A Project Report
on

Automatic Street Light System using IoT

Submitted by

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Under the guidance
of

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RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

(A.P. Government Act 18 of 2008)

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CERTIFICATE OF PROJECT COMPLETION

This is to certify that I have examined the thesis entitled submitted by *D.Pravallika(R170214)* under my guidance and supervision for the partial fulfillment for the degree of Bachelor of Technology in Computer Science and Engineering during the academic session September 2022 – April 2023 from RGUKT – RKValley.

To the best of my knowledge , the results embodied in this dissertation work have not been submitted to any university or institute for the award of any degree or diploma.

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DECLARATION

I, *D.Pravallika(R170214)* hereby declare that the project report entitled "Automatic Street Light System using IoT" done by me under the guidance of Ms C.Suneetha is submitted in partial fulfillment for the degrre of Bachelor of Technology in Computer Science and Engineering during the academic session September 2022 – April 2023 at RGUKT – RK Valley.

I also declare that this project is a result of my own effort and has not been copied or imitated from any source. Citations from websites are mentioned in the references. To the best of my knowledge, the results embodied in this dissertion of work have not been submitted to any university or institute for the award of any degree or diploma.

D.Pravallika(R170214)

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ABSTRACT

The purpose of this project is to design and implement a model of automatic street light system which uses light dependent resistor and is operated through Arduino. The light will glow when there is no light in environment that is in night time and the light will go off during day time.

INTRODUCTION

Automatic Street Lighting system is considered as a vital part in most of the countries. The salient features of a street light as indirectly helped the government in reduction of crime rate and accident in the areas. Conservation of electrical energy is a major concern of the 21st century, as the rapid burning of fossil fuels have resulted in exhaustion of fossil fuel. Although street lights are a top priority, it is highly expensive, energy consuming and possess a high priority load over safety concern. This can be changed by automating the street light system which can reduce the load and manpower significantly. Automatic Street Light system is a type of automation project where manual processing is not required. This is an IoT based project where we combine Arduino, Bread board, sensors and wires along with a written code for project implementation.

BACKGROUND

The key indicators of India's energy problems include; Over 40 per cent of the households (particularly rural areas) in India still do not have electricity, about a third of our total primary energy supply to rural areas still comes from non-commercial sources (biomass, dung) and currently India faces an enormous demand supply gap of about 15-25% energy shortage. Due to shortage of the energy supply till today several villages have not facilitated with electricity and even if provided, the supply of the electricity is limited to few hours in a day and are facing serious problems due to unlimited power cuts. Though most of the streets are equipped with street lights in each and every village areas but due to the uncontrolled power failures/power cut it is becoming a serious problem for villagers to commute for irrigational field work during the night time due to unlimited power cuts which indirectly affect the crop yield of the farmer. Such trends often discourage the villagers taking up agriculture which is the backbone of our economy. It also poses a serious threat to the villagers from physical hazards such as thieves, snakebites, etc. Installation of street lights may seem a pleasant option. Hence the best option is to install light system powered street lights and moving a step ahead, we designed this "Automatic street light system".

PROBLEM STATEMENT

The main problem with the energy conservation is enormous wastage of the energy without proper usage if it is possible to cut off the wastage then we will be succeeded in conserving energy for that we tried making an IoT model to save power energy by switching on the lights only during night times.

The main objective of this project is to implement Automatic Street light System using IoT with which we can attain the following objectives

- To avoid unnecessary waste of light
- Provide efficient , automatic light system
- Longer life expectancy
- Energy saving

EXISTING SYSTEM

In recent years, we have seen street lights which are operated manually by human beings due to that there were many problems faced by people who operate and the street lights such as the operators gets short circuits due to physical damage by the environments or some other consumers, the street lights gets fused due to 24 hours light on, the street lights gets dim whenever the durability of the bulbs gets completed or some wire disconnection or the operator are not available for some reason. Therefore, the rate of accidents gets more in number. So, to reduce all these problems, we have come with new idea called Automatic Street Light System where there is not waste consumption of electricity is one of the major points and another major point is that it reduces almost eighty percent of rate of road accident. This is the benefit of automatic street light system in one hand and the other hand there is no ay demand for person to operate it and we even will have one of the great updates in our development.

PROPOSED SYSTEM

We are with the protype to fulfill the objectives of this project which includes the functioning of street lights based on the intensity of light. If it is day time the light will go off and vice versa in night times. This whole functioning is integrated by using Arduino, Light dependent resistor, Resistors, connecting wires and with a piece of programming code for the implementation.

FUNCTIONAL DESCRIPTION

The present system employs power delivery via a single phase line to the streetlight. The proposed system involves five more components to regulate the power delivery. An Light dependent resistor at the base of the street light detects presence around the street light. The data from the sensor is sent to the Arduino which forms brain of the circuit. The Arduino then commands to switch between dim and bright modes depending upon the requirement and thus controls the functioning of the street light. A battery eliminator, also powered by the single phase line, is used to supply 5V inputs to the sensors and Arduino. The design basically includes Two working modes:

OFF mode :

When there is enough natural light in the surrounding i.e. during the daytime, the entire system is switched off and the batteries are charging.

ON mode :

On the absence of light, the sensors turns on which in turn switches on the LED lights.

Programming Language Used

C language is a high-level, general-purpose programming language. It provides a straightforward, consistent, powerful interface for programming systems. That's why the C language is widely used for **developing system software, application software, and embedded systems**.

Flow Chart for the proposed model

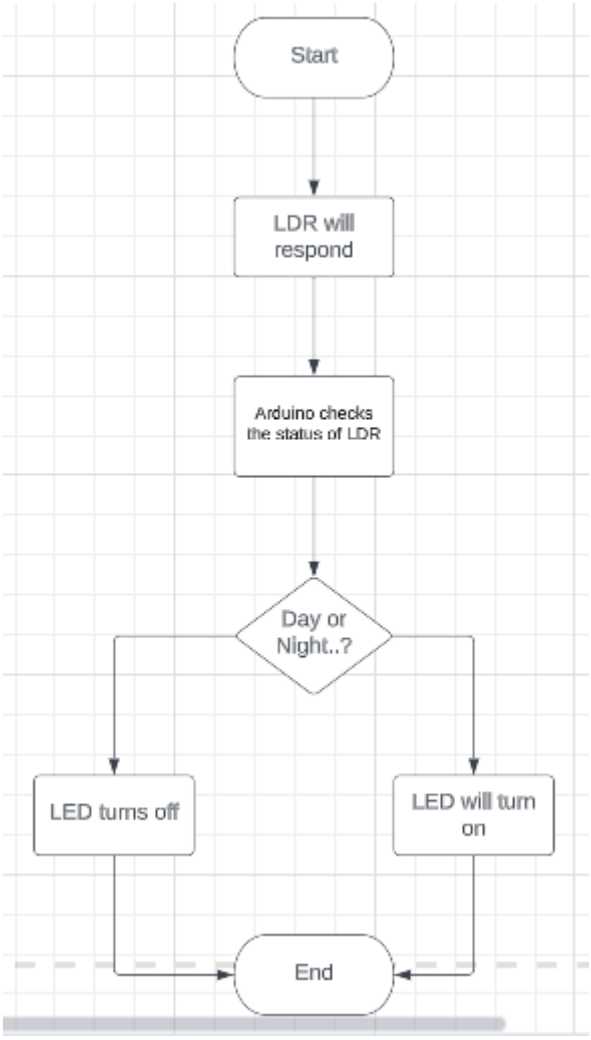

Fig.1 Flowchart for the model

HARDWARE DESCRIPTION

The below listed components are the hardware components used fro the proposed model of Automatic street light system.

ARDUINO

Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Current models feature a USB interface, 6 analog input pins, as well as 14 digital I/O pins which allows the user to attach various extension boards. The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse width modulated signals, and six analog inputs.

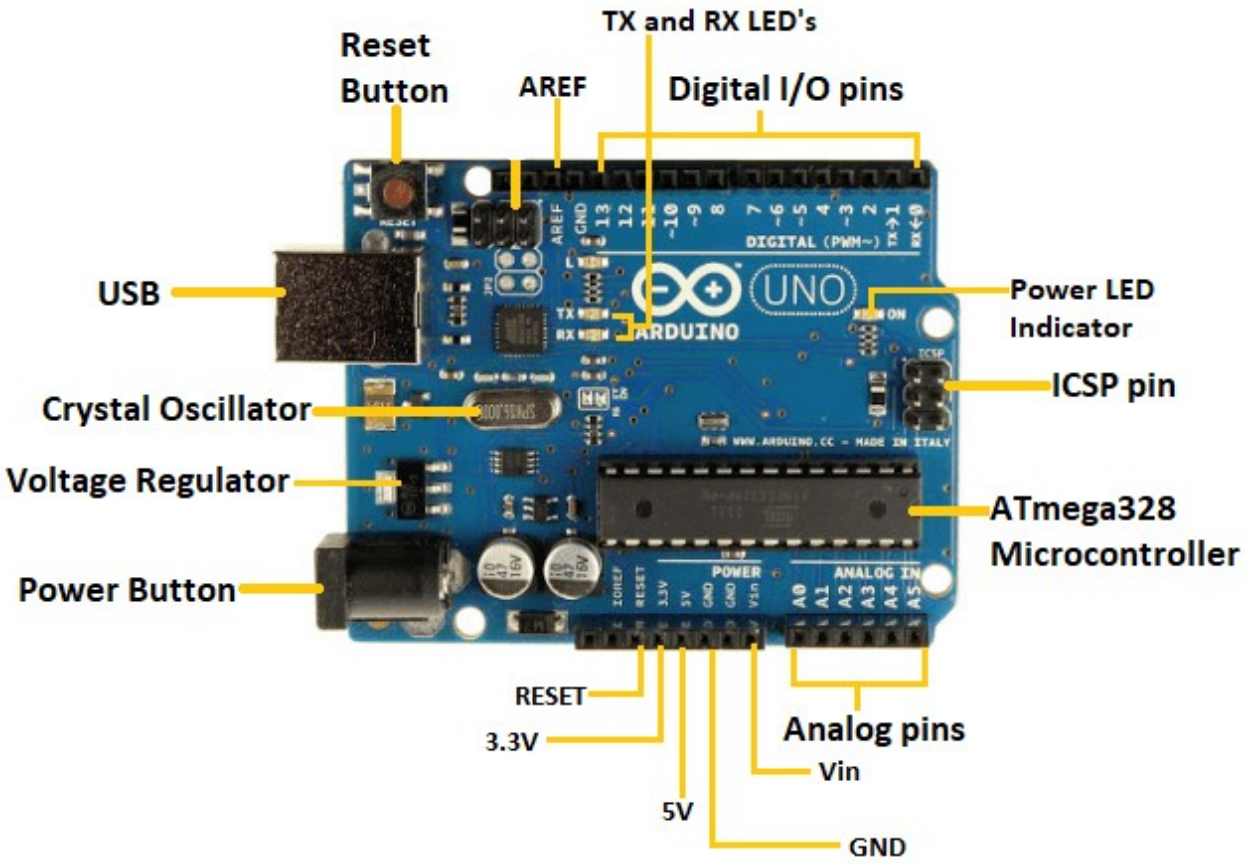

Fig.2 Arduino UNO

Arduino Specifications:

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Fig.3 Arduino Specifications

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a "sketch". Arduino programs are written in C or C++. The Arduino IDE comes with a software library called “Wiring ” from the original wiring project which makes many common input/output operations much easier.

LIGHT DEPENDENT RESISTOR

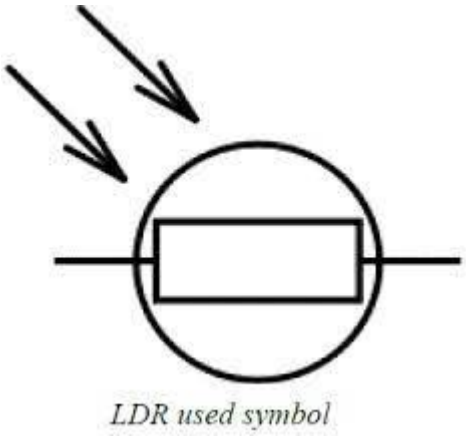

Fig.4 Light dependent resistor

Fig.5 LDR symbol

A Light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity (hence resistivity) reduces when light is absorbed by the material. LDR's are light dependent devices whose resistance decreases when light falls on them and increases in the dark. When a light dependent resistor is kept in dark, its resistance is very high. This resistance is called as dark resistance It can be as high as 1012 Ω. And if the device is allowed to absorb light its resistance will decrease drastically. If a constant voltage is applied to it and intensity of light is increased the current tarts increasing. LDR's have low cost and simple structure. They are often used as light sensors. They are used when there is a need to detect absences or presences of light like in a camera light meter. Used in street lamps , alarm clock , light intensity meters etc..,

RESISTOR

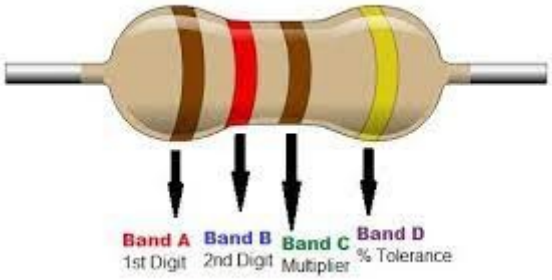

Fig.6 Resistor

A resistor is an electrical component that limits or regulates the flow of electricaln an electr current ionic circuit. Resistors can also be used to provide a specific voltagefor an active device such as a transistor.All other factors being equal, in a direct-current (DC) circuit, the current through a resistor is inversely proportional to its resistance and directly proportional to the voltage across it. This is the well-known Ohm's law In alternating-current circuits, this rule also applies as long as the resistor does not contain inductance or capacitance. Resistors can be fabricated in a variety of ways. The most common type in electronic devices and systems is the carbon-composition resistor. Fine granulated carbon (graphite) is mixed with clay and hardened. The resistance depends on the proportion of carbon to clay; the higher this ratio, the lower the resistance. Another type of resistor is made from winding Nichrome or similar wire on an insulating form. This component, called a wire wound resistor, is able to handle higher currents than a carbon-composition resistor of the same physical size. However, because the wire is wound into a coil, the component acts as an inductors as well as exhibiting resistance. This does not affect performance in DC circuits, but can have an adverse effect in AC circuits because inductance renders the device sensitive to changes in frequency.

BREAD BOARD

Fig.7 Breadboard

A breadboard, solderless breadboard, or protoboard is a construction base used to build semi-permanent prototypes of electronic circuits. Unlike a perfboard or stripboard, breadboards do not require soldering or destruction of tracks and are hence reusable. For this reason, breadboards are also popular with students and in technological education.A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units(CPUs). Compared to more permanent circuit connection methods, modern breadboards have high parasitic capacitance, relatively high resistance, and less reliable connections, which are subject to jostle and physical degradation. Signaling is limited to about 10 MHz, and not everything works properly even well below that frequency.

POWER RELAY MODULE

Fig.8 Power relay module

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. A simple relay consists of wire coil wrapped around a soft iron core, or solenoid, an iron yoke that delivers a low reluctance path for magnetic flux, a movable iron armature and one or more sets of contacts.

The movable armature is hinged to the yoke and linked to one or more set of the moving contacts. Held in place by aspring, the armature leaves a gap in the magnetic circuit when the relay is de-energized. While in this position, one of the two sets of contacts is closed while the other set remains open.When electrical current is passed through a coil, it generates a magnetic field that in turn activates the armature. This movement of the movable contacts makes or breaks a connection with the fixed contact. When the relay is de-energized, the sets of contacts that were closed, open and breaks the connection and vice versa if the contacts were open. When switching off the current to the coil, the armature is returned, by force, to its relaxed position. This force is usually provided by a spring, but gravity can also be used in certain applications. Most power relays are manufactured to operate in a quick manner.

CONNECTING WIRES

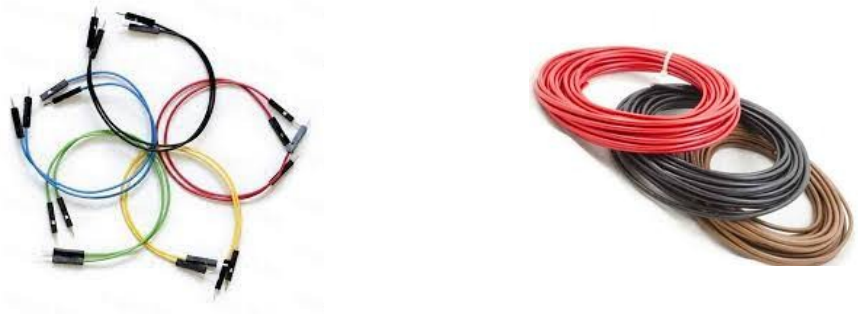

Fig.9(a)(b) Connecting wires

A wire is a flexible strand of metal, usually cylindrical. Wires are used for establishing electrical conductivity between two devices of an electrical circuit. They possess negligible resistance to the passage of current.

LED BULB

Fig.10 LED bulb

LED stands for light emitting diode. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. An electrical current passes through a microchip, which illuminates the tiny light sources we call LED's and the result is visible light.

ARDUINO IDE

Fig.10 Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - **contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus**. It connects to the Arduino hardware to upload programs and communicate with them.

The code been executed on Arduino IDE to implement the Automatic street light system:

duino Uno

LDR_realy (1).ino | LDR_realy (1).ino

```
1  int sensorPin = A0;
2  int relayPin = 8;
3
4  void setup()
5  {
6    Serial.begin(9600);
7    pinMode(sensorPin, INPUT);
8    pinMode(relayPin, OUTPUT);
9  }
10
11 void loop()
12 {
13   int sensorValue = analogRead(sensorPin);
14   if(sensorValue <=25)
15   {
16     digitalWrite(relayPin, HIGH);
17     Serial.println(sensorValue);
18    delay(100);
19   }
20
21
22
23   else
24   {
25     digitalWrite(relayPin, LOW);
26     Serial.println(sensorValue);
27   }
28 }
29
```

Fig.11 Code written in Arduino Ide to implement the prototype

INTERNET OF THINGS

Fig.12 Internet of things

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play. Projections for the impact of IoT on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IoT devices and a global economic impact of more than $11 trillion by 2025.

At the same time, however, the Internet of Things raises significant challenges that could stand in the way of realizing its potential benefits. Attention-grabbing headlines about the hacking of Internet-connected devices, surveillance concerns, and privacy fears already have captured public attention. Technical challenges remain and new policy, legal and development challenges are emerging. The term Internet of Things generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, allowing these devices to generate, exchange and consume data with minimal human intervention. There is, however, no single, universal definition.

The Internet of Things (IoT) is the network of physical objectsdevices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. In this project, we used IoT to display the status of roads and sensors on web browser using a cloud service provider named Firebase that display the output of serial monitor data of arduino on its own app in real time.

The Following are the steps we followed in making this project:

Step 1: Need to install and setup Arduino Uno IDE

Step 2: Build and write your code as per requirements in the sketch

Step 3: Configure the USB settings with Arduino IDE and prototype by installing missing drivers of USB cable

Step 4: Run your code to check for the bugs, if encounters any bugs fix them

Step 5: Upload your code to Arduino in the prototype using upload

Step 6: Then Perform the Experiment by switching on the circuit

Step 7: Results have to be noted.

APPLICATIONS

Area of Applications

- It can be used in some clocks, alarms, and other electronic devices that are dependent on sunlight.
- We can used it outside of house, corridors or industry area, which helps to save power.It can be used as a street light.
- In sea off-shore side we can use it as a dangerous sign.
- Photo resistors have many uses, most of which involve detecting the presence of light.
- Street lights use photo resistors to detect whether it is day or night and turn the light on or off accordingly.
- Photo resistors are also used in digital cameras to detect how much light camera sees and adjust the picture quality accordingly.
- Automatic lighting control
- Burglar alarm systems.
- Camera (electronic shutter).

Advantages

- ✔ Solar street light is independent of grid as a result of this operating cost is much low.
- ✔ Maintenance cost is much low compared to conventional street light.
- ✔ Intensity of LED can be controlled effectively without changes in its light color.
- ✔ Risk of accidents is very low.
- ✔ It is environmental friendly, no harmful emissions.
- ✔ Longer life compared to conventional street lights.
- ✔ Power consumption is much lower.
- ✔ LDRs are sensitive, inexpensive and readily available devices. They have good power and voltage handling capabilities, similar to those of a conventional resistor.

- ✔ They are small enough to fit into virtually any electronic device and used all around the world as a basis component in many electrical systems.
- ✔ Photo resistors convert light into electricity and are not dependent on any other force.
- ✔ Photo resistors are simply designed and are made from materials that are widely available,allowing hundreds of thousands of units to be produced each year.
- ✔ A LDR may be connected either way round and no special precautions are required when soldering.

DISADVANTAGES

- ✗ Initial investment is very high.
- ✗ Rechargeable batteries have to be replaced from time to time.
- ✗ Non-availability of sunlight during rainy and winter seasons is a problem.
- ✗ Dust accumulation on the surface of panel creates a problem.
- ✗ It is sensitive to ambient light and require careful shielding.
- ✗ Can be more complicated to align detector pairs.
- ✗ Photo resistors are only sensitive to light and no other force can power it without risking damage.
- ✗ Also, they are unable to detect low light levels and may take a few seconds to deliver a charge while their electrons build up momentum.

COST ESTIMATION

S.No	Name of the component	Quantity	Price
1	Arduino with cable	1	640
2	Bread board	1	67
3	LDR sensor	1	5
4	Relay Module	1	34
5	Connecting wires	8	45
6	LED bulb setup	1	160
7	Resistor	1	16
	Total	14	967/-

Table 1: Cost Estimation of components

RESULTS AND DISCUSSIONS

The project aims were to reduce the side effects of the current lighting system and find a solution to save power. In this project the first thing to do is to prepare the inputs and outputs of the system to control the lights. The project shown in the figure has been implemented and works as expected and will prove to be very useful.

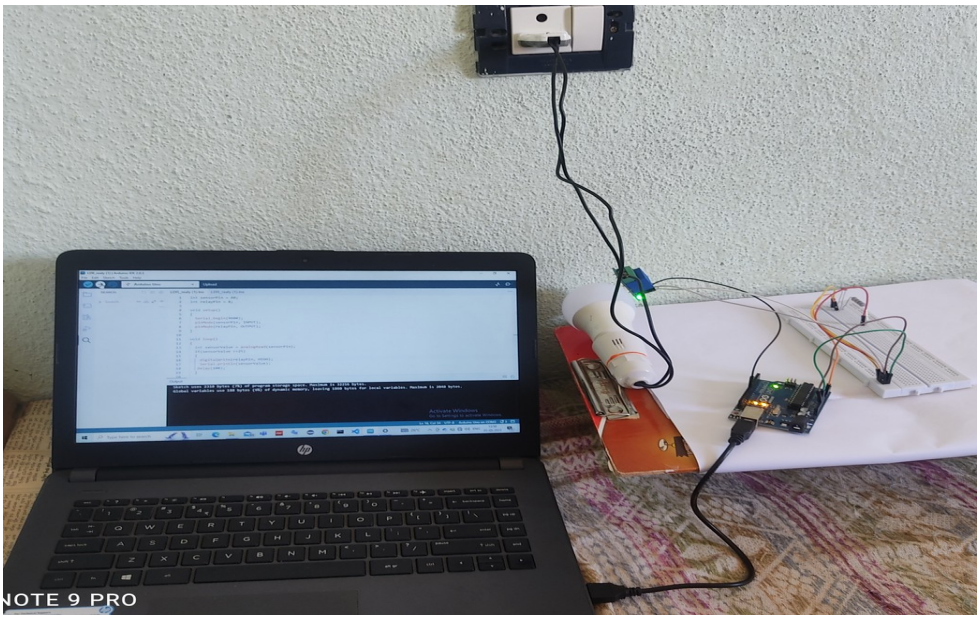

Fig.13 Initial setup of connections

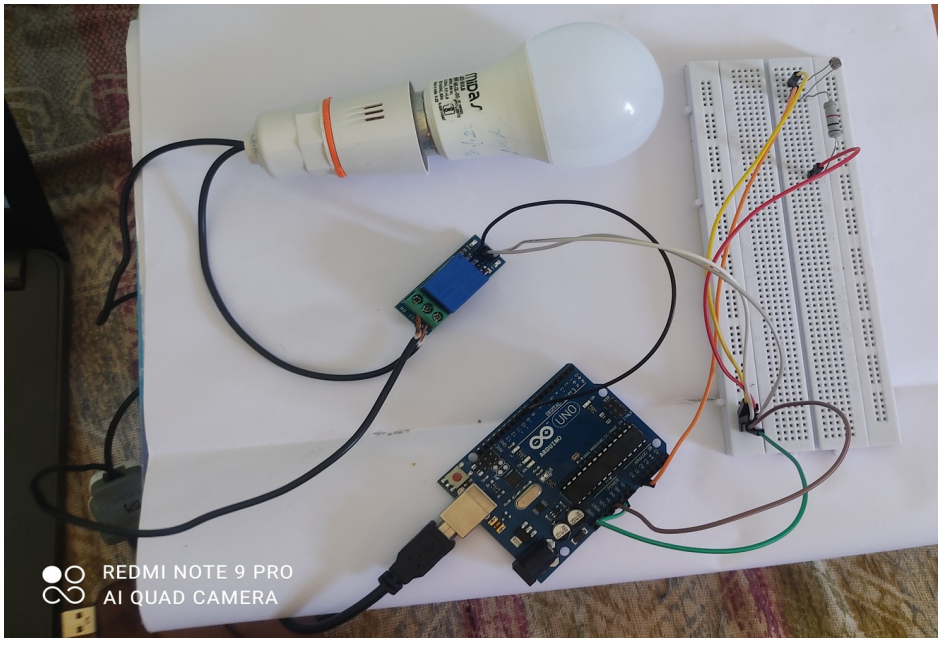

Fig.14 Connections of Prototype

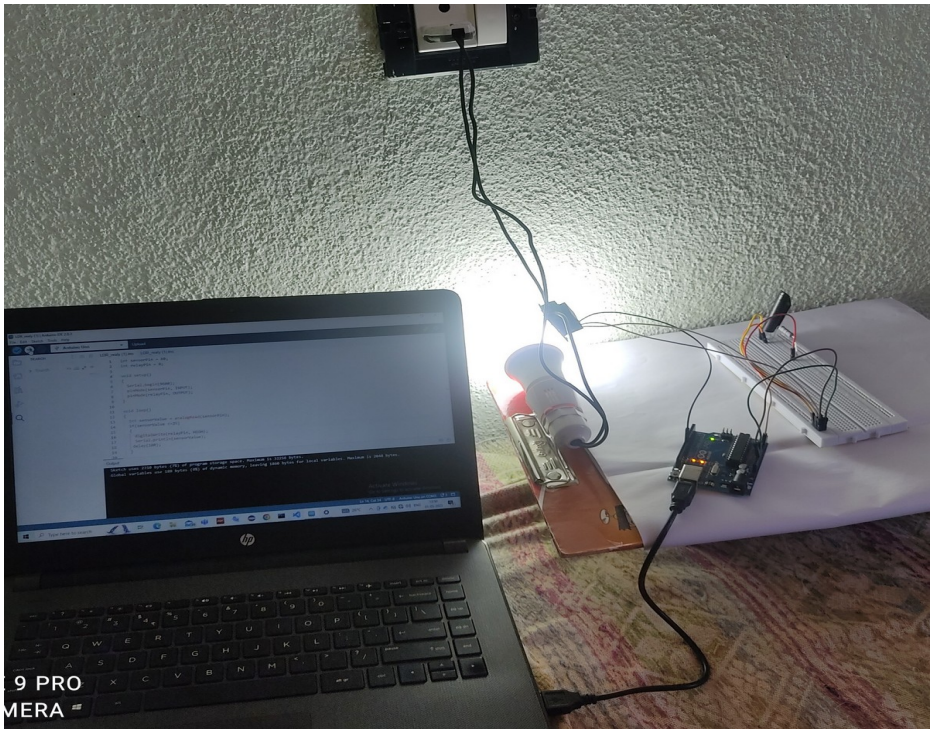

Fig.15 Result after the execution

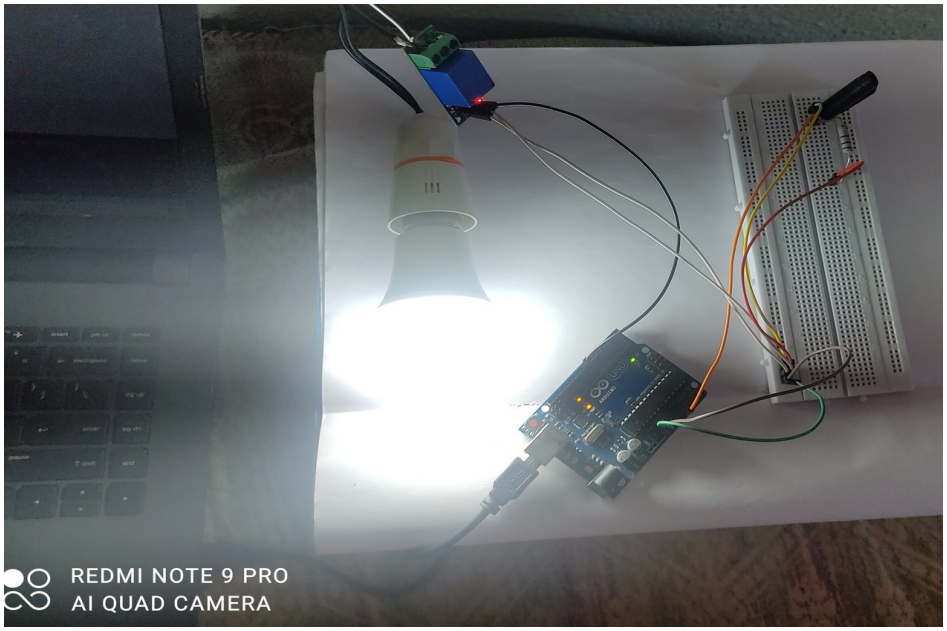

Fig.16 Detailed result after execution

CHALLENGES

- The automatic street light system requires a higher initial investment compared to the conventional street lights.
  Risk of theft of the automatic street light system is much higher since they are non-wired and much expensive
- Automatic street light may not switch on and off on the needed time that means more accidents may happen and more costs may be spent.
- These lights are mostly being affected by the weather conditions due to air, thunder,
- Configuring hardware prototype with Software arduino IDE
- Fixing the range of LDR.

LIMITATIONS

- Delay in displaying the data on web browser.
- Variation Input voltage.
- The sensors used are not suitable for real life setup.
- Power LED should be of greater voltage for actual setup.

CONCLUSION

IT and controlled system manufacturers are seizing the opportunity of having new mobile hardware device as the “Internet of Things” being to a scale of. As we know, the number of devices is increasing continuously more and more and more automation will be required for both the IT and for the manufacturing companies. As every manufacturing companies are moving towards the IoT sector. Due to this the demand are rapidly growing. In this mean time, we have introduced this project called as automatic street light system. It helps our country to increase their infrastructure with the development of emerging technologies. Many countries are facing the problem of the street light so this can solve that problem even it has many other benefits such as it is cost efficiency, reduce the power consumption as it is automatic street light system. So, in daylight it will turn off the light and daylight also it will save the energy. In the night it will start to litup. This is possible only when we take the help of Internet of Things (IoT). So, these things will help the nation and the world to save the electrical energy for the better growth and for the future planning. This system is very efficient energy saver and also user friendly as it can work on any kind of weather and the best part of the project is the automatic switching of the light without much human effort and can be used in very large scale.

FUTURE SCOPE

This prototype can be implemented in physical (Real) world with some more extensions and updates which will help in saving the power energy and allows us for the efficient use of power.

We can implement this prototype in our University also in our Hostels to conserve energy. It not only to save power but also to reduce the accident rate and crime rate.

REFERENCES

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