**IOT Based Intelligent Street**

**Lighting System for Smart City**

**Project By –**

**Anant Raj (87)**

**Shreyansh Gairola (76)**

**Submitted to –**

**Dr. Sachin Sharma Sir**

**ABSTRACT**

This project aims for designing and executing the advanced development in embedded systems for energy saving of street lights. Currently we have a manual system where the street lights will be switched ON in the evening before the sunsets and they are switched OFF in the next day morning after there is sufficient light on the outside. But the actual timing for these lights to be switched ON is when there is absolute darkness. With this, the power will be wasted up to some extent. This project gives solution for electrical power wastage. Also, the manual operation of the lighting system is completely eliminated. The proposed system provides a solution for energy saving. This is achieved by sensing and approaching a vehicle using an IR transmitter and IR Receiver couple. Upon sensing the movement, the sensor transmits the data to the microcontroller which furthermore the Light to switch ON. Similarly, as soon as the vehicle or an obstacle goes away the Light gets switched OFF as the sensor sense any object at the same time the status (ON/OFF) of the street light can be accessed from anywhere and anytime through internet. This project is implemented with smart embedded system which controls the street lights based on detection of vehicles or any other obstacles on the street. Whenever the obstacle is detected on the street within the specified time the light will get automatically ON/OFF according to the obstacle detection and the same information can be accessed through internet. The real time information of the street light (ON/OFF Status) can be accessed from anytime, anywhere through internet.

**INTRODUCTION**

The street lighting is one of the largest energy expenses for a city. An intelligent street lighting system can cut municipal street lighting costs as much as 50% - 70%. An intelligent street lighting system is a system that adjusts light output based on usage and occupancy, i.e., automating classification of pedestrian versus cyclist, versus automotive. An intelligent street light management proposes the installation of the wireless based system to remotely track and control

the actual energy consumption of the street lights and take appropriate energy consumption reduction measures through

power conditioning and control

.

The street light controller should be installed on the pole lights which consist of microcontroller along with various

sensor and wireless module. The street light controller installed on the street light pole will control LED street lighting depending on traffic flow, communicate data between each street light. The data from the street light controller can be transferred to base station using wireless technology to monitor the system. The mode of operation of the system

can be conducted using auto mode and manual mode. The control system will switch on-off the lights at required

timings and can also vary the intensity of the street light according to requirement.

**PROBLEM DEFINATION**

We have seen in the number of cities where the street lights are the one of the huge energy expenses for a city.

Currently we have manual system where the light will be switched ON in the evening before the sunset and they are

switched OFF next day morning after there is sufficient light outside. So, there is lot of energy waste between ON and

OFF timing.

**Disadvantages of Existing System**

 Manual Switching off/on of Street Lights.

 More Energy Consumption.

 High expense.

 More manpower.

**Advantages of the Proposed System**

 Automatic Switching of Street lights.

 Maintenance Cost Reduction.

 Reduction in CO₂ emission.

 Reduction of light pollution.

 Wireless Communication.

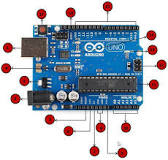
 Energy Saving.

 Reduction of manpower.

**MATERIAL REQUIRED**

1. **The Arduino Uno**

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button.



1. **IR Sensor**

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, but shorter than microwaves. The infrared region is approximately demarcated from 0.75 to 1000μm. IR (infrared) sensors detect infrared light. The IR light is transformed into an electric current, and this is detected by a voltage or amperage detector.



1. **LED**

A light-emitting diode (**LED**) is a semiconductor device that emits visible light when an electric current pass through it. The light is not particularly bright, but in most **LEDs, it** is monochromatic, occurring at a single wavelength.

1. **LDR**

A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function of the incident

electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo

conductive cells or simply photocells. They are made up of semiconductor materials having high resistance.

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.



1. **Breadboard**

A **breadboard** is a construction base for [prototyping](https://en.wikipedia.org/wiki/Prototype) of [electronics](https://en.wikipedia.org/wiki/Electronic_circuit). Originally it was literally a bread board, a polished piece of wood used for slicing bread. In the 1970s the **solderless breadboard** (a.k.a. **plugboard**, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these.

Because the solderless breadboard does not require [soldering](https://en.wikipedia.org/wiki/Soldering), it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solderless breadboards are also popular with students and in technological education. Older breadboard types did not have this property. A [stripboard](https://en.wikipedia.org/wiki/Stripboard) ([Veroboard](https://en.wikipedia.org/wiki/Veroboard)) and similar prototyping [printed circuit boards](https://en.wikipedia.org/wiki/Printed_circuit_board), which are used to build semi-permanent soldered prototypes or one-offs, cannot easily be reused. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete [central processing units](https://en.wikipedia.org/wiki/Central_processing_unit) (CPUs).

1. **Wi-Fi Module**

Espressif Systems ‟Smart Connectivity Platform (ESCP) of high performance wireless SOCs, for mobile

platform designers, provides unsurpassed ability to embed Wi-Fi capabilities within other systems, at the lowest cost with the greatest functionality. ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface or the CPU AHB bridge interface.

**WORKING PRINCIPLE**

The system architecture of the intelligent street light system consists of IR sensors, LDR,The Arduino Uno, UART and WIFI Module. 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. The vehicle which passes by the street light is detected by IR sensor. Relay are used as a switch to switch on/off the street light bulb. A UART (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached street light system.

**RESULT AND DISCUSSION**

The project aims were to reduce the side effects of the current street 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 of

the street. Many prototypes been implemented and works as expected and will prove to be very useful and will fulfil all the present constraints if implemented on a large scale**.**

**CONCLUSION AND FUTURE WORK**

This project “IoT Based Smart Intelligent Lighting System for Smart City “is a cost effective, practical, ecofriendly

and the safest way to save energy and this system the light status information can be accessed from

anytime and anywhere. It clearly tackles the two problems that world is facing today, saving of energy and also

disposal of incandescent lamps, very efficiently. Initial cost and maintenance can be the draw backs of this project.

With the advances in technology and good resource planning the cost of the project can be cut down and also with

the use of good equipment the maintenance can also be reduced in terms of periodic checks. The LEDs have long

life, emit cool light, donor have any toxic material and can be used for fast switching. For these reasons our project

presents far more advantages which can over shadow the present limitations. Keeping in view the long term

benefits and the initial cost would never be a problem as the investment return time is very less. The project has

scope in various other applications like for providing lighting in industries, campuses and parking lots of huge

shopping malls. This can also be used for surveillance in corporate campuses and industries.