

Smart IoT Streetlight Controller System

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Abstract— The street lighting is one of the largest energy expenses for a city. An intelligent street lighting system can cut municipal street lighting costs as much as 50% - 70%. An intelligent street lighting system is a system that adjusts light output based on usage and occupancy, i.e., automating classification of pedestrian versus cyclist, versus automotive. The proposed system of automated streetlight management system using IOT aims at the conservation of energy by reducing electricity wastage as well as to reduce the manpower. Streetlights are the elemental part of any city since it facilitates better night visions, secure roads, and exposure to public areas but it consumes a quite large proportion of electricity. In the manual streetlight system, lights are powered from sunset to sunrise with maximum intensity even when there is sufficient light available.

Keywords: Sensors, IoT, Arduino Compiler, C Language

I. INTRODUCTION

An intelligent street light management proposes the installation of the wireless based system to remotely track and control the actual energy consumption of the street lights and take appropriate energy consumption reduction measures through power conditioning and control. The street light controller should be installed on the pole lights which consist of microcontroller along with various sensors and wireless modules. The street light controller installed on the street light pole will control LED street lighting depending on traffic flow, communicate data between each street light. The data from the street light controller can be transferred to base station using wireless technology to monitor the system. The mode of operation of the system can be conducted using auto mode and manual mode. The control system will switch on-off the lights at required timings and can also vary the intensity of the street light according to requirement.

II. OBJECTIVE

Our proposed system mainly aims at unification of three main prospects:

- 1) Making an intelligent streetlight system managed by the IOT controller system that uses LED-based supply powered by a battery.
- 2) The whole management system will then be implemented through a network of various sensors to gather the relevant information.

III. LITERATURE SURVEY

J. Arthi, W. Lydiapreethi and Gunasundari focused upon designing and executing the advanced development in IOT for energy saving of street light, i.e. the best solution for electrical power wastage which is automation of street light, wherein the manual operation of the lighting system is completely eliminated. A method for modifying street light illumination by using sensor at minimum electrical energy

consumption when object presence is detected, street lights glow at their brightest mode, else they stay in the dim mode during night time. Internet of things (IOT) is used to visualize the real time updates of street processing and notifying the changes occur which shall reduce heat emissions, power consumption, maintenance and replacement costs and carbon dioxide emissions. [1]

Vaishali Gupta and Krutika Thakur have emphasized upon the fact that streetlights are among a city's strategic assets- providing safe roads, inviting public areas, and enhanced security in homes, businesses, and city centers. However they are usually very costly to operate, and they use in average 40% of a city's electricity spending. Since the cost of electricity continues to rise and as wasting energy is a growing concern for public and authorities, it's becoming crucial that municipalities, highway companies and other streetlight owners deploy control systems to dim the lights at the right light level at the right time, to automatically identify lamp and electrical failures and enable real time control. The project describes a new economical solution of street light control systems, wherein an IP address needs to be provided to street lights so that the base server can control the whole city's street lights using internet with the main motive to save energy. [2]

Prabu V Parkash and Dandu Rajendra focus upon designing and executing the advanced development in embedded systems for energy saving of street lights. Modifying a manual system where the street lights will be switched ON in the evening before the sunsets and being switched OFF in the next day morning after there is sufficient light outside, but the actual timing for these lights to be switched ON is when there is absolute darkness and hence keeping these aspects in mind, they give a solution for electrical power wastage, where the manual operation of the lighting system is completely eliminated. The proposed system provide a solution for energy saving which is achieved by sensing and approaching a vehicle using an IR transmitter and IR Receiver couple. Upon sensing the movement the sensor transmits the data to the microcontroller which furthermore allows the light to switch on and similarly as soon as the vehicle or an obstacle goes away the light gets switched off as the sensor senses any object at the same time. The project is implemented with smart embedded system which controls the street lights based on detection of vehicles or any other obstacles on the street. Whenever the obstacle is detected on the street within the specified time the light will get automatically ON/OFF according to the obstacle detection and the same information can be accessed through internet. The real time information of the street light (ON/OFF Status) can be accessed from anytime, anywhere through internet. [3]

A.M Sindhu, Jerin George, Sumit Roy, focus upon the smart street light automated system which automates the street, wherein the main aim to reduce the power

consumption when there are no vehicle movements on the road. The Smart streetlights will be turned on when there are vehicles on the road otherwise the lights will be switched off. And with advancement of technology, things are becoming simpler and easier for everyone in the world today, that's why automation is proposed via the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization, whereas mechanization provided human operators with machinery to assist the users with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. The research work shows automatic control of streetlights as a result of which power is saved to an extent. The Smart street light provides a solution for energy saving which is achieved by sensing an approaching vehicle using the IR sensors and then switching on a block of street lights ahead of the vehicle. As the vehicle passes by, the trailing lights switch off automatically, which saves a lot of energy. [4]

IV. PROPOSED SYSTEM

Currently, we are having a manual system wherein the street lights will be switched ON in the evening before the sunset

and switched OFF the next day during morning hours after there is sufficient light outside.

But, the actual timing for these lights to be switched ON is when there is absolute darkness. With this the power will be wasted up to some extent and hence we propose an IOT based street light monitoring and controlling system to ensure low power consumption, consumption monitoring, instant faulty light detection and light dimming as per external lighting conditions.

High expenditure is one of the major drawbacks of the current system. Since, the circuits need to be set-up on a large scale, thereby increasing the cost for setting up an automatic-operated circuit.

Another major drawback is more energy consumption. What happens via using the timer circuit is that it would switch ON / OFF the streetlights according to the range of a particular time set which has already been specified. But on most days, intensity of the light may vary and hence streetlights maybe glowing when not needed and won't be glowing when they are actually needed.

Lastly, manually switching ON / OFF the streetlights requires more manpower. At most days, manpower may not be available to a large extent. This can then hamper the glowing of streetlights when needed.

V. IMPLEMENTATION

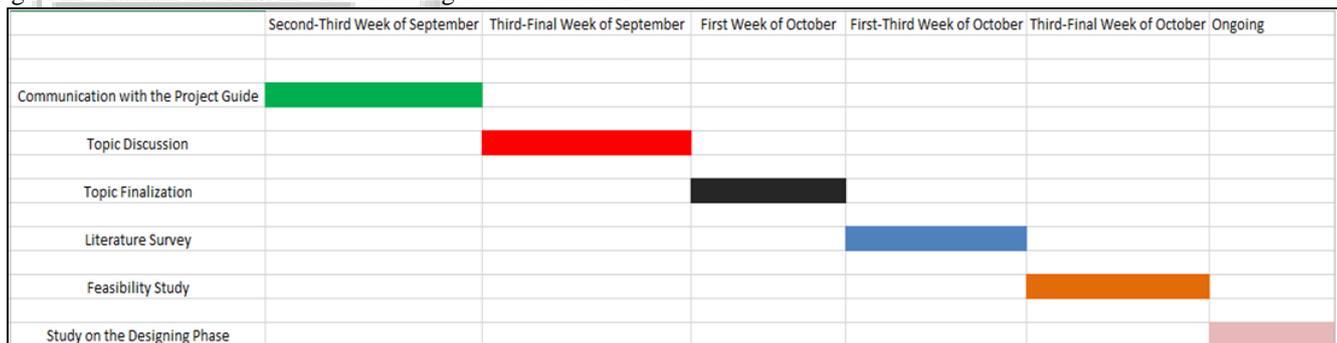


Fig. 1: System Design

A Software Requirement Specification (SRS) is a description of a software system to be developed. It lays out the functional and non-functional requirements and includes a set of use cases that describe user interaction, according to the product being developed. SRS establishes the basis for an agreement between users and the admin on how the software product is going to perform and as well as what the software product might not be able to do.

SRS provides a realistic basis for estimating product costs, risks and schedules. It also permits a rigorous assessment of requirements before the design actually begins, hence reduces later redesign. The Software Requirement Specification document enlists enough and necessary requirements that are required for the project development.

VI. CONCLUSION

The use of power electronics is increasing exponentially across various sectors of human life. The components used in the project, like Arduino and sensors are slowly becoming an indispensable part of our daily routines. So, it is only fitting

that we use them to improve efficiency in every walk of life. Keeping in mind the urgent need for energy conservation, Smart Street Light Controller System with the platform of IoT is an excellent and effective solution. It combines safe lighting protocols with consumption of minimal amount of power. The future scope of this project expands into speed detection and customizable area of illumination.

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