

# An Renewable Energy Source for Street Light Safety System Using Sensor and GSM

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**Abstract** – Now a day, the bridges, lanes, flyovers and highways consume a substantial amount of energy, making improved efficiency a significant challenge. For improving the efficiency, Solar Photo volatile based street light system is very common. But there are some limitations with this ordinary system because of the lack of intelligent performance. It is very essential to automate the system so that we can conserve energy and to maximize the efficiency of the system. However, the highway engineering integrated with smart control for energy optimization and provided safety to the vehicle has not been widely used. In these paper new method is suggested so, as to maximize the efficiency of highway lighting system using solar panel and conserved an energy usage with the help of IR sensor and LDR. This system uses a LDR which provide low resistance at day time and high resistance at night time; accordingly system turns on night time. The information about the vehicle position between IR sensors is transferred by using PIC microcontroller and LCD displays the present statement about the vehicle and GSM send the message to the control station hence we can take the immediate action if required such a way safety provided.

**Index Terms**- Solar Panel, PIC Microcontroller, GSM Module, LDR, IR Sensor and Vehicle Safety.

## I. INTRODUCTION

Almost part of the country's infrastructure, roads and highways are essential for vehicle movement. Thus, they need to be safe and further secure. In order to ensure the latter in highways, lighting appears to be necessary especially in dangerous roads. Being able to properly see and observe that the presence of light is requiring to increasing the visibility of hazards in dangerous portion of highways [2].

In this system above problems, reduced by first designed, highly efficient system and second provide safety.

First designed, highly energy efficient street or highway lighting system found two possible solutions: The first one, and perhaps the most intuitive is Solar light poles are considered to be an efficient way to supply light without any lines installed. They represent a technology which saving the cost by their independence of wire, and by the use of green energy that does not require any recurring bills [2]. Solar poles are equipped with a solar panel, a controller, battery and LEDs. LEDs are being presented as an alternative to replace the conventional lighting system [11]. The main advantage of LED in proposed lighting system is: their long lifetime (100,000 hours) that is compatible with solar panel lifetime (higher than 25 years); which improves circuit efficiency and reduce the cost.

The second solution, generally, a street light is switched on for the whole night and during the day, they are switched off. Use of LDR which turn on the

system at night time, LDR (Light dependent resistor) is a photocell with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity means at the day time [8].

Second, providing safety, IR sensor used to detect the presence of vehicles and then LED lamp will turn on automatically. Yet another advantage with this system, it allows the control system to identify the current status of the vehicle between the IR sensors, whether vehicles are passing properly or not and can even analyse the vehicle stop between IR sensors. Because of this we will able to identify the vehicle position and GSM transmit the message to control room [8].

## II. LITERATURE SURVEY

Many research papers from reputed national and international journals are surveyed and few are presented here.

Gul Shahzad et al., [1] in this paper, a concept of traffic-flow-based smart (LED) street lighting for energy optimization is proposed. They developed smart grid architecture-based system uses low power ZigBee mesh network to provide maximum energy efficiency in response to adaptive traffic on the road. The scalable wireless network of smart LED lights offers improved reliability, reduced cost, and more user satisfaction. In order to validate the performance, the proposed system was implemented and tested in a real environment.

M. Magno et al., [2] This paper proposes a low cost, wireless, easy to install, adaptable, and this smart LED lighting system to automatically adjust the light intensity to save energy of lights and maintaining user satisfaction.

SakshiAnand et al., [3] proposed an intelligent street light system can detect vehicles and it varies the intensity of the street light by using LED lamps as per the traffic flow. It can also help in monitoring and controlling of the street light system and fault detection of the lamps through wireless technology.

Deepanshu Khandelwal et al., [4] proposed method to detect vehicle movement on highways to switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy.

Abdul Latif Saleem et al., [5] proposed that this system is developed for automatic street light maintenance and to reduce power consumption.

Akash R.B. et al., [6] proposed the objective of the project is to provide automatic control and monitoring on the street light. Also the streetlights can be switched ON and OFF through computer from central control station or can be automated using light sensors embedded in the street light pole circuit of the application.

R. Ramakrishnan et al., [7] proposed the design of energy efficient WSN based vehicle movement traffic safety system for highway lighting that we called vehicle detection for light providing system. This develops a system that would enable the efficient use of solar light poles.

Richu sam Alex et al., [8] proposed a new method is suggested so as to maximize the efficiency of the street lighting system and to conserve the energy with the help of ZigBee and sensors. It uses a sensor combination to control the desired system parameters.

Nallaparaju Venkata Kalyan [9] proposed a micro controller based design used to control remote display board and using the GSM technology to create the communication between microcontroller and mobile was designed.

S.R.Bharanialankar et.al.,[10] proposed status of the electrical appliances is analyzed using pressure sensors. This system is designed and programmed in such a way that it can listen, reply and execute the

commands only from the authorized person mobile number.

Fabio Leccese [11] proposed remote-control system can optimize management and efficiency of street lighting systems. It uses ZigBee based wireless devices which enable more efficient street lamp system. It uses a sensor to control the desired system parameters; the information is transferred by using ZigBee transmitters and receivers and is sent to a control terminal used to check the state of the street lamps

Prof. K. Y. Rajput et.al.,[12]proposed this system can detect vehicles and vary the intensity of the street light by using LED lamps as per the traffic flow. It can also help in monitoring and controlling the street light system and fault detection of the lamps through wireless technology.

There are some limitations like ZigBee range, energy wastage, complexity of sensors, high voltage lamps present in the above systems. To overcome the limitations present system implements;

### III. PRESENT METHODOLOGY

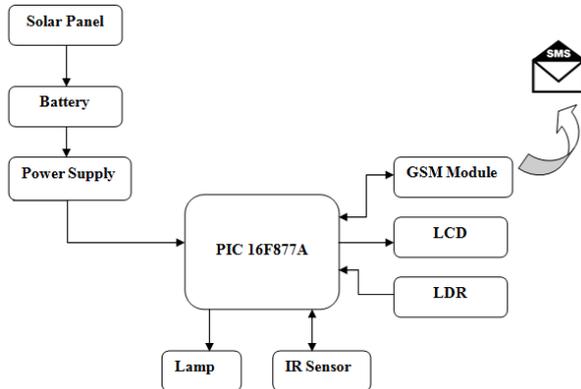
In the present system, the solar light poles in place throughout the portions of the highway that are designated to be lighted for their dangerous aspects. For an efficient lighting, a maximum distance of few m or cm between two poles is to be maintained. In a specific portion of the highway, every group of 3 poles is connected and controlled by the first pole of the group.

The block diagram of the proposed system is depicted in figure A. Here we employ a PIC16F877A so as to perform the controlling actions. We do employ certain sensors namely, IR sensor and LDR sensor. These all sensors are connected to the ports of the microcontroller through an interfacing circuit.

The main idea behind the system is that the LED array will be in off position at day time. During day time, if the intensity of light is lower due to weather conditions like fog, thunderstorm etc. then the array will get turned on. IR sensors will detect the presence of a vehicle. The LEDs will get turned on only if the IR sensor generates an output. This is done so as to minimize the power consumption. Here we need light only when it is needed. At night sometimes roads will be empty and hence there is no use of brighten all the LED lamps. So we can turn off set of LEDs and can conserve the power. Yet another key aspect of this method is that as we are used GSM we will be able to communicate with the control station and the station can analyze the current state of the vehicle and can check whether all the vehicles are passing properly or

not. The monitoring station located in a group of 3 lampposts consists of modules. IR sensor devices work together and transfer all the information to a microcontroller which processes the data and automatically send the message through the GA

**A. System Block Diagram**



**Fig. 1** Block diagram of a renewable energy source for street light safety system using sensor and GSM

**B. System Workflow**

- 1) Detect vehicle and scanned IR sensors
- 2) If vehicle found then switch the street light
- 3) Start timer
- 4) Set threshold value for timer indicate accident (e.g. >30 sec)
- 5) Compare current timer with value, if current value > 30 sec then generate alert (send sms)
- 6) Else continued

**IV. RESULT**

When vehicle in the motion at one point it will get detected by IR sensor and the light will glow, if the vehicle waits for the longest time on the same point then it will send the message through GSM as well as the message display on LCD.

**TABLE I. RESULT OF EQUIPMENT**

Equipment	Result
LED Lamp	Turn ON – If vehicle found Turn OFF – After passing the vehicle
GSM Module	Generate alert message, if there is detect vehicle longer time greater than set threshold value
LCD	Display message alert due to detection of vehicle



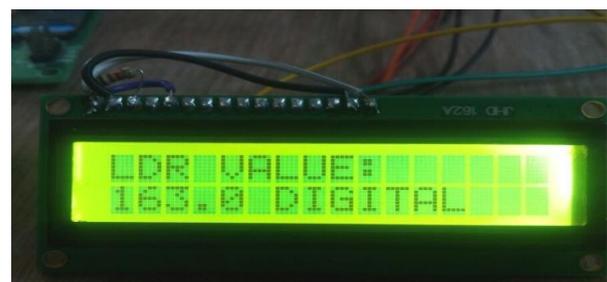
**Fig. 2 (a)** during night time led (lamp) turn ON after detecting vehicle movement



**Fig. 2 (b)** during day time led (lamp) turn OFF



**Fig. 2 (c)** during night time LDR value is maximum



**Fig. 2 (d)** during day time LDR value is minimum



*Fig. 2 (e) during night time, there is accident on road*



*Fig. 2 (f) during night time, there is no accident on road*



*Fig. 2 (g) message is send through GSM, if vehicle stay on one point more than delay time*

## V. CONCLUSION

In the present work of energy efficient vehicle detection safety system using GSM module is developed. This work includes the study of GSM module using sensors. The proposed system is a power saving technique for street lights by using LED lamps as replacement of normal lamps. These LED lamps supplied by renewable energy, solar panels, for which the cost of energy is independent from the power supplier prices. Each sensor controls the turning ON/OFF the lighting column. The street lights have

been successfully controlled by a microcontroller. With commands from the controller the lights will be ON in the places of the movement of vehicles and provides safety through GSM after detecting accidental of vehicle on roads.

## VI. FUTURE SCOPE

In order to detect of vehicle on various roads, future works can be focused on establishing a system with more sensor nodes and convey the message using Ethernet with respect to GSM module. The Ethernet can also be connected to the Internet so the authorized person can receive the information. Also in the future, it can be used to guess abnormal movements of vehicles.

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