



# “A Study on Smart Street Lighting System using Internet of Things- iot”

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## Abstract:

Today's cities consume more than 70 per cent of the world's energy supply and will increase over time. Lighting accounts 19 per cent of the world's total electricity consumption. Almost two thirds of that energy is used for lighting commercial and buildings cities, this project aims for monitoring and executing the advanced development in embedded systems for energy saving of street lights of the smart city. Currently we have a manual system where the street lights will be switched ON in the evening and they are switched OFF in the next morning after there is sufficient light on the outside. But the actual timing for these lights to be switched ON when there is absolute darkness. With this, the power will be wasted up to little extent. In this project gives output for electrical power wastage. Also here no human intervention operation of the lighting system is completely eliminated. The proposed system provides a solution for monitoring the Street light. In this system working and sensing and approaching a monitoring room using an IR transmitter and IR Receiver. Based on sensing movement the sensor transmit the data to the microcontroller which furthermore the Light to switch either ON/OFF.

**KEYWORDS:** PIC Microcontroller, IR Sensor, Current Sensor, LDR through internet.

## I. INTRODUCTION:-

The Smart street-lighting uses wireless technologies to control and monitor the actual amount of energy consumed by these street-lights. This data is then used to initiate the suitable measures to reduce energy consumption through power conditioning. The 'smartness' of the street-lights is derived from a micro-controller and the sensors coupled with a wireless module. This entire unit is called the controller. This, when installed on the street-light pole, would communicate data between street-lights and thus control LED street lighting depending on traffic flow. Data generated from each street-light, is then passed on to the base-station via wireless means, thus enabling a real-time monitoring of the system in a broader view. The mode of operation can be chosen as either manual or auto mode. The control system can be programmed to turn-off lights as per a predetermined schedule. This system can also be programmed to vary the intensity of lighting to suit predetermined situations. Light Dependent Resistors (LDR) sense light and it automatically switches OFF lights. This results in huge energy savings and it avoids wastage of energy by glowing street lights in unwanted areas. The whole system can be operated using solar energy with a battery backup. Sensors using Passive Infra-Red (PIR) technology are used to sense the presence of people and the light intensity of an area. This data is then transmitted wirelessly to the controller, which in-turn switches ON/OFF the streetlight or enables dimming or brightening of the area, depending on the presence or absence of people. This is highly effective in areas experiencing low traffic at sometimes of the night.

## II. RELEATED WORK

In the paper describes about the circuit that switches the street light ON detecting the vehicle movement and remains OFF after the fixed time. In this system the street light automatically ON/OFF during the night and the day time. In this system the GSM technology has been used in which the manual switching OFF/ON of the street light using GSM. Here the system controls the intensity of the street light by dimming and brightness the intensity on the detection of any object using PIR sensor. In this paper is focused on the necessity of the automated street light system and the peculiar way of implementation with embedded system tools. In this system the piezo electric sensor is used to detect the movement of the object on the street instead of using IR sensor. A microcontroller msp430 as a brain to control the process involved. This paper gives solution to the controlling the intensity of the light considering the movement on the road. In this project is designed to detect the vehicle movement on the highways to switch ON only a block of the streetlight ahead of it and switch OFF the trailing light to save energy. During the night all the lights on the highways remain ON for the vehicle, but lot of energy is wasted when there is no vehicle movement on the highways. In this paper two kind of sensors has been used which are light sensor, photo electric sensor. In Automatic Street Light Control System is not only easiest but also the powerful technique. Relay uses as automatic switch in this system. It releases the manual work at most up to 100% . As soon as the sunlight goes under the visible region of our eyes this system automatically switches ON lights. Light Dependent Resistor (LDR) is a type of sensor which actually does this work and senses the light as our eyes does. As soon as the sunlight comes, visible to

our eyes it automatically switches OFF lights. Such type of system is also useful for reducing energy consumption. In this system the system with LDR sensor, PIR sensor, Zigbee is used to intimate the status of humans use, light intensity and street light ON/OFF status to the EB section to avoid wastage of energy by glowing street lights in Unwanted areas. The whole system is operated by using artificial energy source called solar and with battery backup. The PIR and LDR sensors sense the persons and light intensity of a particular place and transmits the data in wireless to the EB section with Zigbee. Depend upon the data received the controller will turn ON/OFF the street light in wireless communication. This system is appropriate for street lighting in remote urban and rural areas where the traffic is low at times.

### **III.PROBLEM DEFINATION**

We have analyzed in Karnataka where the street lights is the one of the huge energy expense 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**

1. Manual Switching off/on of Street Lights
2. More Energy Consumption.
3. High expense.
4. More manpower.

#### **Advantages of the Proposed System**

1. Automatic Switching of Street lights
2. Maintenance Cost Reduction
3. Reduction in CO<sub>2</sub> emission
4. Reduction of light pollution.
5. Energy Saving.
6. Reduction of manpower. Technology

### **IV. METHODOLOGY**

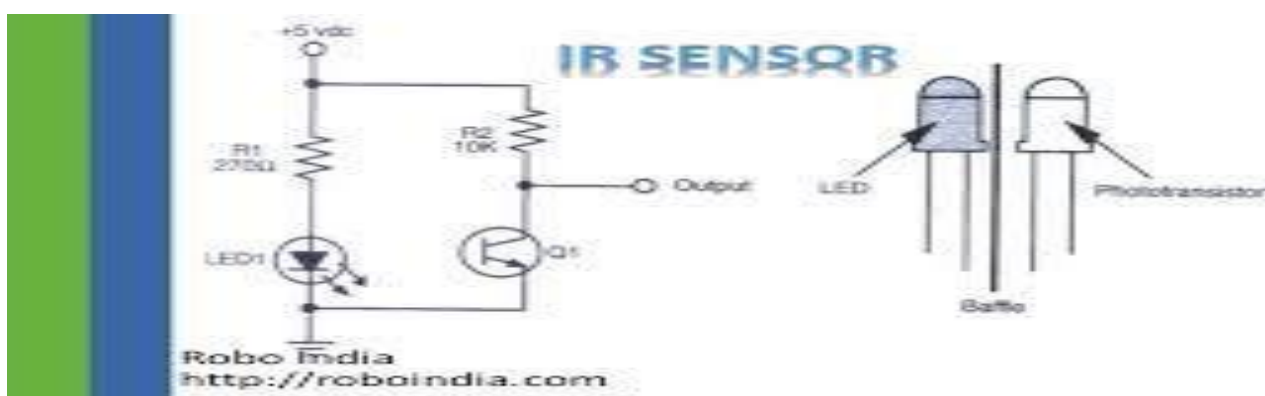
- a) **MPLAB IDE:** MPLAB IDE is a free, integrated toolset for the development of embedded applications on Microchip's PIC and ds PIC microcontrollers. It is called an Integrated Development Environment, or IDE, because it provides a single integrated environment to develop code for embedded microcontrollers. MPLAB IDE runs as a 32-bit application on MS Windows, is easy to use and includes a host of free software components for fast application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tools is a snap, and upgrading from the free software

simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools.

- b) **Arduino IDE:** The Arduino Software (IDE) is an open source software and it makes easy to the code and upload it to the board. I turns on the different plant from Windows, MAC OS, Linux. The environment is written in Java and before running the IDE Java software to be installed on the machine this software can be used with any Arduino board.
- c) **OrCAD:-** OrCAD is a blessing when it comes to PCB design and the subsequent manufacture. This utility helps from designing the schematic to implementing the routes of the electrical connections and further mounting diagrams of the components. In general it offers a total solution for core design schematic and PCB layout. The Capture program includes a project wizard that provides an easy method for creating a project, complete with library and simulation resources. Creating a project does not create a design within the project. A new design inherits characteristics from the settings in the design template dialog box, so we should always check those settings before we create a design. After creating a schematic folder we can move existing pages into it and we can create new pages in it.

## I. V. 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 1000  $\mu\text{m}$ . 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.



**Fig5.3:** Working of IR Sensor

### vi. Relays

A relay is usually an electromechanical device that is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. Relays are like remote control switches and are used in many applications because of their relative simplicity, long life, and proven high reliability. Although relays are generally associated with electrical circuitry, there are many other types,

such as pneumatic and hydraulic. Input may be electrical and output directly mechanical, or vice versa. Relays are mainly made for two basic operations. One is low voltage application and the other is high voltage. For low voltage applications, more preference will be given to reduce the noise of the whole circuit. For high voltage applications, they are mainly designed to reduce a phenomenon called arcing

### **vii. Wi-Fi Module**

Express if 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.

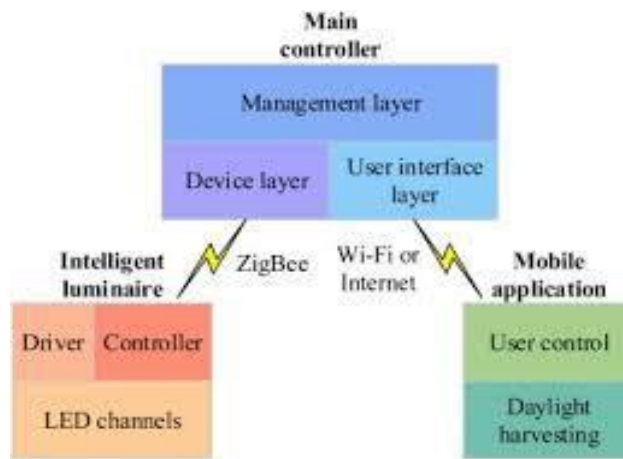
## **VI. WORKING PRINCIPLE**

The system architecture of the intelligent street light system consists of IR sensors, LDR, PIC16F877A microcontroller, Relay, UART and Wi-Fi 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

## **VII. 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. The prototype as shown in Fig .has been implemented and works as expected and will prove to be very useful and will fulfill all the present constraints if implemented on a large scale.



**Fig 7.1:** Prototype of Smart Intelligent Lighting System

Here the above Fig7.1 shows that the complete working prototype of the IoT Based smart intelligent lighting system for

smart city which includes LDR, IR Sensor, Current Sensor, PIC microcontroller, Intel Galileo Gen2 Board, Wi-Fi

The webpage displaying the real time information of the status of the light on the webpage. It displaying the status of the Light is OFF on the webpage. Here the real time information can be accessed from any time anywhere through internet and the shows that the prototype of the system with obstacle detection on the street through IR sensor where the IR Sensor detects the obstacle and switch ON the Lights. Status of the Light is ON after obstacle detection. Webpage displaying the status of Light. The smart intelligent light is getting automatically switched on after detection of the obstacle on the street as well checking the LDR status the webpage which displaying the real time data of the smart intelligent light on the webpage through internet.

## **VIII. CONCLUSION**

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 for many time 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.

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