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Research Paper

Analysis on IoT based dynamic street light control system

M.Srinivas [1]*, T. Naga Siva Ram [2], P. Kanthi Aishwarya [3], K.L. Priyanka[4]

KLEF, vaddeswaram, Guntur district, AP, India
**Email: srinu_cse@kluniversity.in:*

Abstract

The Dynamic street lightening system is designed for energy saving through automation, which is best ever solution for electric consumption as the manual operation for the lightening system for the smart cities is difficult to operate also because of human negligence and maintenance cost is more. Light dependent resistor is used to sense the light intensity measure and transmits the statistics to micro controller and work accordingly that is if the intensity of light increases then the light will be in off mode and if the intensity of light decreases then the light will be in on mode. Through internet connection the status of street lights can be identified through a communication channel called GSM. If at all any light fails to work then alert message is send to the mobile through GSM mobile terminal. This reduces heat emissions, power consumption, maintenance, replacement costs and carbon monoxide emissions.

Keywords: *AT89S52 Microcontroller; GSM module; capacitor; Relays.*

1. Introduction

The lighting of street is considered as one of the most important energy expenses for a metropolis. a savvy avenue lights framework can lessen city road lights charges as lots as half of - 70%. A clever street lighting fixtures framework is a framework that modifies slight yield in view of use and inhabitance, i.e., mechanizing association of walker as opposed to motorcycle proprietor, as opposed to vehicle. This type of road light administration conveys the establishment of remote based framework for tracking and controlling the real utilization of the road lights by taking proper steps to utilize and decrease measures through strength molding and manipulate the street light controller. The street light regulator which is introduced upon shaft light consists of a microcontroller together with different sensors and remote module. The road light controller introduced in the city light shaft controls LED road lighting relying upon activity stream, conveys the information between every light present in the street. The information from street light controller is exchanged to the base station with the help of remote innovation. This method of process of framework can be done utilizing auto mode and manual mode. Control framework turns lights on or off based on the object at a distance which is set to the light and it acts accordingly.

2. Components

2.1 AT89S52 Microcontroller

The AT89S52 is CMOS device containing flash memory with built in 8 Kilobytes and also it is a 8 bit micro controller with high performance using low power. AT89S52 is Atmel's technology which means it is a non-volatile and high density memory. AT89S52 with the combination of on chip programmable flash memory on single monolithic chip and CPU of 8 bit is available in reasonable price so that we can use in many applications. The AT89S52 offers these following: 8k bytes of flash, watchdog timer, facts, tips, three 16-bit timer/counters, whole duplex serial port, on-chip oscillator, 256 bytes of RAM, 32 input/output strains, and clock circuitry. Further, AT89S52 is used to provide a better experience in a proper way such that the frequency will be zero and allows software utility to select strength saving modes. Ram timers/counters, interrupt device and serial port keeps functioning, at the same time the idle mode stops CPU. Until the hardware is reset, the power-down mode stops the oscillator, but saves the RAM, by deactivating all chip abilities.

2.2 LDR

A Light Dependent Resistor is a tool in which resistivity changes with light intensity and functions on incident electromagnetic radiation. Consequently, this allows them to be used in sensing circuits. They will be additionally referred to as image conductors and photocells. They are made from semiconductor substances consuming immoderate resistance. LDR is an optical phenomenon in which conductivity of materials diminishes on the equal time as light is absorbed through the fabric.

2.3 Relays

A relay is generally electromechanical tool, prompted over the AC current. Consider two circuits; current flown in one circuit stimulates the second circuit on/off mode. Even though relays are commonly related to electrical circuit, there are numerous differing types, consisting of pneumatic and hydraulic. Relays are specifically made for 2 fundamental tasks. One of it is low-slung voltage software and the alternative was excessive voltage. For low-slung voltage programs, greater importance is given to decrease the sound of complete circuit. But for excessive voltage programs, they are especially considered to reduce arcing.

2.4 Capacitor

Capacitor is a device which stores electric energy which consists of one or more pair of conductors which are separated by an insu-

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lator. The impact of a capacitor is called capacitance. Capacitors are mostly used for blocking of direct current while allowing alternate current to pass through it. The non-conducting dielectric acts the capacitor's charge capacity to be increased.

2.5 GSM module

The GSM connects various mobile telephones over a cell network within a region. GSM is an open and digital cellular technology which is used for transmitting data services and mobile voice operates at 850MHz, 1900MHz, 900MHz and 1800MHz of frequency bands. Some of the nations like the US use these types of frequencies which are allocated to them.

3. Related work

Ouerhani ct. All [1] the proposed project , is the switching of circuit based on the light intensity and turns off after a time. In the project, streetlight gets ON/OFF in middle of night and based on the intensity of light at day time in this paper the development of GSM had been used in which switching on or off circuits uses GSM. Power consumed is controlled, with the useful resource of reducing and sparkle the strength on the acknowledgment of any inquiry the usage of LDR sensor. Sharma ct. all [2] proposed the project is primarily based on automatic avenue light shape and the unpredictable method for utilization with embedded system mechanical assemblies. On this form the object-based sensor is used to understand the development of the project out and approximately rather than the usage of infrared based sensor. AMSP430 named microcontroller acts as a cerebrum to govern the method which is included. This paper gives a response for controlling the strength of the light thinking about the development everywhere inside the location. Bhaskar S. S. ct. all [3] proposed the project is predicted to recognize the car improvement at the turnpikes to update on a best square of the street moderate before it and kill the trailing mild to shop imperativeness. Inside the midst of the night time each one of the lights on the interstates remains on for the auto, however bundle deal of essentialness is misused at the same time as there's no car improvement on the thoroughfares. In this paper simplest one shape of sensors has been used this is mild dependent resistor sensor. Rajput ct. all [4] proposed the project automated road mild manipulate device isn't always recently least asking for yet furthermore the intense method. Hand-off uses as a custom designed switch in the present gadget. At the element while the light is going under the discernible range of eyes this gadget subsequently switches on the light. LDR identifies the light in the same way as our eyes do. On the component at the same time as the daylight comes, unmistakable to our eyes it usually kills lighting fixtures. Such kind of shape is in the like manner accommodating for diminishing imperativeness usage. Mohamed. ct. all [5] proposed the project is based on roughly with LDR sensor, GSM is used for advising the fame of people use, slight electricity and path moderate on or off fame to the fragment to avoid the wastage of essentialness through shimmering avenue lighting in unfortunate districts. The complete form is labored through the usage of using made imperativeness source called solar based along with battery help. The LDR sensor senses the light energy of a specific area and transfers the information inside remote to the EB territory through GSM. Based on the information given, based on the information the controller will switch on the light by detecting far flung correspondence on the road. This type of system is best suitable for lighting the streets in remote urban and the capital towns of a country where the present activity is low now. Saad.M. ct. all [6] proposed the project that the street light will be switched on and will be offed in an automatic manner by using microcontroller. Microcontroller is worked as the main root to control the system. This can reduce the loss of power and this paper gives the best solution to consume power sources. In this paper we also use LDR sensor to detect the light and photoelectric sensor to sense the displacement on the street. The programming language used to develop this microcontroller is C language. Archana. G ct. all [7] proposed the project that this paper mainly concentrates on power consumption. On this form the object-based sensor is used to understand the development of the project out and approximately rather than the usage of infrared based sensor. Murali Siva ct. all [8] The paper is targeting only the requirement of machine-pushed road light-weight device and additionally typical technique of implementation with embedded gadget gear. At some stage in machine the piezo electric device is hired to observe the motion of the component on the road in place of mistreatment Infrared tool. The microcontroller msp430 acts as a main root to control the approach concerned. Nitin Kumar ct. all [9] proposed the project is supposed to be study the car motion on the highways to alternate on totally a mass of street lights in advance than it and flip off the trailing light-weight to keep away from wasting energy[20-25]. At night time all of the lighting fixtures on the main road stay on for the automobile, however heap of power is lost if there is no vehicle motion on highway. 2 kinds of devices had used which are lightweight sensor and icon electrical device. Alexander Omoregie ct. all [10] proposed that the main purpose of this street lightening system is that to control the electricity wastage by applying the process of automation of street light control system by using sensor. Here LDR sensor is used to control or reduce the wastage of electricity and it also acts as a light detection sensor. This LDR sensor detects the light and then switches on if the intensity is low and switches off during the darkness. Introduces the manual work and saves the power. Kapse Sagar Sudhakar ct. all [11] proposed the paper where light automatically turns on the street light in form of LEDs or bulb together with relay, it is sufficient to understand those objects nearby. This circuit is very much easy to implement, and battery power consumed by circuit is very low because of the very less components used in this circuit. Mustafsaad ct. all [12] proposed this project which test out the quantity of light. If presence of light on roads is 80 percentage available, then lights are automatically turned off. But if quantity of light is less than 80 percent, lights get automatically turned on. According to its requirement one can also adjust it. To detect intensity of light, light sensor is used. To sense amount of light available, PIC161F877A microcontroller is used interfaced with light sensor. After analyzing amount of light Control signal is generated with the help of PIC161F877A microcontroller.

4. Problem Definition

We had seen in extensive kind of towns in which road lighting fixtures are one of the largest power price for the town. Presently, we have got a manual tool wherein the light can be turned on within the nighttime in advance also during sunset and light will be switched off next day morning after there can be enough intensity of light. So, because of this reason there is lots of energy wastage while switching on or off. Moreover LDR's are of low price and maintenance cost is low.

Risks of present System

- Extra electricity consumption.
- High price.
- Guide switches off/on of avenue lighting fixtures
- More manual power

Advantages of the Proposed System

- Wi-Fi Communication.
- Energy is saved.
- Reduction of manpower.
- Reduction in maintenance cost.
- Automated switching of road lighting.
- Reduction in CO gas emission.

SNO	AUTHOR	PROPOSED WORK	ADVANTAGES	DISADVANTAGES
1.	Ouerhani.N	His work on this is an energy savings of 56% when related to that of static and time-based street light control.	Power consumption	Expensive
2.	Sharma.D	A Method to modify street light illumination a sensor used to detect the appearance of the object.	This reduces the heat emissions, maintenance	Time Consumption
3.	Anil. A. A.	Relay is used for automatic switching by using LDR sensor.	Reduces Time and Absence of manual work	Maintenance Issue
4.	Khatav.G.	The determination is to explain clever street lighting system to achieve the mandate for flexible type of lighting systems.	Reduce energy by 40% and maintenance by 50%.	Expensive
5.	Mohamed, S. A. E	The main purpose of the system is to switch on the light only in the presence of vehicle and switch off when there is no vehicle.	Without disturbing the safety of the drivers and the visibility, huge energy is saved.	Difficult of implementation.
6.	Saad, M	This entire system mainly depends on photoelectric sensor.	Save your electricity and in return your money.	street light system is using timer controller
7.	Archana. G	This project mainly focusing on power saving in which all street lights lit in the evening but at midnight lights lit only if there is presence of vehicle.	This design not only extend the service life of lighting equipment but also achieve energy-saving power	Expensive to implement.
8.	Murali Siva	instead of IR sensors, here usage of piezo electric sensors is used to detect the movement of opaque body in the roads	Piezoelectric sensors act independently without any external power sources They do not cause any radiation exposure to the pedestrians and vehicles.	The piezo can't give digital HIGH, if any of automobile halts for longer time.
9.	Nitin Kumar	movement of opaque objects on highways are detected and switches ON only few of those street lights in forward distance of it and to switch OFF lights after vehicle goes. This saves energy.	Through this method power consumption is conserved.	When vehicle movement is not there, then lots of energy is wasted.
10.	Alexander Omoregie	After sensing the vehicle movement, data is transmitted to microcontroller in which it tends the light to switch on and vice versa. Street light status can be accessed through internet.	The manual operation of lighting system is eliminated here. . Also, Electrical power wastage is reduced	More Expensive
11.	M. A. Wazed	Based on the intensity of the daylight a circuit is designed and fabricated that can control the distribution line of a particular region.	The limitations can be controlled by placing the system in an appropriate location. The construction is so simple.	Time Consumption is high.
12.	Mustafsaad	In the evening before the sun sets the street lights in streets will be switched on and in the next day morning, they are switched off after sufficient light is present on the roads.	street light system using timer controller is the drawback in which it had been overcome, as the whole system depends on the photoelectric sensor	Time Delay and also high cost to implement.

5. Working Theory

This internal design of smart lighting system includes LDR, AT89S52 micro controller, relay, UART wireless module and GSM. The light dependent resistors are a device whose resistance decreases when light falls on it. Sunlight is detected by using LDR sensor, by sending information to microcontroller light gets either switched on or off, relays are used to update on off switches on the street. The common receiver is microchip that controls the computer's interface.

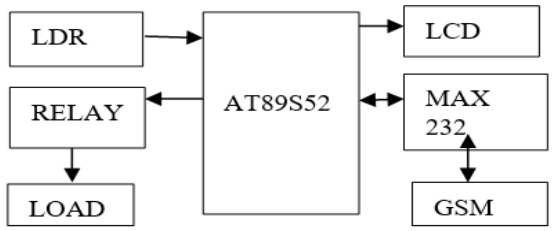


Fig 2: Internal architecture

6. Outcome

The primary task is to put the system inputs and outputs together to manipulate the street lights. The major interests have been to increase the cutting-edge day road light devices and find out a manner to keep them working. The predicted model is very beneficial and could full fill all the constraints and could be manufactured on a great measure.

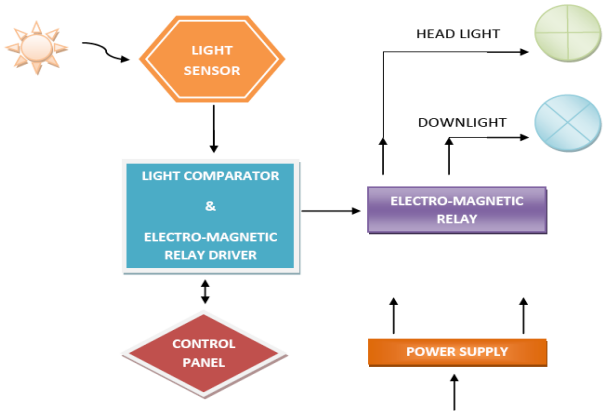


Fig 3: Model for Dynamic Street Lighting System

Right here the above fig three suggests that the whole operating model for IOT primarily established smart sensible lightening fixtures device for a smart city which comprises LDR's, modern sensor, at89s52 micro controller, GSM module, wireless module, relays. The model using obstacle detection on the street through LDR, which detects an impediment lighting obstacle detection that displays the smart light. By checking properly, the LDR repute, it will automatically gets switched on after detecting the object on the street.

7. Conclusion

As technology is increasing the streets get evolved by this smart lighting system which is powerful, sensible and most comfortable to maintain this tool. The information gained by this tool can be accessed anywhere. Saving power and furthermore decreasing the use of lamps is one of the most useful parts of this system. As the generation goes, the rightful use of these resources decreases the price of maintenance and can be used in phrases of periodic assessment. This smart street lighting system is integrating new technologies with ease of maintenance and saving energy, this is an ecofriendly and safe way to save the power.

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