Iot Based Smart Street Light That Glows On Detecting Vehicle Movement

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Abstract:

IoT has made significant impact in our economies and society, which describes as a worldwide network of intercommunicating devices. This saves lot of energy especially objects like Home appliances, Roads, and vehicles. Based on technology, when vehicle moves on highway it automatically switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy. During night conditions all the lights on the highway remain ON for the vehicles, so lots of energy is wasted when there is no vehicle movement. By using the IR sensors on approaching the vehicle we save lot of energy.

One piezoelectric Buzzer is provided to alert and monitor the speed of vehicle. When vehicle moves on high speed the LCD panel will show display of it. Upon sensing the movement the sensor transmit the data to the microcontroller which furthermore the Light to switch ON. Similarly as soon as the vehicle or an obstacle goes away the Light gets switched OFF, as the sensor sense any object at the same time the status (ON/OFF) of the street light can be accessed from anywhere and anytime through internet. If any failure occurs it sends the signal to the control department.

Keywords

IOT; Vehicle moment, Smart Street light; embedded system.

1. Introduction

Internet of Things (IoT) is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. The IoT is a giant network of connected things and people – all of which collect and share data about the way they are used and about the environment around them. IoT has made significant impact in our economies and society, which describes as a worldwide network of intercommunicating devices. This saves lot of energy

especially objects like Home appliances, Roads, and vehicles. Based on technology, when vehicle moves on highway it automatically switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy. During night conditions all the lights on the highway remain ON for the vehicles, but lots of energy is wasted when there is no vehicle movement.

The street lighting is one of the largest energy expenses for a city. A smart street lighting system can cut municipal street lighting costs as much as 50% - 70%. A smart street lighting system is a system that adjusts light output based on usage and occupancy. This 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.

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

The project IOT BASED SMART STREET LIGHT THAT GLOWS ON DETECTING VEHICLE MOVEMENT using Arduino Microcontroller is an exclusive project that can control the devices according to the instructions given by user.

Over view of Embedded Systems:

An embedded system is a special purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time

computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular task or set of tasks costs far more time and money. Many embedded computers even come with extensive libraries, so that "writing your own software" becomes a very trivial task indeed. From an implementation viewpoint, there is a major difference between a computer and an embedded system. Embedded systems are often required to provide Real-Time response. The main elements that make embedded systems unique are its reliability and ease in debugging.

2. Literature Review

S.Suganya [1] have proposed about Street Light Glow on detecting vehicle movement using sensor isa system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity to develop flow based dynamic control statistics using infrared detection technology and maintain wireless communication among lamppost and control terminal using ZigBee Wireless protocol. It also combines various technologies: a timer, a statistics of traffic flow magnitude, photodiodes, LED, power transistors.

K.Santha [2] have surveyed on Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness algorithm and light intensity. The control can be made according to the seasonal variation. It includes a time cut-out function and an automatic control pattern for conserving more electricity. The whole project was implemented using a PIC microcontroller.

Srikanth [3] proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed with the help of ZigBee modules that helps in detecting the faulty lights and control the light. It also discusses about an intelligent system that takes automatic decisions for ON/OFF/DIMMING considering the vehicle movement or pedestrian and also the surrounding environment. PIR motion sensor is used to detect movement of both living and non-living things.

M.Abhishek [4] have implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting. They have also used 8052 series microcontroller and is developed by replacing the normal bulbs with the LEDs due to which the power consumption is reduced by 3 times. Sensors are placed on either side of the road which senses the vehicle movement and sends the commands to the microcontroller to switch ON and OFF the lights. Here all the street lights remain switched off and it glows only when it senses the vehicle movement. Hence, because of the microcontroller, even when its night the lights are switched off.

C. Bhuvaneshwari [5] have analyzed the street light with auto tracking system by which one can increase the conversion efficiency of the solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun time to time and gives the output to the amplifier based on light density of the sun. Sun tracking sensor is LDR, amplifier unit is used to amplify the LDR signals which converts low level signals to high level signals and the output is given to comparator. The LM324 IC is used as an amplifier. Comparator compares the signals and gives the command to AT89C51 microcontroller.

Steve Chadwick [6] reports on the two installation case studied in Scotland and Wales and explains the details and benefits of the technology. The system was called as MINOS that had a track record of over 100,000 units installed and working successfully.

Somchai Hiranvarodom [7] describes a comparative analysis of photovoltaic (PV) street lighting system in three different lamps. Namely, a low pressure sodium lamp, a high pressure sodium lamp and a fluorescent lamp have been used for installation in each mast to determine the suitable system to install in a typical rural area of Thailand. All three systems have been mounted with the same module type and wattage in different places within the Rajamangala Institute of Technology, Thanyaburi district, Pathumthani province of Thailand. An operation of solar street lighting system can be divided into 2 period of time, namely, at 18.00-22.00 hours and 05.00-06.00 hours. The design of a control circuit was experimentally done in this work. The aim of this work is to determine the appropriate system to install in a typical rural area or a typical rural village of Thailand.

Radhi Priyasree [8] explains a system to reduce the power consumption of street lights by avoiding inefficient lighting which wastes significant financial resources each year. This is done by dimming the lights during less traffic hours. For this purpose PIR sensor is used which detects any movement. This work also aims at reducing the fatal crashes and road accidents caused due to alcohol consumption. This is done using skin sensors placed in vehicle doors and also using breadth sensors inside the vehicle. By implementing this death rates due to drunk driving can be reduced to a great extent. The prototype has been implemented and works as expected and will prove to be very useful and will fulfill all the present constraints if implemented on a large scale. It also aims at detecting consumption of alcohol by the driver and if it exceeds certain level it impairs the driver from entering into the Vehicle. This prevents occurrence of accidents or any fatal crashes. This initiative will help the government to save this energy and meet the domestic and industrial needs.

From this literature survey, the methods each one has implemented and used is simple and easy to understand. These papers and journals has given many ideas to further implement a much efficient system and make things automated. The presentations are simple and clean with all the necessary information needed for a basic learner or reader.

3. Design and Methodology

The Smart street light control system adopts a dynamic control methodology. According to the proposed plan, initially when it becomes dark, all the street lights automatically glow for a few seconds and switches off. But throughout the night, only one streetlights remains switched on for security concerns. When a vehicle passes by, a block of street lights glows and as the vehicle moves forward, the next block of lights starts glowing where the previous block switches off.

Existing System

The existing work is done using HID lamps. Currently, the HID is used for urban street light based on principle of gas discharge, thus the intensity is not controlled by any voltage reduction method as the discharge path is broken. HID lamps are a type of electrical gas discharge lamp which produces light by means of an electric arc between tungsten electrodes housed inside a translucent or transparent fused quartz or fused alumina arc tube. This tube is filled with both gas and metal salts. The gas facilitates the arc's initial strike. Once the arc is started, it heats and evaporates the metal salts forming plasma, which greatly increases the intensity of light produced by the arc and reduces its power

consumption. High-intensity discharge lamps are a type of arc lamp.

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.
- Brightness of the lights in the rear view mirrors which causes a problem for drivers in front of your vehicle.

Proposed System

Since the HID lamps are not cost effective and not reliable, smart street light system has overcome by replacing the HID lamps with LED. Due to automation, power consumption and cost effectiveness in the present field of electronics and electrical related technologies, industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities.
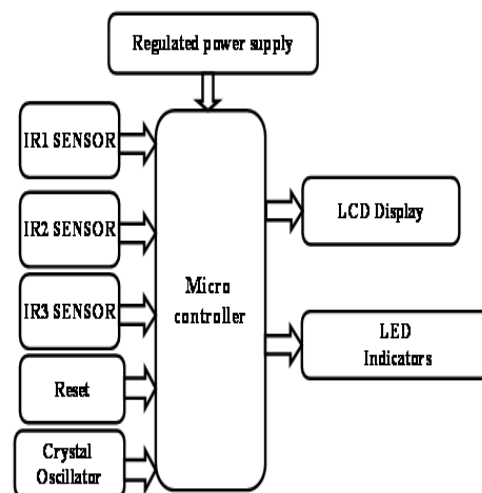

Figure: Block Diagram of the proposed Design

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 energy consumption of a town's public lighting system using different technologies which uses IR motion sensors to detect the vehicle movement after which the street light begins to glow. As the vehicle moves, the street light that was glowing switches off and the following lights begins to glow.

In this chapter the block diagram of the project and design aspect of independent modules are considered. Block diagram is shown in fig below.
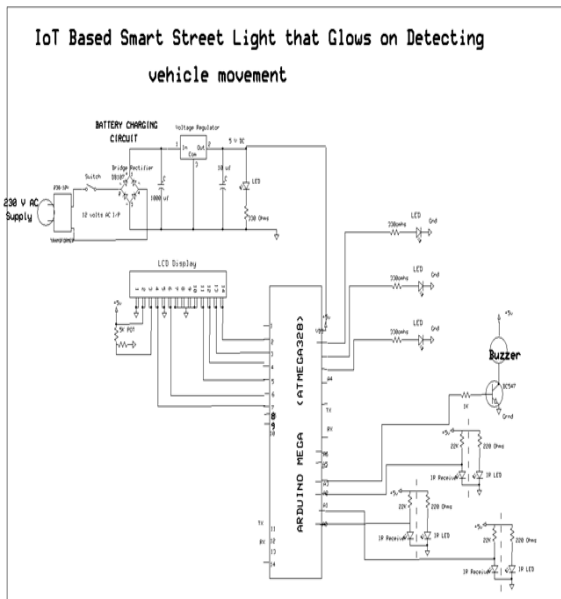
4. Results And Discussion

Figure 2: schematic diagram

The above shown figure is circuit diagram of the project. In this project piezoelectric buzzer is added to monitor the speed of the vehicle and give alert for the humans. One LCD display will provided to check the speed and particular range is stetted thorough the system. IoT is connected by placing the WLAN cable to the kit where it gives information through the online or blynk app server may use for controlling and monitor the street lighting system. 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 energy consumption of a town's public lighting system using different technologies which uses IR motion sensors to detect the vehicle movement after which the street light begins to glow. As the vehicle moves, the street light that was glowing switches off and the following lights begins to glow.

In this section, the setup of the whole work is depicted in a step by step manner. Sample screenshots are displayed once the components are fixed and connected to each other.

The following are the screenshots in an orderly way

The Fig 3 depicts the initial setup of the hardware. All the components are in accordance to every other component. The three IR sensors are placed next to each other. The Arduino board is connected to the external power supply for the flow of current. All the three IR sensors are connected to the Arduino board.
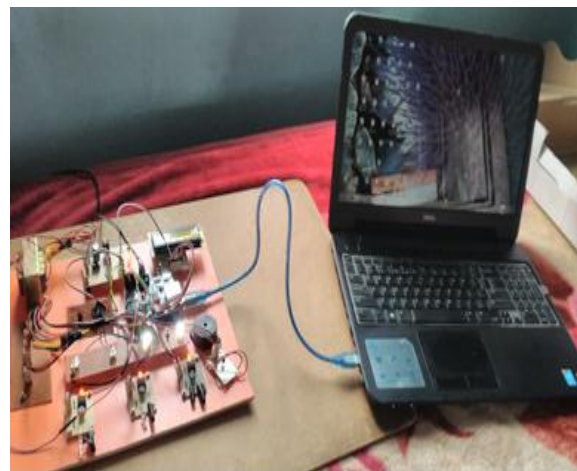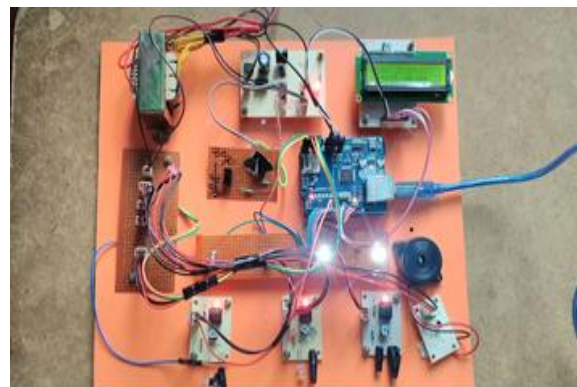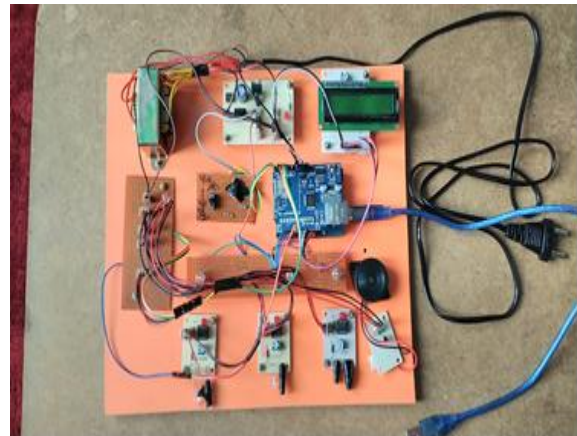
The Fig 4 depicts the second phase where one and two LED's glows for few seconds and then switches off when vehicle pass on.

The Fig 5 depicts the vehicle movement or object movement. As shown in the fig, the third streetlight is switched on as it detected the object. Immediately, as the vehicle passes by, these lights are switched off and the next block of lights are switched on.

5. Conclusion

By using Smart Street light, one can save surplus amount of energy which is done by replacing sodium vapor lamps by LED and adding an additional

feature for security purposes. It prevents unnecessary wastage of electricity, caused due to manual switching of streetlights when it's not required. It provides an efficient and smart automatic streetlight control system with the help of IR sensors. It can reduce the energy consumption and maintains the cost. The system is versatile, extendable and totally adjustable to user needs.

- The system is now used only for one way traffic in highways.
- Continuous use of LDR and IR sensors even in day time.
- Not switched on before the sunset

The Smart light system can be further extended to make the current system in two-way traffic, making the system more flexible in case of rainy days and introduction of ways to control the lights through GSM based service

6. References

[1]. http://opensourceecology.org/wiki/Automation

[2]. S. Suganya, R. Sinduja, T. Sowmiya& S. Senthilkumar, Street light glow on detecting vehicle movement using sensor

[3]. K. SanthaSheela, S.Padmadevi, Survey on Street Lighting System Based On Vehicle Movements

[4]. Srikanth M, Sudhakar K N,ZigBee Based Remote Control Automatic Street Light System [5]. M.Abhishek, Syed ajram shah, K.Chetan, K,Arun Kumar, Design and implementation of traffic flow based street light control system with effective utilization of solar energy, International journal of Science Engineering and Advance Technology, IJSEAT, Vol 3, Issue 9, September -2015

[6]. C.Bhuvaneshwari, R.Rajeswari, C.Kalaiarasan, Analysis of Solar energy based street light with auto tracking system, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol 2, Issue 7, July 2013

[7]. Steve Chadwick,"Street Light Monitoring – a Practical Solution magazine" November/December 2002

[8]. "Intelligent Street Lighting System Using Gsm" International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726Volume 2 Issue 3 March. 2013

[9]. "Wireless internet lighting control system",Budike, E.S. Lothar (Power web Technologies), US patent 7,167,777, Jan 23, 2007.

[10]. https://en.wikipedia.org/wiki/High-intensity_discharge_lamp

[11]. http://www.hobbytronics.co.uk/arduino-uno-r3

[12]. Tarun Agarwal. Retrieved from https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF.