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Arduino based smart street light system with accident avoidance in U-turns

Rushikesh Bharatrao Choudhery
rchoudhery678@gmail.com

Jagadambha College of Engineering
and Technology, Yavatmal,
Maharashtra

Shraddha M. Bute

shraddha09bute@gmail.com

Jagadambha College of Engineering
and Technology, Yavatmal,
Maharashtra

Akash M. Nikam

a.m.nikam98@gmail.com

Jagadambha College of Engineering
and Technology, Yavatmal,
Maharashtra

Nividita R. Bhujade

nividibhujade13@gmail.com

Jagadambha College of Engineering
and Technology, Yavatmal,
Maharashtra

R. S. Sawant

disuzasam087@gmail.com

Jagadambha College of Engineering
and Technology, Yavatmal,
Maharashtra

ABSTRACT

In this paper, we are going to discuss the streetlight system and the accident avoidance system which may help society to reduce the number of accidents which is usually happening in u-turns and also with the help of IOT based smart street lights, we can reduce the energy consumption. Streetlights play an important role in cities which means to avoid accidents, secure roads and provide better vision since evening to morning. As the world is ready to accept the technology, we need to upgrade that street light system which will reduce the energy consumptions and save energy. Also one of the major problems happens in cities is accidents, so we are applying IR mechanism to avoid the accidents that usually happens in u-turns. As our goal is to save energy, so we are using LEDs which is directional light source it can emit light in a specific direction thereby optimizing the efficiency of streetlights. The IR sensors detect the objects and set the intensity of LEDs to high for some time. The work has achieved better performance and reduces energy consumption as compared to the current system.

Keywords— LED (Light Emitting Diode), IR (Infrared Sensor)

1. INTRODUCTION

In any city, 'street light' is one of the major power consuming factor. Even in the daytime when there is no requirement of street lights, it is frequently seen that these lights remain ON violating the energy conservation rule. This continuous lighting pollutes the environment as well as increases the tariff of the electricity. The vital use of streetlight is in public transportation during night time or when the daylight is very feeble. Therefore the design and controlling of street lighting is an important area of work for maintaining safe transportation in our daily life. Also, we can help out to avoid the accidents that are usually happening in the u-turns and save the life of people.

2. LITERATURE REVIEW

In recent years, many efforts have been taken by the government for Smart City and in that, they try to make system automatic rather than the existing system. There are some traditional methods are available and because of those human efforts get reduced but the wastage of electricity and light pollution still existed. So for that implementing a more reliable system is required. For any intelligent system, it should operate automatically and it requires the systematic way to operating to maximize the quality and lifeline. Manish Kumar published the paper regarding the streetlight control in the year 2016 using Zigbee wireless module. Zigbee allows for the wireless communication lamp module and the LDR sensor the day and night variations and night lamp health condition. The system used a microcontroller and the sensors such as the smoke, noise, light etc and it measures using the various parameters. A.D.Devi and A.Kumar also published the research paper based on saving the system using solar power for street light and automatic traffic control on November 12. Mustafa saad, Abdlahim, Ahmed published the research paper regarding automatic street light control system using a microcontroller in it they use the two sensors that are photoelectric for detecting the movements of street light and LDR for detecting the day night time. So we are adding this whole thing in one project and for some additional implementations from our side is to provide the accident avoidance system in u-turns.

3. PROBLEM IDENTIFICATION

Based on the previous paper we add some new things and some update that may help to save energy. The previous system is operated manually by human beings that may cause more energy consumption because sometimes humans can forget to switch off the street lights and this causes the high energy consumption and pollution of the environment. The high-pressure sodium lamps are most commonly used streetlight in

the world. These bulbs can produce light using electricity through a mixture of gases, which produces light. This light is preferred because it requires less maintenance. Instead of that sodium lamps, we are using LED lamps which is more efficient as compared to sodium lights and these reduce the pollution. Again to resolve some other power issues we are using the LDR(Light Dependent Resistor) and IR sensors which may cause to save more energy. Also, our one of the vision is to reduce the accidents that may cause near the U-turns. The main reason behind the accidents happens near U-turns is the driver is not able to see the opposite side vehicle activities which may cause to the accidents. In 2013, over 1,37,000 people were killed in road accidents and there is one death every for a minute due to a road accident in India. According to the road accident report for 2014 prepared by the road transport and highway ministry, over 75,000 people have been killed because of killer roads of India. Another major factor that is contributing to road accidents is speeding

4. PROPOSED SYSTEM

The proposed work of this system is to reduce the consumption of the artificial energy that is nothing but electricity and to maximize the use of natural energy which is coming from the sun. On that basis, we are using the solar panels which take energy from the sunlight and convert it into the electrical energy. Again to reduce the energy consumption we are using the IOT (Internet of Things) concept which helps us to use the saved energy in a more convenient way. This can be done with the help of sensors which are connected to the hardware and this hardware is communicated with the sensors to adjust them to give the proper input and output.

As the population is increasing day by day the natural resources consumption is also increasing, because of this the pollution control system is get failed to control the climate change, So our one step to save the environment we are using the LEDs which is energy efficient and not causing any harmful effect to the environment.

Now we discuss the real thing happens in the back end of the system. Firstly the vehicle and we can say the object is travelling through the road when this object comes in contact with the IR sensor which is connected with the Arduino board, the Arduino board send the input high signal to the LED which is relative to that IR sensor. The LED blows up for the specific time that is set by the program. This cycle continues as the IR sensor detects the object. But the interesting part of this is when there is no object in front of IR the intensity of LED is set to the minimum to that limit people can see the road, but when the object comes then it sets too high. Again this part is saving the energy. As the object come forward to the u-turn the beginning of the accident avoidance is system get started. For this system, we use four IR sensors and four LEDs of two red colour and two yellow colors which are connected to IR. The first IR sensor is placed 100 meters away from the u-turn which is connected to the yellow LED which is on the opposite side of the u-turn and another IR is placed 50 meters away from the u-turn which is connected to the red LED of the opposite side. The same system is set up on another side of the u-turn with two IR sensors and this all is connected with Arduino board. As the object is detected by the fir IR sensor which is placed at 100 meters it blows the yellow LED for a few seconds which is on the opposite side and when this same object comes in contact with the second IR sensor it blows up the red LED for a few seconds which shows the object is near and the object coming from another side of the u-turn is alert. So this system is used

for avoiding the accidents which usually happens in u-turns and may be updated according to the time.

4.1 Microcontroller

The microcontroller is the heart of the system. In this system, Arduino UNO development board is used. The operating voltage of the board is 5V with the 7-12V input voltage. The board has 20 input pins in which 14 digital pins and 6 analog pins. Clock speed for this board is 16MHz.

4.2 LDR (Light Dependent Resistor)

LDR circuit is used as a light sensor to sense the ambient light. Street lights are to be automatically switched on or off depending on the intensity of the sunlight on LDR. As the intensity of sunlight reduces, the resistance of LDR increases. This minimum value decides when the street lights are required to switch ON and OFF. As the resistance value will be maximum in the nights, the LDR will switch the street lights to higher intensities and it will remain at high until real time clock reaches a preset value.

4.3 IR proximity sensor

The proximity sensor is a device used to detect the presence or absence of an obstacle by using an infrared light transmitter without any direct physical contact. A simple prototype of a proximity sensor is made with an Infrared LED and photodetector. The proposed system is designed in such a way that at night, say 11 p.m. (or as time set by the user using RTC), the proximity sensor will be active and will remain active until LDR will sense the sunlight. Whenever a vehicle is detected by the proximity sensor, it will give a signal to the microcontroller which, in turn, will switch the intensity of street-light to high and vice-versa.

4.4 Light Emitting Diode (LED)

The LED stands for a light emitting diode which is a semiconductor device. These are a common type of light that is used today to save the energy as they are operating with very low power and provides more light with no pollution of the environment. The lifetime of LED as compared to the other devices is high therefore these are popular today. Again these lights are used to manufacture the display panels which provide thousands of colours and high definition video quality.

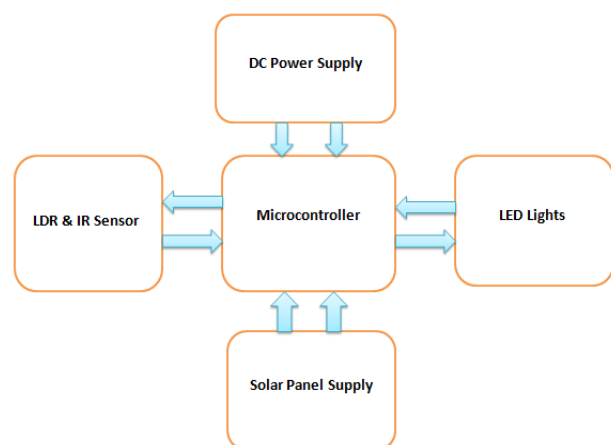


Fig. 1: Block diagram of circuit

5. ADVANTAGE

This will reduce the energy consumption of the whole street light system and again with the accident avoidance system the number of an accident that usually happens in u-turns is controlled so the human life is safe to live on roads.

6. APPLICATIONS

6.1. Industrial Area

This system is the best application for industrial lighting, campus lighting, and village street lighting.

6.2. Rural Areas

The area where the electricity services are not available yet, this system is best for it.

6.3. Mountain Roads

If possible the system of accident avoidance is also applicable in mountain areas too.

7. CONCLUSION

This paper introduces the drawbacks in the existing system, As a result in a new concept of street light system, the energy consumption techniques are changing as per the hardware devices is used to control the energy privileges. Also, the system maintenance cost is reduced because the LED has more life than previous lights. The new system of IR sensor is

beneficial for avoiding the accidents that may occur near u-turns.

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