Intelligent Street Light Controller with Security System

Vinothkumar N, Subhash V.K, Viswanathan T, Surya Prakash S

Abstract: ***This paper aims at efficient energy saving method for street lights and also to provide the security for human during emergency situations. The street lights are automated with brightness control based on the illumination intensity, tracking of vehicle or human movement. Thus, the street light energy saving can be achieved about 30-50% in comparison with existing system. Also, the theft indicator for solar panel, batteries and security camera is provided with finger scanners based security systems. It supports to call emergency services such as ambulance, fire and police during the emergency situations. The fast alertness can be achieved due to the Global Positioning System (GPS) based security system. Further, the security system can be linked with AADHAAR which prevents the misuse by any person subject to government approval. Hence the overall security for the streetlights as well as the humans can be achieved intelligently.***

Keywords: Energy conservation, emergency alert, street- light, PWM, fault detection, security

I. INTRODUCTION

The street light plays a major role in the today's life for safety purpose during night. Street lighting is a main concern for the government authorities in the countries because of its social stability. The street lights indirectly assistedthe reduction of crime rates in the street and also accidents in the streets. It provides an environment in which people can feel courage to walk alone in the streets during nights. Due to the today's modern busy lifestyle, people are less care about the street light ON/OFF, when not required. During day if light is ON then, its waste of power. Otherwise, if the light is OFF during night it'sunsafe for the society. So, to maintain the street light regularly with the reducedenergy consumption, the most reliable method available to us is automation. Automation plays a vital role in the world and in our daily life. Automation is preferred over manual 0peration everywhere, because of its advantage like power reduction, increase in efficiency etc. The energy consumption of street light can be reduced only, when automation plays a role in it. The street light consumes energy 18-40% in total energy. Around 2 & more lakhs street lights are installed in major cities of India and the total consumption of those lights is about in charges 19MW. It comes under the costof about 20 million per month. Most commonly used street light are high pressure sodium vapor (HPSV), Low pressure sodium vapor (LPSV) and Metal Halide (MH) lamps. The consumption range is about 50W-400W depending on the lumens requirement. Hence reduction in energy consumption will be great solution to reduce the electricity bill. Further, if the power consumption is reduced, the amount of carbon-dioxide produced during the electricity production can also be reduced. According to the CNCF the amount of carbon-dioxide produced for the production of 1KWH of power is about 0.94kg. Hence the global warming can also be reduced. The power consumption of the street lights can be reduced largely by replacing existing HPSV, MH lamp with the LED lamps. Thus, the energy consumed by the lamp can be reduced around 50-75%. Another method is to use the energy saving circuits which shall be provided 20-30% of reduction in power consumption. The energy saving circuit will control the ON/OFF of the street lights and also its intensity based on the movement of person or vehicles in the streets. The security is more important for any citizen in India. Most of the criminal activities, such as robbery, murder, chain snatching etc. takes place in public places like streets. The security for the women walking alone in the street during night is totally unsafe. Also, the maximum numbers of road accidents are happening in the streets or road. During emergency condition, such as road accidents, fire accidents and criminal activities the time was wasted to find out the exact place by the emergency service. Hence, if the emergency service can able to get the accurate coordinates of the place where emergency situation is occurred, they can able to reach the place earlier by the following the traffic free route with the help of navigation

II. EXISTING WORK

In this work[1],suggested that human being are not have the time to switch OFF the street lights which intern to choose automation in lighting using Light Dependent Resistor (LDR) and photoelectric sensor. It is [2] addresses the uses of the HPS lamps which requires higher consumption of energy. Light Emitting Diodes are more economic and cost effective which is most desirable in electric utility. In [3] suggested that the conventional street lamps presently using are build high intensity discharge tubes that possess major disadvantages such as hefty levels of power consumption. The proposed model provides a better solution with optimized management and efficiency. It uses LEDs and multiple sensors interconnected with ZigBee protocol that help in designing energy efficient method for controlling the street lights from a remote location; the information is transmitted point-to-point via ZigBee with centralized server. It enables checking in case of system failure.

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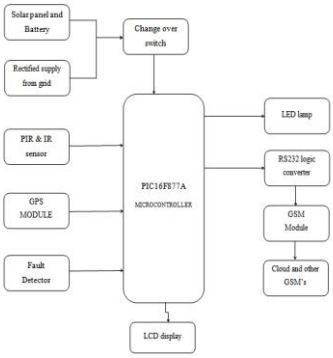

Fig. 1. Block diagram of proposed system

In[4] suggested that unreliable system for street lighting will be ineffective. The usage of image processing techniques with camera. In [5], suggested that solar based system will provide ecofriendly. In [6-10] suggested that efficient streetlight supervising and control system that can monitor and control streetlight more efficiently and can provide a safe night time environment for all road users including pedestrians. The proposed system uses the [11] ZigBee-based wireless devices which allow more efficient lamp management. It also discusses an intelligent system that takes automatic decisions for ON/ OFF/ DIMMING considering movement of vehicle The various architecture of communication system is addressed [12,14], in which ZigBee is the suitable for streetlight application. The efficient way of battery maintained can be done with proper design [13].

III. METHODOLOGY

The lamp is powered from the battery which is charged by the solar panel during day. If the battery is discharged or any failure occurs, the power is taken from the grid by rectifying it. For changing the connection, the changeover switch is used. The lamp intensity is controlled based on the signal from the PIR and IR sensor. The intensity is adjusted by supplying the PWM pulses to the lamp. If the PWM pulses supply to the lamp has 50% duty cycle, then the current consumed by the lamp will be reduced to 50%. The PWM pulses were produced from the PIC controlled.

The intensity is determined based on the PIR and IR sensor. The PIR sensor is used for detecting the human's walking in the streets. The IR sensor is used for detecting the vehicle movements. If both the PIR and IR sensor remains undetected, then duty cycle of the PWM pulses is set to 25%. If the IR sensor is alone in detected state, then duty cycle is set to 50%. If the PIR sensor remains detected, then the PWM

pulses are supplied at 100% duty cycle. The emergency switch will be placed in the street lights. Whenever the switch is pressed, then emergency message will be sent to all the emergency services with its accurate coordinates. The GPS is used to get the coordinates of the particular place and send to the emergency service with the help of GSM module. Every street lamp will have a unique number for it. It will be connected to the cloud. If any fault or theft occurs in the particular street lamp, then it will indicate on the cloud server. Hence, if the lamp is fused or any problem occurs in the street lamp then maintenance operator can easily identify and can able to take the remedial action as soon as possible.

IV. PROTEUS SIMULATION

The proposed work is designed and developed using proteusversion8.Insimulation,the PIR and IR sensor operation can be obtained using switches based on the logic level 0 & 1. The IR sensor will get activate during logic 1 and PIR sensor will get activate during logic 0.

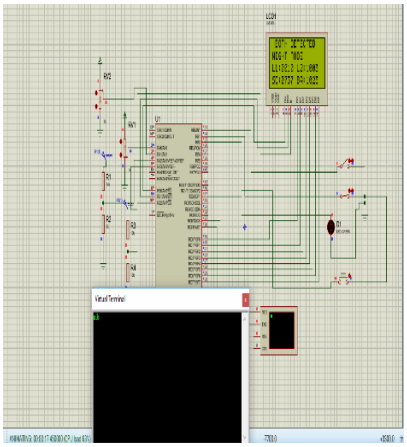

Fig 2: Output of a circuit when both the PIR and IR sensor get activate.

As, the solar panel and battery is not in the proteus, the voltage source is used. If the battery is fail, then the voltage will reduced nearly zero. If the battery is theft, then the voltage will accurately zero. Based on that fact the status of the battery can be display. The same fact can be used for the solar panel to display its working status. For alerting the emergency service a predefined value is stored in the controller, when emergency button was pressed its location is display using the virtual terminal. The program is done with the help of MPLab IDE. The predefined values stored for the emergency service are ambulance – 108.police – 100.fire service – 101 In Fig 2, both the PIR and IR sensor detects the object. At this situation street lamp will glow at 100% brightness.

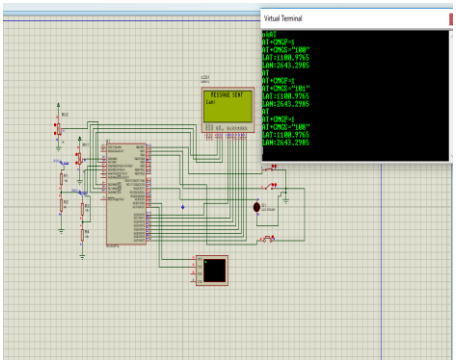

Fig 3: Output of a circuit when the coordinates was transmitted.

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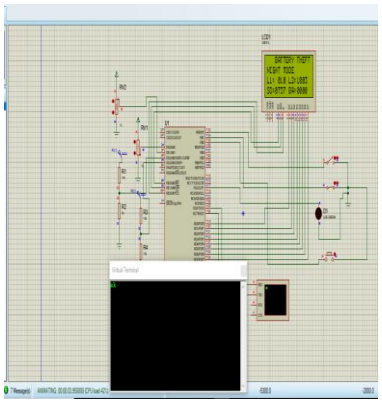

Fig 4: Output of a circuit when the battery was theft.

In Fig 3, the emergency button is pressed for alerting the emergency service. Thus, the coordinates are being transmitted to the emergency service, which is displayed in the virtual terminal.

In Fig 4, with the help of voltage source, the battery voltage is made to zero. By using that the controller will identify that battery is theft and displayed with the help of LCD.

V. HARDWARE RESULTS

The hardware made with the sensors and the control is done with the micro controller. The pulse width modulation technique is done with micro controller. The various results are taken and analyzed.

In Fig 5, the PWM pulses given to the lamp is shown. The lamp intensity is directly proportional to the amount of current flowing through it. Hence, current flowing through the current is controlled using the PWM pulses at 100%, 50% and 25%.

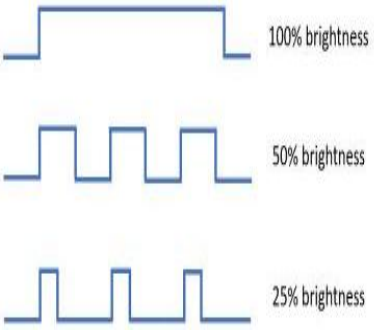

Fig 5: PWM pulses given to the LED lamp.

Fig 6: Fault occurring in the lamp will be indicating in the cloud.

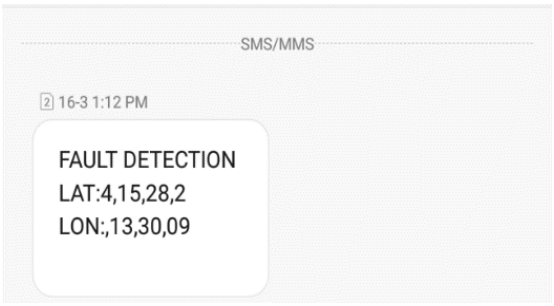

Fig 7: Co-originates which will sent to the emergency service.

In Fig 6, the status of the solar panel, battery and lamp is displayed in cloud. The location of the street lamp is also displayed with accurate coordinates.

In Fig 7, the coordinates sent to the emergency service is shown. The coordinates are sent to the emergency service can be done by GSM module by gathering the coordinates from the GPS module.

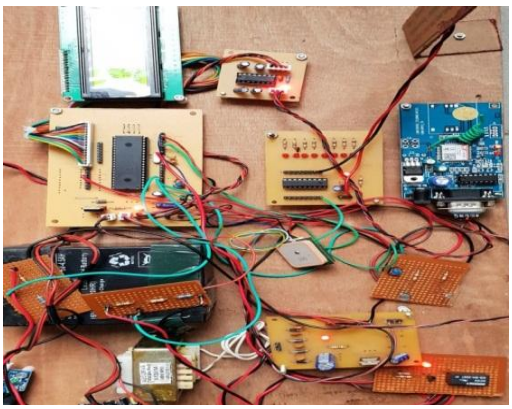

Fig 8: Prototype model.

VI. CONCLUSION

The proposed work provides the solution for the power wastage in the street light during unnecessary situation and security issues during the emergency. The prototype model developed here; provide the solutions are provided using camera, voltage divider circuit and the finger print based biometric system. The battery and solar working idea of the proposed system. The brightness control of the street light is based on input of the PIR and IR sensor. The PWM is developed based on the PIR and IR sensor O/P. The security panel's safety is ensured. The prototype model is developed for a single system. To implement in real time, the number of light has to be increased, each street light is addressed with unique number and the position can be detected using GPS, which can provide the emergency service to reach the location without any delay. In future, the real time street light shall be used. The biometric system provided the person who operates the system. Further, It can be linked with AADHAAR to avoid the misuse subject to approval and guidance of government.

REFERENCES

1. W. Yue, S. Changhong, Z. Xianghong, and Y. Wei, "Design of new intelligent street light control system," in Proc. IEEE International Conference on Control Automation, 2010.
2. ChaiyanJettanasen and SuntitiYoomak, "Comparative study of lighting quality and power quality for LED and HPS luminaires in a roadway lighting system," in Proc. IEEE Region 10, Conference, pp. 2173-2178,2010
3. ZeeshanKaleem and Tae Min Yoon, "Design and Fabrication of Automatic Street Light Control System", Engineering e-Transaction, Vol. 5, No. 1,pp 27-34, 2010
4. D N B Chakrapani, V. Naveen Kumar, Y Padma Sai, K ArchanaBhange, "Street light data acquisition using VLSI based object recognition", Computational Intelligence and Computing Research (ICCIC) 2016 IEEE International Conference on, pp. 1-4, 2016.
5. D. A. Devi and A. Kumar, "Design and Implementation of CPLD based Solar Power Saving System for Street Lights and Automatic Traffic Controller", International Journal ofScientific and Research Publications, Vol. 2, no;11, Nov 2012.
6. C. Chun, C. Hung, L. Kun, C. Kuan, and Y. Chun, "Energy Efficient Street Light Supervising and Control System," in Proc. FIT, 2014.
7. Elejoste et al., "An Easy to Deploy Street Light Control System Based on Wireless Communication and LED Technology," Sensors (Basel), vol. 13, no. 5, pp. 6492–6523, May 2013.
8. L. Chushan, W. Jiande, and H. Xiangning, "Realization of a general LED lighting system based on a novel Power Line Communication technology," in Proc. IEEE Applied Power Electronics Conference and Exposition, pp. 2300-2304,2010.
9. C. Ozcelebi, and J. Lukkien, "Exploring user-centered intelligent road lighting design: a road map and future research directions," IEEE Trans. Consum. Electron, vol. 57, pp. 788-793, May 2011.
10. Siddiqui, A. W. Ahmad, H. K. Yang and C. Lee, "ZigBee Based Energy Efficient Outdoor Lighting Control System," in Proc. ICACT, pp. 916-919,2012
11. Hengyu Wu; Minli Tang; Guo Huang, "Design of multifunctional street light control system based on AT89S52 single-chip microcomputer", IEEE 2nd International Conferences on Industrial Mechatronics and Automation (ICIMA), 2010.
12. Reza Mohamaddoust, AbolfazlToroghiHaghighat, MohamadJavadMotahari Sharif and NiccoloCapanni, "A Novel Design of an Automatic Lighting Control System for a Wireless Sensor Network with Increased Sensor Lifetime and Reduced Sensor Numbers", Sensors, vol.11, no.9, pp. 8933-89,2011.
13. Shobitjain, N. Vinothkumar, V.KumarChinnaiyan, Pradish.M and V. Arunachalam, "Survey on Smart Grid Technologies, Smart Metering, IoT and EMS" in second IEEE student international conference for Electrical, Electronics and Computer Science (SCEECS-2014) MNIT, Bhopal.
14. P. Thirumoorthi, Jyothis Francis and N. Yadaiah, "Power Conditioning In Battery Chargers Using Shunt Active Power Filter through Neural Network", International Journal of Advances in Engineering & Technology, March 2012, pp 306-314.

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