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Smart Street Light System with Automated Feedback

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***Abstract*: The lack of efficient prevention of hazardous accidents that people face on streets can be addressed by designing an automated sensor detection. It is embedded with different sensors so that it can detect the condition of lights on streets. If any street light is not working then the condition of light is displayed on dash board which is at control room of street lights operating station.**

***Keywords*: Streetlights, Accidents, NodeMCU, LDR, WiFi transfer, IoT.**

1. Introduction

As the technology growing immensely in recent year certain improvisation needs to be made street lights have been installed in many villages and state highways in Central India, however many times these lights remain non-functional due to late information about the exact location and unavailability of sufficient service support. Consequently, in the absence of proper lighting, some of these areas become on safe for people at night especially elders' women and children we will develop a good street lighting system which will allow the service engineers to know the exact location of non-functional street lights in their area of responsibility.

2. Components

A. Hardware Components

1) NodeMCU

Node Microcontroller Unit is named as NodeMCU which is open-source software and firmware that is built around System-on-Chip (SoC) called the ESP8266. The ESP8266 is designed and manufactured by Express. It contains the crucial elements like CPU, RAM, networking (Wi-Fi), modern operating system and SDK. The NodeMCU aims to simplify ESP8266 development. It has an operating voltage of 3.3v. It has an operating temperature range of 40˚c~125˚c. ESP8266Wi Fi So C is embedded with the memory controller, including SRAM and ROM. Micro Controller Unit can enter the memory units through IBus, dBus, and AHB interfaces.

2) LED

A Light Emitting Diode (LED) is a semiconductor device, which can emit light when an electric current passes through it. To do this, holes from p-type semiconductors recombine with electrons from n-type semiconductors to produce light.

3) LDR

What is an LDR (Light Dependent Resistor) An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. Light Dependent Resistors (LDR) are also called photo-resistors

A photo-resistor or light dependent resistor is an electronic component that is sensitive to light. When light falls upon it, then the resistance changes. Values of the resistance of the LDR may change over many orders of magnitude the value of the resistance falling as the level of light increases.

4) Relay

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

B. Software components

1) Arduino IDE

The Arduino Integrated Development Environment (IDE) contain a text editor for written code, a message area, a text console, a tool bar with button for common functions and a series of menus. It connects the Arduino hardware to upload program and communicate with them.

2) Things Board

It is an open source IoT platform for data collection, processing, visualization, and device management. It enables device connectivity via industry standard IoT protocols – MQTT, CoAP and HTTP and supports both cloud and on-premises deployments.

3. Working Operation

- Power supply is given to NodeMCU microcontroller. The digital outputs from LDR1, LDR2 and LDR3 sensors is given to the microcontroller.
- The condition of light1 and light2 is continuously monitored on the thingsboard interface that are transferred through WiFi.
- If light-1 is not operated, the LDR2 given the signal to

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NodeMCU then automatically light-2 will operate. Meanwhile The signal is also displayed on IoT interface i.e., which one light is in operating condition.

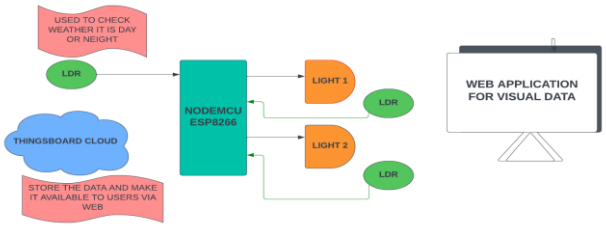

Fig. 1. Working

4. Real Time Statistics

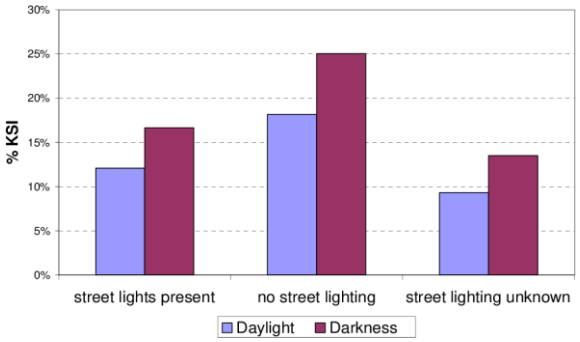

Fig. 2. The impact of street lighting on night time road causalities

An investigation into the impact of street lighting on night-time road casualties was carried out in order to provide highway authorities with a robust methodology for preparing cost benefit analyses of new, and refurbishment or replacement of old road lighting schemes, in relation to safety benefits. Significant changes in the efficiency of modern lighting, developments in vehicle design and increases in traffic levels mean that current UK guidance may require updating. Information from local authorities in Great Britain and the national road accident database was used in the study. Night time accident data were studied and correlated with the lighting system in use, in order to determine the relationships among the presence of lighting and the frequency or severity of accidents on different classes of road. The findings of the study to date show that there are many interacting variables affecting accident rates, making the separation of the effect of street lighting difficult. The analysis carried out shows an apparent benefit in accident savings due to lighting, but confidence in the size of the benefit is low and should be improved when the study is completed.

A. Street lighting for preventing accidents

Road traffic crashes are a major cause of death and injury, especially in low and middle-income countries. It is estimated that road traffic injuries will have risen from ninth to third in world disease burden rankings by 2020, accounting for 2.3 million deaths globally. Street lighting has been suggested as a relatively low-cost intervention with the potential to prevent traffic crashes.

We found 16 controlled before-after studies of street lighting, all reporting crash data, of which 14 contributed data to the meta-analysis. Seven trials included a designated control site, the other nine collected data at one site with the daytime data being used as the control. The methodological quality of the trials was generally poor. Three trials compared street lighting with an area control on total crashes; pooled rate ratio (RR) = 0.45 (95% Confidence Interval (CI) 0.29 to 0.69). Two trials compared street lighting with an area control on total injury crashes (all severities); RR = 0.78 (95% CI 0.63 to 0.97). No trials compared the number of fatal crashes with an area control. Ten trials compared street lighting with a day time control on total crashes; pooled RR = 0.68 (95% CI 0.56 to 0.83). Five trials compared street lighting with a day time control on total injury crashes; pooled RR = 0.68 (95% CI 0.59 to 0.79). Three trials compared street lighting with a day time control on fatal crashes; pooled RR = 0.33 (95% CI 0.17 to 0.66).

5. Result and Conclusion

These days are required to keep up with the latest technologies. The design of smart street light system with automated feedback is done successfully. Using internet of things we can showed the data in the website, which light is in on and off condition. The data of lights can be stored in things board cloud. The result picture of the circuit is shown below:

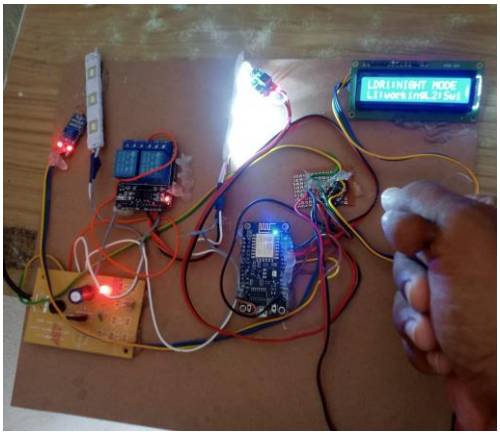

Fig. 3. Hardware setup

Data in website:

The required data, which is condition of lights is observed in the website, whether the status is day or night which is shown in website, which is offered by things board cloud. The figure is given by:

Fig. 4. Status

Stored data in cloud:

The data regarding conditions of lights at all the times can viewed in this cloud i.e., which light is worked at which time all the details and working condition lights can be shown here.

The pictorial view of data visualization is shown below:

Fig. 5. Time series table

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