

Intelligent Street Light Using Object Detection

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ABSTRACT

Street lights are the major requirement in today's life of transportation for safety purpose and avoiding accidents during night. Despite that in today's busy life no one bothers to switch OFF/ON when not required. This project introduced here gives solution to this by eliminating manpower and reducing power consumption.

Various intelligent street light ideas have been implemented using Infrared sensors. However, implementing this idea using camera is more feasible because the use of camera on street is increasing day-by-day in our country. The research work provides a solution for energy saving which is achieved by capturing the image of an approaching vehicle using the camera. As the vehicle passes by, instead of switching OFF the lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street light switch to 100% intensity and then as the vehicle passes by the trailing lights revert back to 10% intensity again. Thus, we save a lot of energy. During daytime all the lights remain OFF. Also, we can detect the failed street light and then send a SMS to the control room we can detect the failed street light and then send a SMS to the control room for appropriate action.

Keywords— Arduino UNO, LDR (Light Dependent Resistor), LED (Light Emitting Diode), Object Detection, Energy consumption.

1. INTRODUCTION

Automation plays an important role in the world economy and in our day to day life. Automation systems are being preferred over manual system because it reduces the usage of energy and also conserves energy [1]. The research work shows automatic control of streetlights as a result of which power is conserved to some extent.

Nowadays, street lighting systems in industries or cities are growing rapidly. The important considerations in the field of different technologies like electronics and electrical are automation, cost-effective and power consumption. There are different street lighting system developed to maintain and control the power consumption. These Intelligent Street Light Using Object Detection is an extension which not only control energy consumption but also tries to reduce the cost as well as detect the defected LED's to minimize accidents. The proposed system uses Arduino UNO microcontroller board based on ATmega328P and a rectified power supply. In this system, Arduino UNO is used along with LDR wherein the sensors are used for detecting the vehicle movement. The LED lights are used for giving the illumination to the vehicles that all are connected to the Arduino UNO. Cameras are fitted on the street lights which will capture the image of an approaching vehicle and then switching ON a block of street lights ahead of the vehicle. As the vehicle passes by, instead of switching OFF the lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street light switch to 100% intensity and then as the vehicle passes by the trailing lights revert back to 10% intensity again. Thus, we save a lot of energy. During daytime all the lights remain OFF. Also, we can detect the failed street light and then send a SMS to the control room for appropriate action.

2. EXISTING SYSTEM

The industry of street lighting systems is growing rapidly and going to complex with the rapid growth of industry and cities. Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. To control and maintain complex street lighting system more economically, various street light control systems are developed. These systems are developed to control and reduce the energy consumption of a town's public lighting system using different technologies. The existing work is using the High intensity discharge lamp (HID). HID presently used for urban

street light are based on the principle of gas discharge, thus the intensity is not been controllable by any voltage reduction method as the discharge path is broken.

2.1 Disadvantages of Existing System:

- HID lamps consume more power.
- The life time of the HID lamps is very less.
- It cannot be used in all outdoor applications [2].

For this disadvantage, one solution can be using IR sensors with LED lights as shown in Figure 1. In Figure 2 IR sensors detect vehicles and accordingly increase the intensity of light to 100% from 10% intensity which is by default. However, this solution has some drawbacks like IR proximity sensor senses objects in the range of 3-80 cm [3]. Practical implementation involves large amount of wiring. New construction is required in order to incorporate sensors on the street. Also, Infrared detectors can be sensitive to inclement weather conditions and ambient light [4].



Fig. 1 Street Light using IR Sensors and LED

Cameras installed on street lights are used to detect approaching vehicles. The block diagram of the proposed system is shown in Figure 3. As a vehicle is detected a block of street lights ahead of it is switched ON with 100% intensity and trailing lights switch back to 10% intensity to save energy. So when there are no vehicles, then all the lights remain ON with 10% intensity. Intensity control is possible by Pulse Width Modulation (PWM) generated by the microcontroller. Also, during daytime there is no requirement of street lights so the LDR keeps the street lights OFF. Arduino UNO microcontroller board based on ATmega328P is used. Cameras installed on the street lights detect the approaching vehicle and sends logic commands to microcontroller to switch ON/OFF the LEDs. This is done through the concept of Image Processing. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. The system is designed in such a way that light sensors are placed in the street light circuit. Whenever the fault occur in the LED, it is detected by the sensors then a signal is sent to the microcontroller and with the help of GSM module we can send messages to the control station [6]. In case when the lifetime of the LED is about to reach 50,000 hours, message is sent to the control station prior to 2 days.

2.2 Advantages of the Proposed System

- The circuit uses LED Bulbs, so the cost is very low.
- LEDs have more life span.
- Maximum energy can be saved.
- Nowadays cameras are widely used; therefore this system can be implemented without altering the existing system.



Fig. 2 Street Light glows with 100% intensity when obstacle is detected

3. PROPOSED SYSTEM

Automation, Power consumption and cost effectiveness are important considerations in the present field of electrical related technologies. Industry of street lighting system is growing rapidly. To control and maintain this system more economically, various intelligent street light systems are developed. These systems are developed to control and reduce energy consumption using different technologies [2]. The proposed work is to control the switching of street light automatically according to the light intensity using cameras.

4. TECHNIQUE

A technique for finding small parts of an image which match a template is called as Template Matching. It is a straightforward process. In this technique, a template image is stored as a reference and when an image is given as input it is matched with the reference template image to determine the object in the input image.

Templates are used for recognition of vehicles, human being. It can be performed on grey level as well as color images. Template matching can either be pixel to pixel matching or feature based. In feature based, the features of template image is compared to the features of sub-images of the input image; to determine if the template object is present in the input image [5].

5. BLOCK DIAGRAM

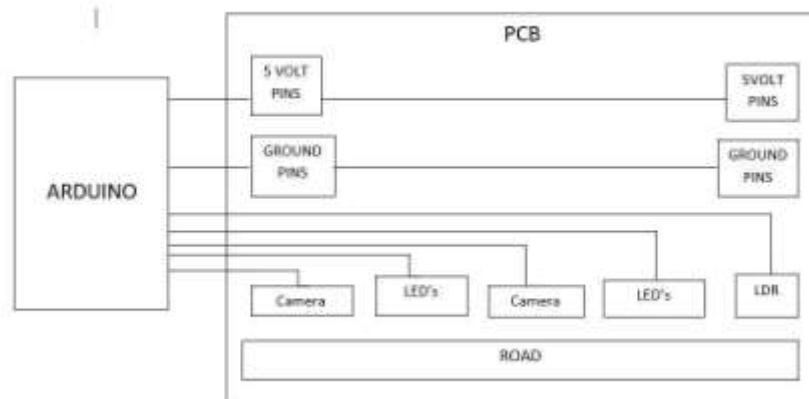


Fig. 3 Block Diagram

6. CONCLUSION

- Street-lights are a large consumer of energy for cities using up to 50 percent of a city's energy budget.
- If every city installs the proposed system then a lot of power can be saved. Proposed system is power saving mechanism for street lights by using LED lamps as replacement of normal lamps. It turns out most reliable and time efficient way to switch ON/OFF street-lights.
- It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required.
- It adopts a dynamic control methodology for traffic flow. The proposed system is especially appropriate for street lighting in remote urban and rural areas where the traffic is low at times.
- The system is versatile, extendable and totally adjustable to user needs.

7. FUTURE SCOPE

Instead of using camera, we can use RFID tag [7] which automatically identifies and track tags attached to objects.

8. REFERENCES

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