Street Light That Glows on Detecting Vehicle Movement

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Abstract - A large amount of electricity of many towns and cities is being expended in the all night street lighting systems. Street lighting systems are indeed very necessary, but in most of the areas the traffic density is very low during the late hours and midnight, there would be a huge waste of electricity resulting from such places if the streetlights are left unused. The main objective of this paper is to save energy, and by doing so we would be able to lighten few more houses. In this paper we are focus to reduce the wastage of unused electricity by using automatic street light based on vehicle detection. This system uses a microcontroller (Arduino) to switch on the streetlights depending on the vehicle or object detection.Also, since the lights don't stay on the whole night, the lifetime of the streetlights gets enhanced

Index Terms – Arduino Uno, RF Transmitter and Receiver, Energy Saving.

1. INTRODUCTION

Automation plays an important role in the world and in our day today lives. Automation systems are being preferred over manual system because it reduces the usage of energy and also conserves energy. Especially in cites streetlights are one of the serious power consuming factors and also one the largest energy expenses for a city, accounting above 35-45% of cost for a municipality utility budget. The manual based street light control involve many disadvantages which includes the street lights being remained on when there is a visible spectrum of light, manual switching operation, high power consumption, less reliable and manual hectic operation due to change in season and climate. An intelligent lighting control system can cut municipality street lighting costs as much as to 70% [1]. The main aim of automated street lights is to reduce the power

Consumption when there are no vehicle movements on the road. The street light will turned ON when there are vehicles on the road otherwise the lights will be OFF. Consequently the system provides a solution for energy saving. This paper deals with Automated Street Light Control System based on Vehicle Detection using Arduino board. Power saving and money saving are the main advantages through this work.

2. RELATED WORK

Presently the availability of power sources like coal, biomass, and hydro electric plants is limited thus the awareness to use adequate power from the mentioned sources has become common. Wastage of power from street lights is one of the noticeable power loss, efforts to use optimum power using automation lead to many new methods of power and money saving. 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.

C.Bhuvaneshwari et al [2] have analyzed the street light with auto tracking system by which one can increase the conversion efficiency of the solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun time to time and gives the output to the amplifier based on light density of the sun.

S.Suganya et al [3] and W. Yue [4] have proposed about Street Light Glow on detecting vehicle movement using sensor is a system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity.

M.Abhishek et al [5] have implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting.

K.Santha et al [6] have surveyed on Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness.

Srikanth et al [7] proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed with the help of ZigBee modules that helps in detecting the faulty lights and control the light.

Steve Chadwick [8] reports on the two installation case studied in Scotland and Wales and explain the details and benefits of the technology. The system was called as MINOS that had a track record of over 100,000 units installed and working successfully.

RadhiPriyasree [9] explains a system to reduce the power consumption of street lights by avoiding inefficient lighting

which wastes significant financial resources each year. This is done by dimming the lights during less traffic hours.

From this literature survey, the methods each one has implemented and used is simple and easy to understand.

These papers are focused to further implement a much efficient system and make things automated.

3. PORPOSED MODELLING

This system as shown in figure 1 representing the block diagram, it depends on the detection of vehicle movement using IR sensors. The IR sensor is a proximity sensor which consists of an emitter LED and a receiver LED embedded in it. IR radiation is constantly emitted by the emitter LED. When this radiation is blocked by some metal or reflecting object at a distance, the IR radiation gets reflected by the object can be detected by observing the receiver LED. This principle can be used to detect vehicles on pedestrians or the on street roads and accordingly switch on the successive streetlights, as long as the vehicle blocks the IR sensor radiation, fixed to the street light near to the ground.

BLOCK DIAGRAM

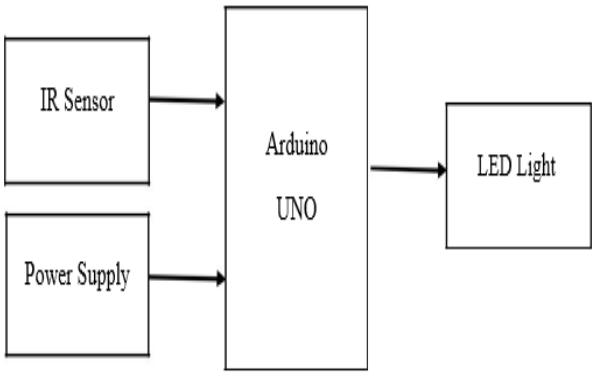

FIGURE 1: Block diagram of automatic street light control system

3.1 ARDUINO UNO R3

Arduino Uno R3 as shown in figure 2. The specifications are ATmega328 microcontroller, operating voltage at 5v, input voltage 7 to 12v, input voltage limit up to 20v, digital I/O pins 14, analog pins 6, DC current 40mA, flash memory 32KB including 0.5KB used by boot loader. SRAM of 2KB, EEPROM of 1KB and clock speed of 16 MHz some of the Features of Arduino UNO are power: can be USB connection or external power supply, with 7 to 12 volts recommended. The Arduino UNO provides power pins for other devices, the variants are 5V 3.3V and Vin I/O, REF pin for optional power [9].

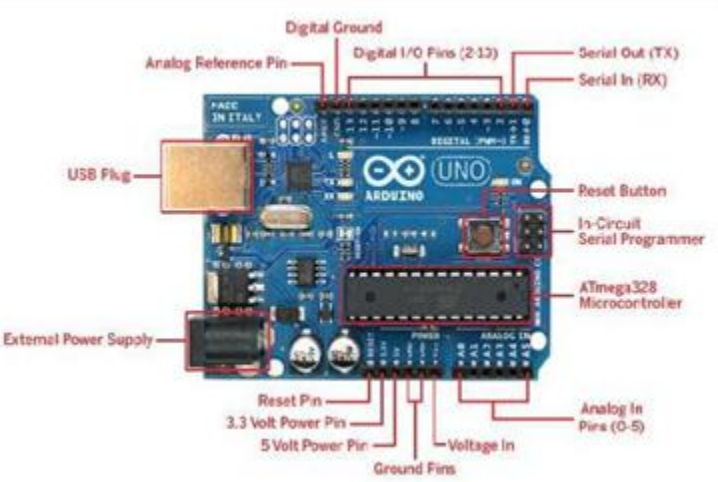

FIGURE 2 Arduino Uno Board

3.2 INFRARED SENSOR

Figure 3.1 and 3.2 shown as the IR sensor and working principle of sensor. 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. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode. The resistances and these output voltages, change in proportion to the magnitude of the IR light received [10][12][13].

FIGURE 3.1 IR Sensor principal of IR sensor

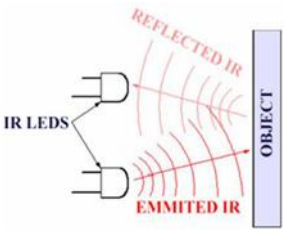

FIGURE 3.2 working

3.3 WORKING PROCEDURE

Figure 4 shows the Automatic Street Light Control Based on Vehicle Detection Using Arduino uno. The Circuit diagram of the IR sensors are connected to the Arduino port pin number 2 to 5 respectively which is the input signal to the Arduino board and connect the ground of all the IR sensors to GND port. All the positive terminals of the LEDs, depicting the streetlights in the model, are given as the outputs of the Arduino signals, are

connected to port pin number 6 to 13. Again connect the ground of all the LED's to GND port as per the circuit diagram. It works in accordance with the crossing the vehicle.

Initially the IR sensor is in LOW. When the vehicle moves past an IR sensor becomes HIGH, the positive terminals of the two or three LEDs, as per requirement, are made high through the Arduino output ports and hence they glow. As soon as the vehicle crosses one streetlight, the LEDs again switch off. And when the vehicle goes by the next IRsensor,the corresponding LEDs glow. This process continues. Since the streetlights (LEDs)are not switched on continuously ,lot of electricity will be saved.

FIGURE 4: The Automatic Street Light Control Based on Vehicle Detection Using Arduino.

3.4 SOFTWARE DEVELOPMENT

The Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language. It originated from the IDE for the languages Processing and Wiring. It was created for people with no profound knowledge of electronics.

4. CONCLUSION

This paper provides a competent method for lighting systems and makes the whole process of energy saving easier and efficient. This model could be implemented with few modifications as a source of revenue; as charging station for battery operated vehicles. Moving with the new & renewable energy sources, this system can be upgraded by replacing ordinary LED modules with the solar based LED modules. With utilizing the latest technology and advance sensors, we could serve the same purpose of automatically controlling the street lights much more effectively both by cost and manpower.

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