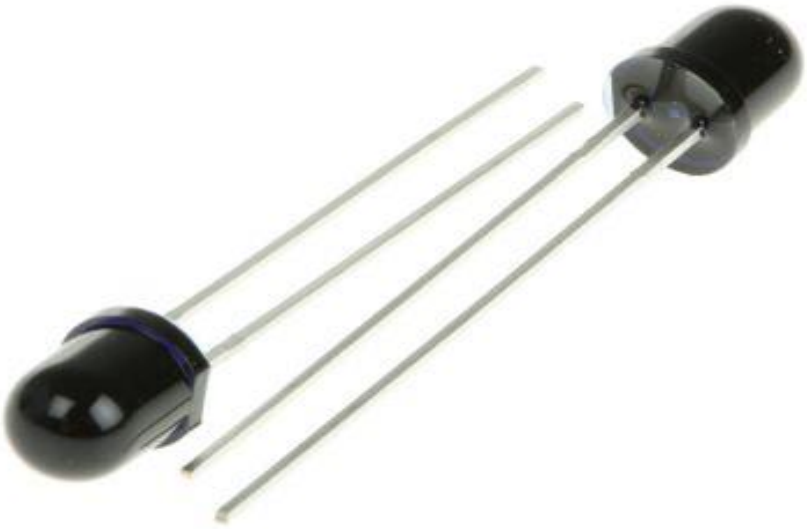

Fig: 4

4) IR SENSOR

An IR sensor is a device that detects IR radiation falling on it. Proximity sensors (used in touchscreen 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 applications involving IR sensors. An IR sensor consists of two parts, the emitter circuit and the receiver circuit. This is collectively known as a photo-coupler or an optocoupler.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photo-diode's resistance and output

voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.

The type of incidence can be direct incidence or indirect incidence. In direct incidence, the IR LED is placed in front of a photodiode with no obstacle in between. In indirect incidence, both the diodes are placed side by side with an opaque object in front of the sensor. The light from the IRLED hits the opaque surface and reflects back to the photodiode.

IR SENSOR

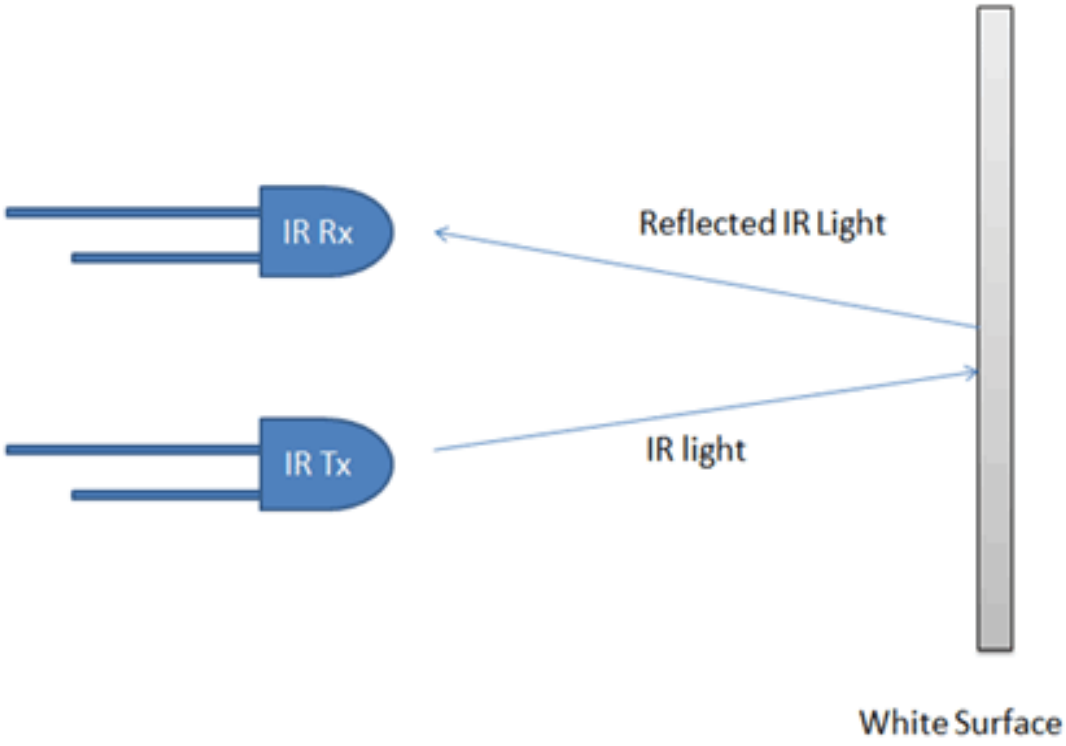

Fig: 5

Rx--- PHOTODIODE

Tx--- IR LED

5) QUARTZ CRYSTAL OSCILLATOR

One of the most important features of any oscillator is its frequency stability, or in other words its ability to provide a constant frequency output under varying load

conditions.Frequency stability of the output signal can be greatly improved by the proper selection of the components used for the resonant feedback circuit, including the amplifier.To obtain a very high level of oscillator stability a Quartz Crystal is generally used as the frequency determining device to produce other types of oscillator circuit known generally as a Quartz Crystal Oscillator, (XO).When a voltage source is applied to a small thin piece of quartz crystal, it begins to change shape producing a characteristic known as the Piezo-electric effect. This Piezo-electric Effect is the property of a crystal by which an electrical charge produces a mechanical force by changing the shape of the crystal and vice versa, a mechanical force applied to the crystal produces an electrical charge.The quartz crystal used in a Quartz Crystal Oscillator is a very small, thin piece or wafer of cut quartz with the two parallel surfaces metallized to make the required electrical connections. The physical size and thickness of a piece of quartz crystal is tightly controlled since it affects the final or fundamental frequency of oscillations. The fundamental frequency is generally called the crystals “characteristic frequency”.

QUARTZ CRYSTAL OSCILLATOR

Fig: 6

Now let us come to the main block of our project.

The highway model consists of 8 LEDs as streetlights and 8 pairs of photodiodes-IR diodes used as sensors, and variable resistors. The IR sensors are placed on one side of the road and the LEDs are placed on the other side of the road, directly facing the IR sensors. The device is manufactured using Atmel's high-density nonvolatile **memory** technology and the IR receivers are connected to PORT-1 of the microcontroller while the LEDs are connected to PORT-3 of the microcontroller. The AT89C51 is a low-power, high-performance CMOS 8- bit microcontroller with 4K bytes of in-system Flash programmabl and erasable read only memory.

WORKING IN BRIEF:

The IR transmitter is placed directly in line of sight with IR receiver, so that the IR receiver continuously receives infrared rays. Once the IR receiver receives infrared rays, the microcontroller will detect Logic 1. If the infrared rays are blocked by some means, the microcontroller will detect logic 0.

So, the program for the microcontroller must be written in such a way that it will turn ON the LEDs, which means here the street lamp, when it detects Logic 0 and it will turn OFF the LEDs, when it detects Logic 1.Let us consider the two IR sensors i.e. IR Transmitter and IR Receiver are placed on either side of the road. As per the circuit diagram, the IR receivers are connected to the PORT 1 and the LEDs are connected to the PORT 3 of the microcontroller. At the beginning, when there is no obstacle, the IR receiver continuously detects IR light transmitted by the IR Transmitter. When a car or any other vehicle blocks any of the IR sensors, the microcontroller will turn ON the immediate three LEDs.If the car blocks the first IR sensor, the first three LEDs are turned ON by the microcontroller. As the car moves forward and blocks the second IR sensor, the corresponding next three LEDs will be turned ON and the first LED of the previous set is turned OFF. The process continues this way for all the IR Sensors and LEDs

CIRCUIT DESIGN:

The hardware design of the circuit is centered on the 4 basic components, the AT89C52 Microcontroller, the IR Transmitters, the IR Receivers and the LEDs.In order to use the on-chip oscillator, the microcontroller requires an external clock. This is provided by a crystal oscillator. An 11.0592MHz quartz crystal is connected to XTAL1 and XTAL2 pins with two 33 pF ceramic capacitors connected to it. The reset circuit of the microcontroller consists of a 8.66K resistor, 10uF capacitor and a push button. The external access pin is connected to Vcc of the circuit via a 10K resistor. The next hardware that is connected is the IR Receiver. 8 IR receivers to the PORT 1 pins of the microcontroller. In order to use the PORT 1 as I/O port, we need to connect external pull up resistors to the PORT 1 pins. After that, connect the

output of the IR receiver i.e. anode terminal of the photo diode to PORT 1 pins. The cathode terminals of the photo diodes are connected to supply. Also, a 3.3K resistor is connected between the anode terminal and ground. The next part of the circuit is IR transmitter. IR transmitter is not a part of the microcontroller connections as the only job of the IR transmitter is to continuously emit infrared rays. Hence the 8 IR transmitters are connected with corresponding 8 current limiting resistors of 330 Ohms with a power supply. Finally, the LEDs are connected. We need to connect the LED's to the PORT 3of the microcontroller.

CIRCUIT DIAGRAM

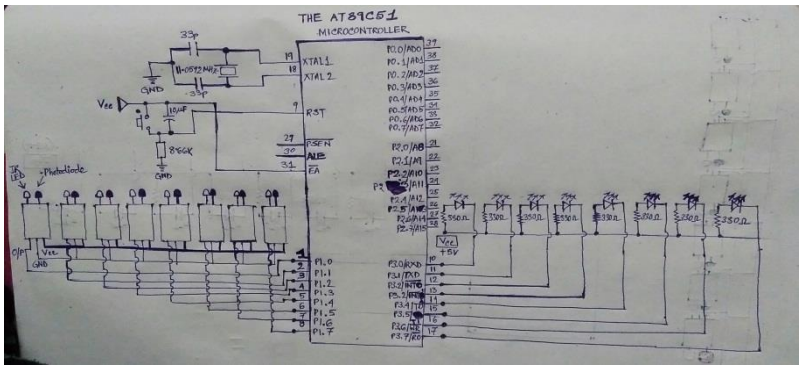

Fig: 7

1.4 Outcome:

The primary outcome of our project is to see the streetlights glow, which are the LEDs in this case, after the IR sensors used in the circuit have successfully detected a passing vehicle. Another important outcome of our project work is energy conservation. This is also achieved as the LEDs used in our circuit are automatically turned ON and OFF, thereby saving a considerable amount of energy. Also, reduction in the maintenance cost is also achieved since the life span and durability of LEDs are higher than that of Neon based lights which are commonly used as streetlights.

As discussed earlier the basic hardware circuit of our project consists of the microcontroller,the IR sensors (transmitters as well as receivers) and the LEDs. After assembling these along with some other components which are required for the creating the circuit,the complete hardware design of the circuit is show below. We have used the upper surface of a rectangular piece of plywood to mount the different components of the circuit.

THE FULLY OPERATIONAL HARDWARE CIRCUIT

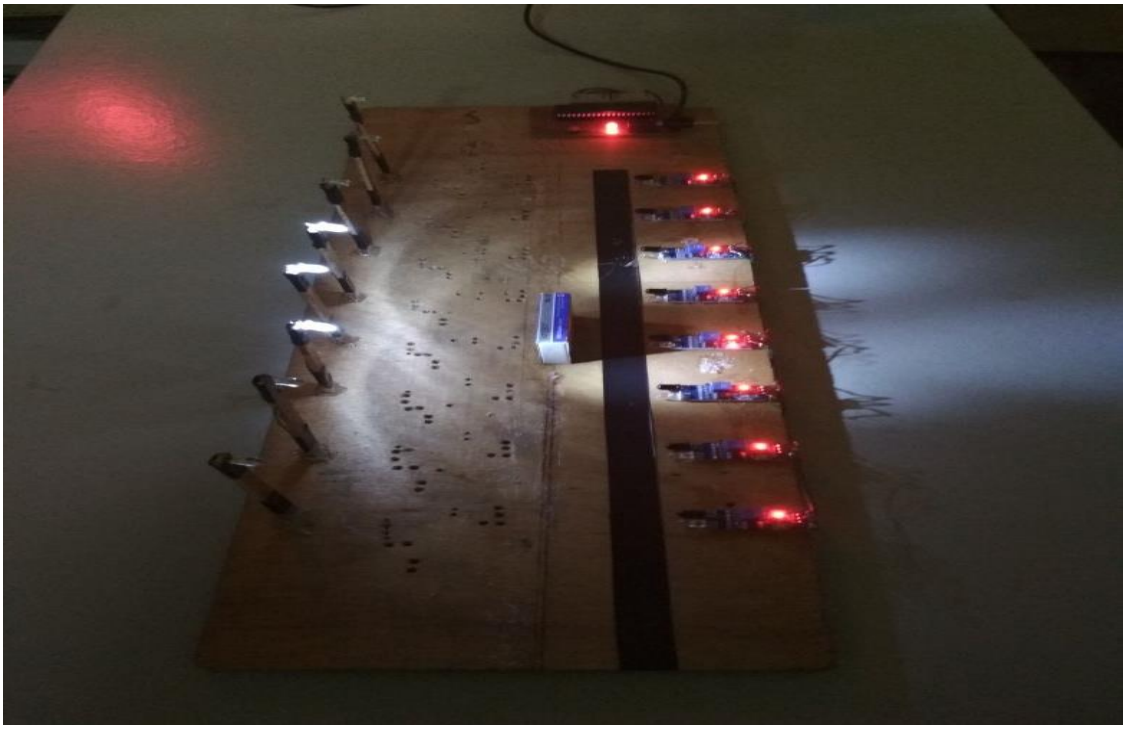

Fig: 8

Now our project not only consists of a hardware part,it has a software part as well. The linking between the hardware and the software part is done by the AT89C51 microcontroller. We have programmed the microcontroller in such a way that it will turn ON the LEDs when it detects Logic 0 and turn them OFF when it detects Logic 1, which in turn are controlled by the IR sensors.

The coding for the microcontroller is done in the assembly language using the PROTEUS software (version 7.6). The same software is also used for the software simulation of the circuit.

ASSEMBLY LANGUAGE PROGRAM OF THE MICROCONTROLLER

Code Used

```
ORG 00H
MOV P1, #0FFH          ;P2 port as input (IR Sensor Connected)
;MOV P3, #0FFH
;-----------------------------------------
;          Main Loop
;-----------------------------------------
START:
        MOV A, P1
        CJNE A, #0FFH, temp1
        MOV P3, #0FFH
        SJMP START
TEMP1:  CJNE A, #0FEH, TEMP2
        MOV P3, #3FH
        SJMP START
TEMP2:  CJNE A, #0FDH, TEMP3
        MOV P3, #1FH
        SJMP START
TEMP3:  CJNE A, #0FBH, TEMP4
        MOV P3, #8FH
        SJMP START
TEMP4:  CJNE A, #0F7H, TEMP5
        MOV P3, #0C7H
        SJMP START
TEMP5:  CJNE A, #0EFH, TEMP6
        MOV P3, #0E3H
        SJMP START
TEMP6:  CJNE A, #0DFH, TEMP7
        MOV P3, #0F1H
        SJMP START
TEMP7:  CJNE A, #0BFH, TEMP8
        MOV P3, #0F8H
        SJMP START
TEMP8:  CJNE A, #7FH, TEMP9
        MOV P3, #0FCH
TEMP9:      SJMP Start
END
```

Fig: 9

SOFTWARE SIMULATION OF THE CIRCUIT

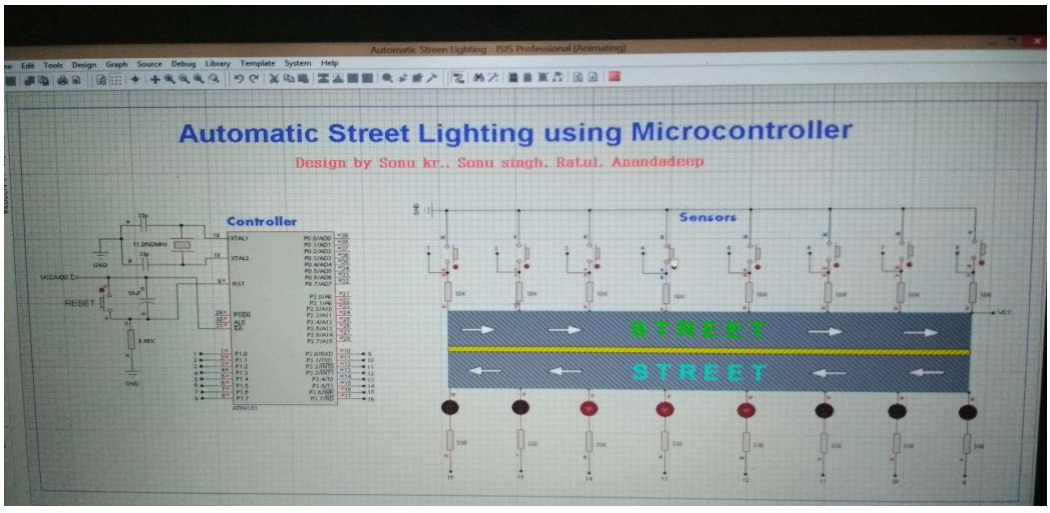

Fig: 10

REFERENCES

1. www.electronicshub.com
2. https://youtu.be/UMwhlHeaem0
3. https://youtu.be/c5_2ab6AKOY
4. https://youtu.be/zd1aofa7QBc
5. 8051: Microprocessors and Microcontrollers by Gaonkar
6. Official website of Atmel

CONCLUSION

By performing this project, we have studied and got to know how an IR sensor actually works in real life. We also got to know seperately, the functionings of the microcontroller,the IR LEDs as well as the Photodiodes. The fully operational circuit portrays a clear picture of how actually by detecting the presence of any vehicle,the street lights which are the LEDs in this project,are being made to glow. This street light control circuit can be used in normal roads, highways, express ways etc. This project can also be used in parking areas of malls, hotels, industrial lighting etc. If the lighting system implements all the LED lights, the cost of maintenance can be reduced as the life span and durability of LEDs are higher than that of Neon based lights which are normally used as street lights. In today's world of energy crisis new and alternative resources to supply energy and power are being extensivel explored to meet the growing demands of the ever increasing population. As the lights here are automatically turned ON or OFF, huge amount of energy can be saved thus reducing the consumption of the present resources which are decaying at an alarming rate.

ACKNOWLEDGEMENTS

It is our pleasure to thank and remain grateful to various people, professors, who directly or indirectly contributed in the development and successful completion of this project report and who have influenced our thinking, behavior, and acts during the course of building this project. We would like to express our sincere gratitude to Mr. ABHISHEK BASU, HOD, Department of Electronics and Communication Engineering, RCC Institute of Information Technology,for providing us the opportunity, to choose this topic as our undergraduate final year project topic, and to perform it successfully. We are grateful to Mr. SUJOY MONDAL, Assistant Professor and UG and PG Project Coordinator, Department of Electronics and Communication Engineering, RCC Institute of Information Technology and Mr. ANINDYA BASU, our project mentor and guide (Assistant Professor, Department of Electronics and Communication Engineering, RCC Institute of Information Technology) as well other faculty members of our esteemed department for their constant support, cooperation, and motivation, provided to us during the different phases of building the aforesaid project, which served as a constant source of inspiration, presence and blessings. We also extend our humble gratitude and will remain forever indebted to Mr. BUDHADITYA BISWAS, Assistant Professor, Department of Electrical Engineering, RCC Institute of Information Technology who provided us with his valuable suggestions and precious time in designing this project and accomplishing our project report.