

SMART STREET LIGHT BASED ON ARDUINO

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Abstract – Automation plays an increasingly very important role in the world economy and in daily life. Automatic systems are being preferred over any kind of manual system. We can also call it an “SMART STREET LIGHT SENSING”. Intelligent light sensing refers to public street lighting that adapts to movement by pedestrians, cyclists and cars. Intelligent street lighting, also referred to as adaptive street lighting, dims when no activity is detected, but brightens when movement is detected. This type of lighting is different from traditional, stationary and illumination, or dimmable street lighting that dims at pre-determined times. The research work shows automatic control of streetlights as a result of which power is saved to some extent. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist the users with muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Basically, street lighting is one of the important parts. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density.

Key Words: Street Light, Light Dependent Resistor, Transistor

1. INTRODUCTION

Street Automation plays an increasingly very important role in the world economy and in daily life. Automatic systems are being preferred over any kind of manual system. We can also call it an “SMART STREET LIGHT SENSING”. Intelligent light sensing refers to public street lighting that adapts to movement by pedestrians, cyclists and cars. Intelligent street lighting, also referred to as adaptive street lighting, dims when no activity is detected, but brightens when movement is detected. This type of lighting is different from traditional, stationary and illumination, or dimmable street lighting that dims at pre-determined times. The research work shows automatic control of streetlights as a result of which power is saved

to some extent. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist the users with muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Basically, street lighting is one of the important parts. Therefore, the 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 need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of 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 optical control method done using high pressure sodium lamp in their system.

2. OBJECTIVE

This project is about Smart Street light, street light will turn on while vehicle is passing through it. Here we are using 4 IR sensors that senses the position of the vehicle, each IR sensor controls 3 LED's. When vehicle passes by a particular IR sensor it senses the position of vehicle and gives its signal to the Arduino board and it will turn on the LED's.

3. PROBLEM STATEMENT

In the existing system, the street lights are manually switched ON and OFF so we need man power to maintain these, we have proposed a system in which we don't require manpower and manually controlling the street lights we have placed an LDR which automatically switches ON and OFF depending on the sunlight.

4. BRIEF DESCRIPTION OF THE PROJECT

4.1. PROPOSED SYSTEM

The present framework is similar to, the road lights will be exchanged on in the night prior to the sun sets and they are exchanged off the following day morning after there are adequate lights on the streets. The hindrance of the framework is that we require manual operation of the road light which needs labour In sunny and rainy days, on and off time differ discernibly which is one of the significant hindrances of the present street lights systems' Conventional street lighting systems are online most of the day without purpose' The consequence is that a large amount of power is wasted meaninglessly' With the wide accessibility of adaptable lighting innovation like light transmitting diode (LED) lights and all over accessible remote web association, quick responding, dependable working, and power moderating street lighting frameworks get to be reality. The reason for this work is to portray the Smart street Lighting framework, a first way to deal with perform the interest for adaptable smart lighting frameworks. The goal of this undertaking is to plan an automated lighting framework which focuses on the saving of power; to construct a vitally energy efficient smart lighting framework with integrated sensors and controllers; to outline a smart lighting framework with particular methodology plan, which makes the framework adaptability and expandability and configuration a smart lighting framework which similarity and versatility with other commercial products and mechanized automated system, which may incorporate more than lighting frameworks. The Automation of the street lighting in India is not up to the mark. Any body needs to switch on the light manually and if the person forgets to switch ON the Street Light it would be a big problem for the pedestrians as well as the vehicles on the road. Our proposal helps to identify the movements of the vehicle or for that matter any obstacle on the road. We used 2 IR sensors 2 LED's 1 LDR sensor which play a key role in the switching ON and OFF of the lamps. The Arduino UNO Microcontroller acts as an interface while converting the Analog form of input into digital form and makes the lamp glow. The code is dumped into the Arduino by using a Arduino cable by means of a computer.

4.2. METHODOLOGY

Initially we need to make the connections according to the circuit diagram. The code is very important in making the whole equipment work. Recent days, Smart Street Light System is major component of a smart city Infrastructure. The important function is to lighting the city streets using Sensor's to save the current or power energy. In existing system using normal street lamps, It takes more current and expensive so we must use LED lamps to save the current and low amount of power is required. Using IoT type system is all over the world. It is used to be watch all kind of areas in the cities.

The entire project is divided into five major sections listed below:

- MICROCONTROLLER
- INFRARED SENSORS
- LIGHT DEPENDENT RESISTANCE
- LIGHT EMITTING DIODE
- RESISTOR

The above sections are briefly described as follows:

MICROCONTROLLER

Arduino UNO is the microcontroller used in this project, it is based on ATmega328. It is open source electronic platform based on easy to use software and hardware. It reads input-light on sensor, finger on a button, etc. it has 14 input/output and 6 analog pins. The software used in this microcontroller is ARDUINO IDE.



Fig-1: MICROCONTROLLER

INFRARED SENSORS

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 intervention or interruption. These type of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor, an IR sensor is simply a device which detects IR radiation falling on it.



Fig-2: IR SENSOR

LIGHT DEPENDENT RESISTANCE

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.



Fig-3: LIGHT DEPENDENT RESISTANCE

FEATURES

1. High reliability.
2. Light Weight.
3. Wide Spectral Response.
4. Wide ambient Temperature range

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 and integrated optical components may be used to shape the radiation pattern.

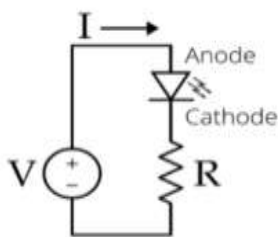


Fig-4: LIGHT EMITTING DIODE

RESISTOR

Resistor 10k Ohm 1/6th Watt PTH. Commonly used in PCBs and perf boards, these 10K resistors make excellent pull-ups, pulldowns, and current limiters.



E12 Range, Resistor 10KΩ, 5% Tolerance, Carbon Film

Fig-5: 10K OHM RESISTOR

4.3. IMPLEMENTATION OF PROJECT

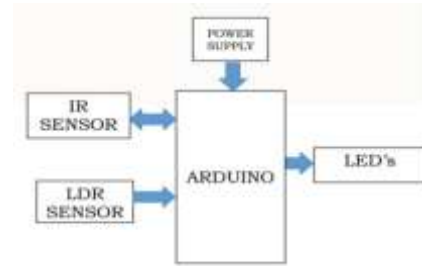


Fig-6: BLOCK DIAGRAM OF IMPLEMENTED PROJECT

The working procedure of the Smart street light using IR sensors is explained below. The following are the different steps included in building a Smart street light. Output of the LDR pin is connected to A5 (Analog) port of Arduino Uno board. Connect all output of the IR sensors to port numbers A0 and A1 respectively (Analog) which is the input signal to the Arduino board. Connect the ground of all the IR sensors to GND port. The output signals from LED are connected to port number 2 and 3 respectively. Again connect all the negative terminals of LED's to GND port. Power is passed to the Arduino (7-12V).

CONNECTION DIAGRAM

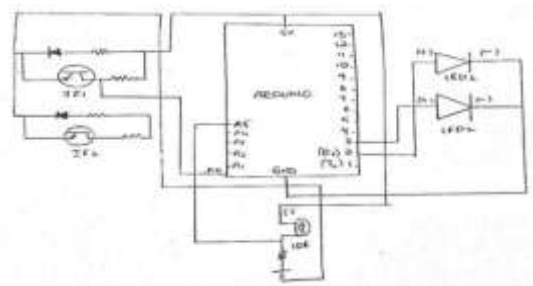


Fig-7: SCHEMATIC DIAGRAM

5. RESULT

LDR is hidden by finger tip, to create natural dark condition. Due to no light, the resistance of LDR becomes very low, allowing current to pass through the LDR circuit. Thus, LEDs glow dimly, figure shows that first IR sensor detects the object and glows the corresponding LED and the successive LED with full intensity keeping rest of LEDs lit dimly.

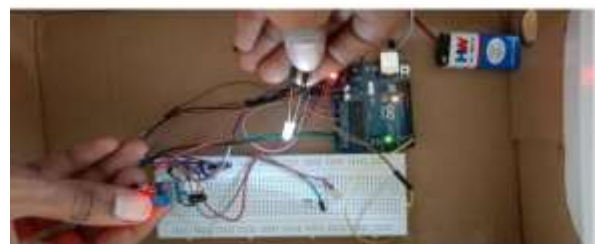


Fig-8: INITIAL CONDITION

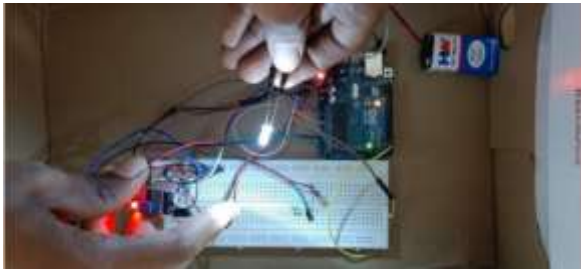


Fig-9: IN PRESENCE OF AN OBSTACLE

6. CONCLUSION

In the above mentioned system we have proposed a smart street light which is Arduino based. The proposed system is appropriate for street lighting in remote as well as urban areas. The proposed system reduces power consumption and human effort.

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I am pursuing B. Tech in Information Technology from BV Raju Institute of Technology Affiliated to JNTUH. I have written the code in Embedded C along with Mohammad Ozair Khan for this project I have immense passion towards technology and looking forward to pursue my MSc in Data Science. I have done Internship in developing a Home Automation Device and have many experiences.