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Automatic street light intensity control

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ABSTRACT

This paper aims at designing and executing the advanced development in embedded systems for energy saving of street lights. Nowadays, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. The present system is like, the street lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. This paper gives the best solution for electrical power wastage. Also, the manual operation of the lighting system is completely eliminated. In this paper the two sensors are used which are Light Dependent Resistor LDR Sensor to indicate a day/night time and the ultrasonic sensors to detect the movement of the object. when movement of the object is not detected in the ultrasonic sensor it become glow in low intensity and if anyone cross the sensor path at that time it will glow at high intensity. After the object passes away from the sensor path it automatically converts high intensity to low intensity.

Keywords—*Arduino, Ultrasonic sensor, Node MCU, CF bulb, Potential transformer, Current transformer, Embedded C*

1. INTRODUCTION

The idea of designing a new system for the streetlight that do not consume huge amount of electricity and illuminate large areas with the highest intensity of light is concerning each engineer working in this field. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficient technologies and design mechanism can reduce cost of the street lighting drastically.

Manual control is prone to errors and leads to energy wastages and manually dimming during mid night is impracticable. Also, dynamically tracking the light level is manually impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting.

The present street lightning framework have many problems which needs to be worked upon. The Problem with the present framework is that it requires human intervention to make system to operate. In Bad weather condition, the timing of street light ON/OFF differ discernibly which is one of the main problems of the present street lights systems. Due to human intervention sometimes street lights are ON most of the day without any purpose because these are manually operable and this cause huge amount of power loss meaninglessly. With the wide acceptability of energy conserving and sustaining technologies like light emitting diode (LED) lights and quick response system, dependable working, and power saving street lighting system getting into reality. The reason for this is to showcase the Smart automated Street Lighting System. The only aim of this research paper is to describe an automated lighting framework which focuses on the energy saving and reducing human intervention, and also to construct a smart street lighting system with sensors and controllers, to outline an automated lighting system with particular methodology plan, which makes the system more user friendly and that requires less involvement of manpower.

2. LITERATURE SURVEY

Automatic street light controller using light dependent resistor (LDR) removes manual works. The street lights are automatically switched ON when the sunlight goes below the visible region of our eyes. It automatically switches OFF the street lights under illumination by sunlight. The component used for light sensing is a Light Dependent Resistor. By using the LDR we can operate the streetlight automatically, when ample amount of light is available the streetlight will be in the OFF state and when it is dark the light will be in ON state, it means LDR resistance is inversely proportional to light falling on it. It exploits the working of a transistor in saturation region and cut-off region to switch ON and switch OFF the lights at appropriate time with the help of an electromagnetically operated switch [1].

Here two kinds of sensors will be used which are light sensor and photoelectric sensor. The light sensor will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on and the photoelectric sensor will detect movement to activate the streetlights. LDR, which varies according to the amount of light falling on its surface, this gives an induction for whether it is a day-night time, the photoelectric sensors are placed on the side of the road, which can be controlled by microcontroller PIC16f877A. If any object crosses the photoelectric beam, a particular light will be automatically ON. By using this as a basic principle, the intelligent system has been designed for the perfect usage of streetlights in any place [2].

The project represents a new cost-effective solution for street light control systems. The control system consists of control circuitry, internet and electrical devices. The system also includes the client-server mechanism where a user can directly interact with the web-based application to monitor the Streetlight of any place from a single position. The base server will run a Java Web Application which will maintain whole street light of Country/State/City. Street light controller will receive that information, and it will decode and find the particular streetlight which will set using relay circuit, the notification came it will then decode and finds the appropriate streetlight which needs to put ON/OFF using relay circuit [4].

In this paper it senses the Infrared from the surrounding and check whether the lights needs to be ON or not as per the intensity value. This system will eliminate the system of manual control as the system will cause to light up when the infrared value become less than our defined value. Also, the light will automatically switch OFF when detected value of infrared become greater than the defined value. This system works in 2 forms, First, for highways Second for the Streets. For highways the lights remain OFF as long as the motion of the object is detected. If motion is detected the light will be in ON state and Glows for specific time interval. In second form the lights do not remain in OFF state, instead they remain ON but in less intensity [8].

This paper consists of a single observation station at the cloud to control the overall street lights in a region. It is a modular system which is expandable easily. The controlling terminal observes the condition of street lights for its perfect working. The sensors are used to control the dim/bright of the street lights based on the intensity of the sunlight. The information about the sensors will be sent using the wireless network to the base station for processing data. During malfunction, the service engineer is informed through graphical user interface and corrective actions are performed [9].

3. EXISTING SYSTEM

The current system of street lights consists of manual controls which need Human intervention to work upon. This cause the loss of energy due to manual control, or the use of outdated technology. These systems are designed in such a way that they could reduce their intensity of light and save energy as much as possible. These systems are made to use of HID (High Intensity Discharge). Due to manual system one needs to turn the street lights ON or there is a time allotted during which the intensity of the system keeps on high and then turns the lights OFF when the sun rises up. Intensity reduction starts at during dawn when it is not much dark and there is not much traffic and is switched OFF when the light is totally visible in the morning. Mostly use IR (Infrared Ray) sensors to detect vehicles presence. Existing systems do overcome the problems of HID based systems by using the LED, but are not able to save that much amount of energy as required also they are time based, also in seasons like monsoon the surroundings are remains dark compared to usual days. In Winters there is a fog and if the lights are less it could result into a great accident or catastrophe. Therefore, still some improvements in these systems are needed. Time interval-based systems consider the time slot as an edge, but it actually is a drawback as it could not work in all conditions. As above discussed, it creates problems during Bad weather changes, it needs to be changed if it is needs to be implemented globally or in India where the weather differs the most from Jammu to Thiruvananthapuram. Also, if any, hardware failure or fault occurs, it could be costly to solve it.

4. PROPOSED SYSTEM

So, there were the several problems which need to be worked upon in former system. This can be done by creating a new system which is Automated, Energy conserving and cheap. Our system works in a similar fashion first, it senses the sound wave produced by the object from the surrondings and check whether the lights needs to be ON or not as per the intensity value. This system will eliminate the system of manual control as the system will cause to light up when the ultrasonic value become less than our defined value. Also, the light will automatically switch OFF when detected value of ultrasonic become greater than the defined value. This system works for university roads, Streets, hotel & mall parking area. In this system the lights do not remain in OFF state, instead they remain ON but in less intensity. Again, if the motion is detected here the intensity of light become greater for the particular time interval. This is dimming effect created by our system.

Here many systems use IR sensor it will not be more efficient as like the ultrasonic sensor it will give the distance value between the detected object and the sensor. Here we use CF bulb for the lighting purpose. Then the current and voltage consumed by the bulb can be measured using current and the potential transformer. The consumed current and voltage reading can be stored in the cloud. Here we using cloud is that we need not to enter the data manually the cloud will update the data automatically in daily manner. Then we are using android app in two ways. One for viewing the stored data in the cloud. Another way for if we find wastage of light in roads then we can ON/OFF the whole system by using this android app.

4.1 Components of the proposed system

4.1.1 Hardware Module

- Arduino
- Ultrasonic sensor
- LDR
- Node MCU
- Light
- relay

4.2 Software module

- Embedded C

The process starts by detecting it is night time or day time if it is day time the LED lamp will be in ‘OFF’ state and then Arduino will show ‘0’ state at LDR and ‘Day’ at serial. If the night time is detected by the LDR then it check for the presence of the vehicle if the presence of vehicle is detected then ultrasonic sensor will respond and respective lamp will glow at high intensity then Arduino will check for the status of ultrasonic sensor and LDR then the monitored data will be

updated in the cloud automatically. If the presence of vehicle is not detected then it waits for the vehicle and LED will glow at low intensity then the Arduino will show '0' state of the ultrasonic sensor at serial monitoring and it is updated in the cloud and then the process will end.

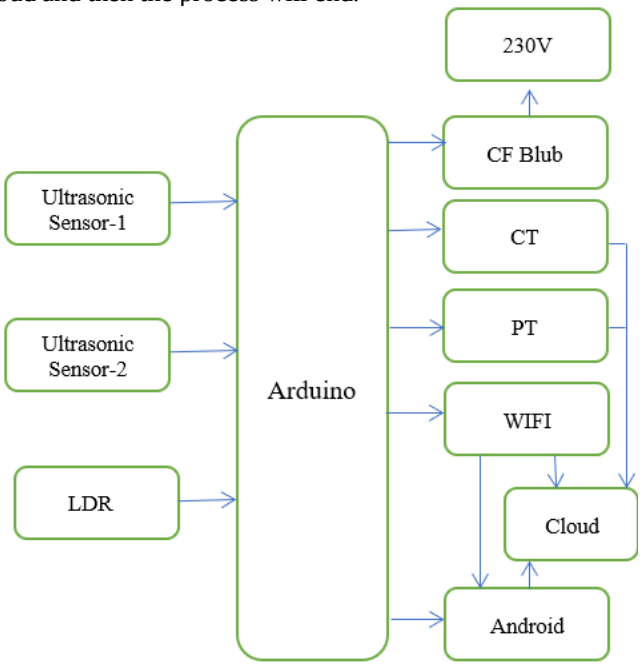

Fig. 1: Block Diagram

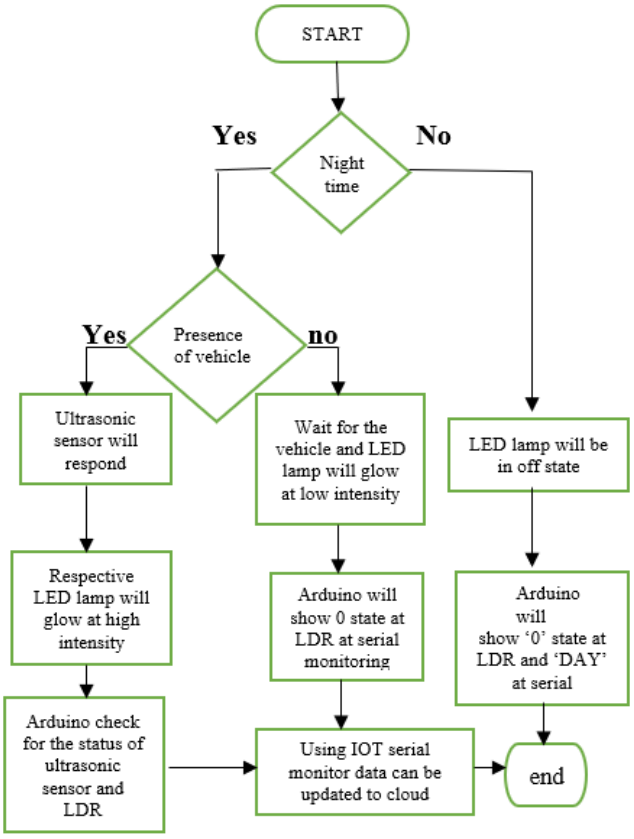

Fig. 2: Flow Chart

5. CONCLUSION

This paper aims to find the solution of power consumption and manual working of the current system. As we have aimed this project is working as expected in both forms i.e in university roads and in streets. This system overcomes the drawback of current system of manual operation. This system automatically works according to the ultrasonic sensor values detected from the surroundings. Also, the light remains OFF or in Dim state as long as the motion is not detected. Once the motion is detected the lights comes to ON or bright state. This system is solely made for using in a wide scale project. Also, it is very cheap.

This research paper explains the construction of Automated street light system with its working via flow diagram and circuit diagram. Circuit works properly and make lights to be in ON/OFF state. LDR and ultrasonic sensor are the two main components of the circuit design. If the components work properly and proper criteria for these components are met than the system works properly and produce desired result. With help of micro controller command, the lights glow when it is dark and vehicle passes by. Also, the microcontroller uses the embedded C code which is extremely fast language. The former system code is also optimized according to our system design and to meet the system requirements. The LDR sense visible light. The ultrasonic sensor as it senses till 11 meters of distance. So, this make system more reliable.

6. REFERENCES

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