

Intelligent Street Lighting System using Wireless Sensor Network and LED

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Abstract— A gift card is a restricted monetary equivalent or scrip that is issued by retailers or banks to be used as an alternative to a non-monetary gift. Most of the gift cards issued by retailers are in paper form. Some of the e-commerce providers issue electronic gift cards. However, separate gift cards are issued by different retailers. It becomes cumbersome to manage all the gift cards. This paper proposes a solution for easy management of the gift cards with a single point of contact for user. A digital Gift Card Wallet would allow users to buy and save gift cards of multiple retailers.

Key words: Solar energy, LED, Zigbee, RGB Led, IR sensor

I. INTRODUCTION

Now-a-days, it became essential for people work during nights and returning back to homes late nights; also increasing crime rate during night times. This can be best achieved by implementing proper solar based lighting system on Streets. The efficient monitoring and controlling of this lighting system must be taken into account. We will get more power consumption, saving money through solar panel. Also saving precious time, decrease the huge human power through from the LDR, IR Sensors [1].

The lifecycle of an LED can be more than three times as long as an HID light. LED illumination could reduce the amount of time needed to exchange defective fixtures, and it is expected that an LED system would be comparatively maintenance free [2].

Lighting systems, particularly within the public sector, are still designed per the previous standards of reliability and that they don't usually profit of latest technological developments. Recently, however, the increasing pressure associated with the raw material prices and also the increasing social sensitivity to CO₂ emissions are leading to develop new techniques and technologies which permit significant cost savings and larger respect for the environment [3].

Solar Photovoltaic panel based street lighting systems are used. But the limitation with these ordinary street light systems is that it lacks intelligent performance. It is very essential to automate the system so that we can conserve energy as well as to maximize the efficiency of the system [4].

Due to the huge cost of energy, especially electricity, Efficiency can be one of the main ways to save energy in the world. Lighting consumes for around 20% of the world's total Electrical energy .therefore, the efficient lighting can save lots of energy.As a result of the increasing

traffic congestion and high population density and increase the proportion of cars and engines led to the use of a new type of technology, such as solar cell technology to reduce energy waste and environmental conservation.

The main objective of this paper is to realize a smart street lighting system based on ZIGBEE and RGB LED. So that to reduce the traffic congestion. And also use a new technique that reduces the energy consumption by using solar photovoltaic panel street lighting system, so as to take care of environment.

A review of relevant literature in accordance to the objectives of this Project were explored and adopted in order to solicit the right information needed for the analysis. Design based research methodology was employed to carry out this research.

Develop a street lighting system by using the renewable energy (solar photovoltaic) & design the lighting system after choosing the sensors &Microcontroller that used and simulation it's in Proteus simulation program.

II. LITERATURE REVIEW

The literature review gives brief idea about the existing system and how we are introduced new street lighting system. The main objectives to the systems are increased the material cost and social sensitivity to the environmental problems. So the manufactures give three solutions to solve this problem. They [5]-[9] are LED technology, remote control technology and solar technology. The newly proposed system combined three technologies such as LED technology, Remote control technology and solar technology and forming a good power save system.

III. PROPOSED SYSTEM

In normal position of road lighting be in the stopped state. Once the oncoming car to the road,LED lighting works. There are sensors in the first way, sensors in the road last and sensors in all lamppost. When the arrival of a car to the road gives a reference to the delicate lighting in order to work and show the way. Upon the arrival a car to the road gives another indication of delicate lighting to stop working.

In the street number S or N or W or E if the firstsensorsensevenor morecarsand the lastsensor did notgivea signalthe exit ofvehicles fromthe roadthismeans thata busyroad. In this caseif lightredLEDon the street, In this case your entire car coming from the other trends that can be seen busy road Climate direction in figure 1.

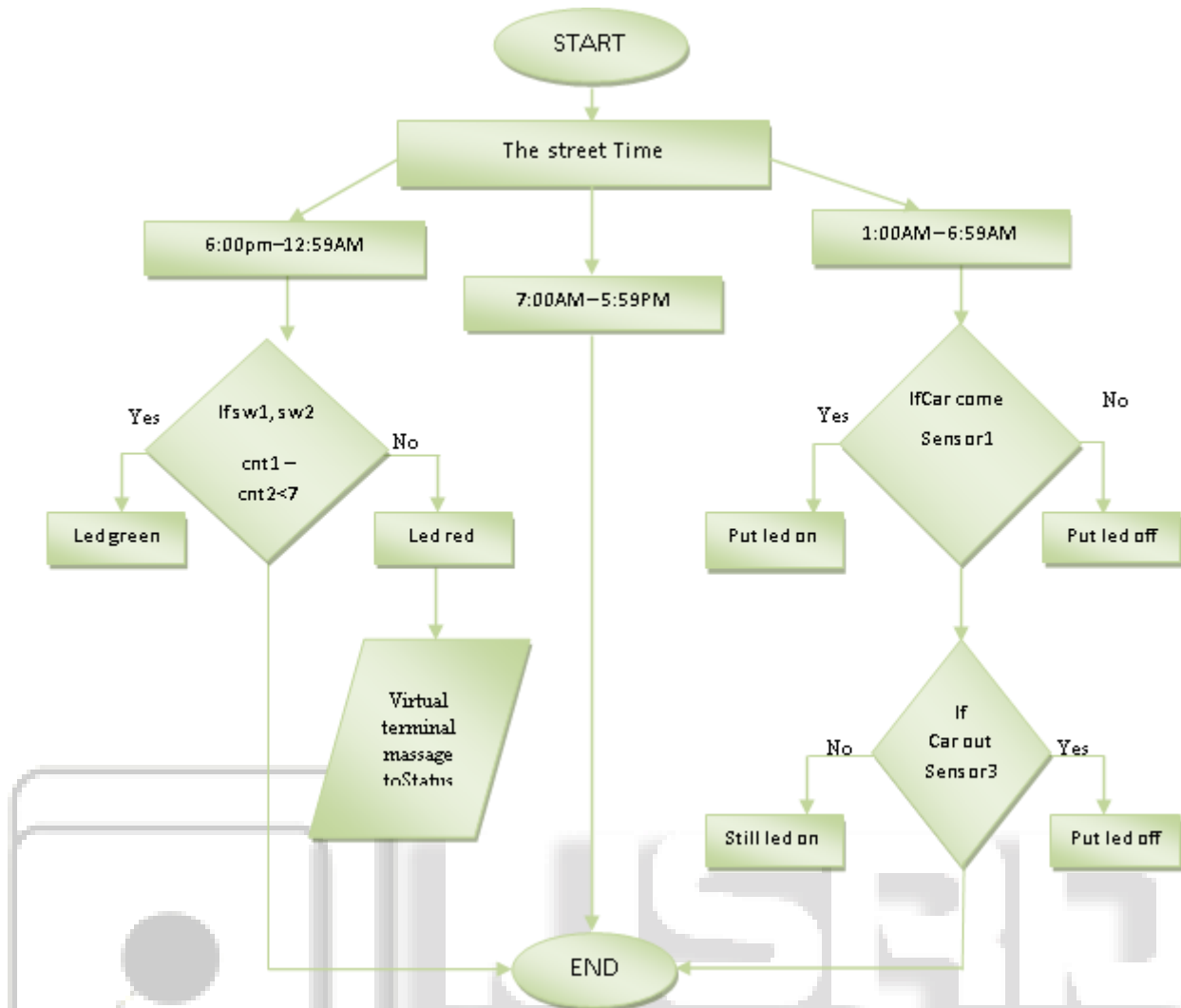


Fig. 1: Flow chart of the System

IV. OPERATION OF SYSTEM

There are three cases in this system

A. CASE ONE (Sleep case)

From 1:00AM to 6:59AM at this time the road is not busy or barely empty of vehicle. In this case it lights the way to be static and not working as shown in figure 2.

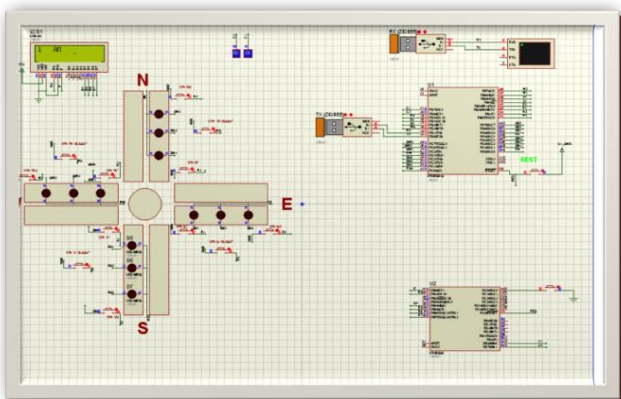


Fig. 2: LED off (sleep case)

If we use the road in case S the IR sensor (SW: S1) sense enter the vehicle to the road it sends signal to the MCU of the transmission unit .the MCU send this signal to the receiving unit through the zigbee module. Start lighting in

the work gradually, the purpose of the road lighting is to gradually reduce the energy used in lighting and preserved and used when needed. This situation applies to the rest of the streets N, W and E as shown in figure 3.

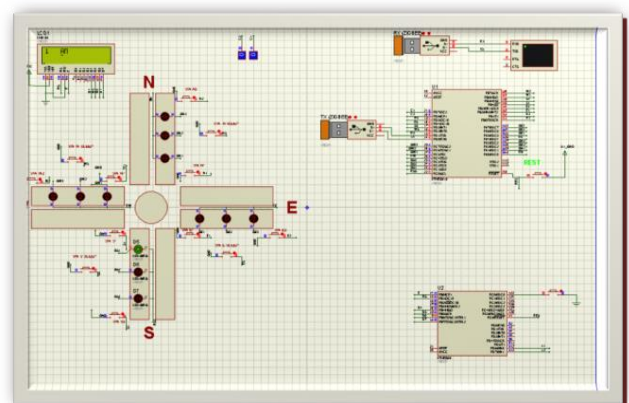


Fig. 3: LED ON gradually 1

When IR sensor (SW: S) sense the vehicle, then the LED (GN2) lighting as shown in figure 4.

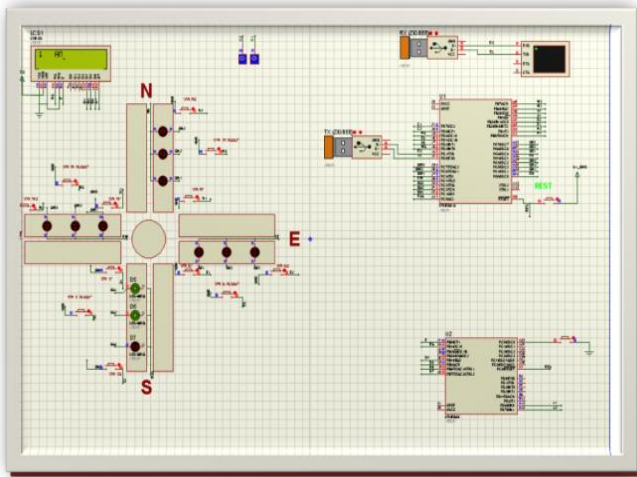


Figure 4: LED ON gradually 2

When sensor (SW: S2) sense the vehicle then the LED (GN3) lighting and after moment the all lighting in this road stop the working as shown in figure 5.

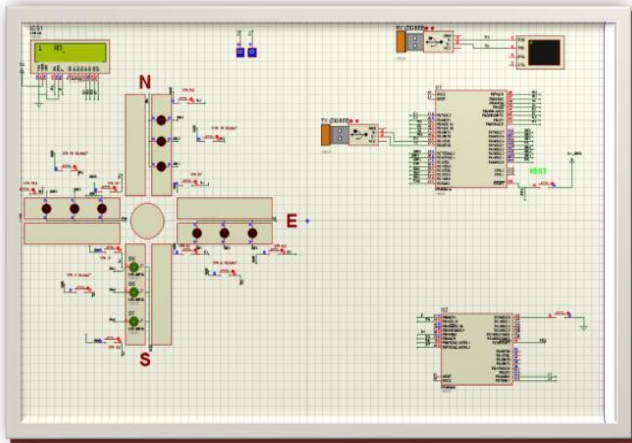


Figure 5: LED ON gradually 3

B. CASE TWO (Stop case)

From 7:00AM to 5:59PM in this time period in this case the system is not active and is off work as shown in figure.6.

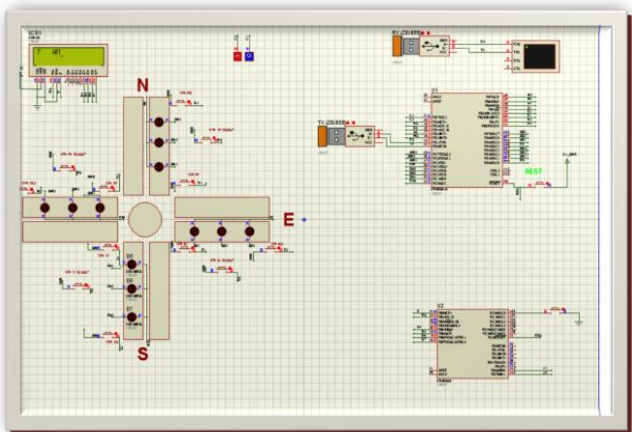


Figure 6: system off (stop case)

C. CASE THREE (Normal case)

In time of 6:00PM to 12:59AM in this case if the road is not crowded which means that the number of cars in less than

seven cars, LED the way lighting is green as shown in figure 7.

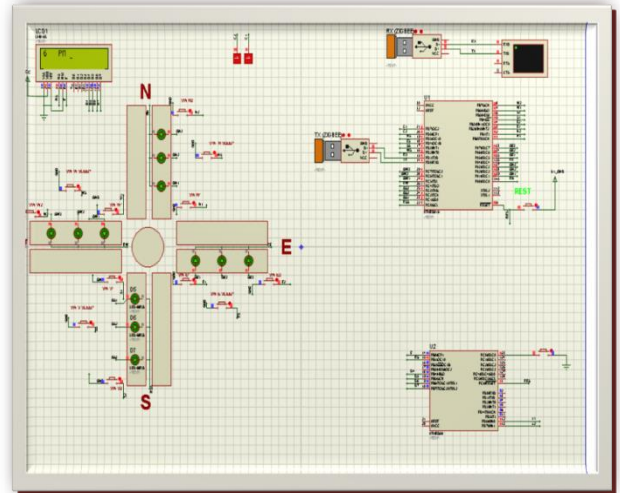


Figure 7: Normal case

When the sensors(SW:S1, SW:N1, SW:E1, SW:E1)sense inter the cars in roads, are sends message to the MCU of the transmission unit .the MCU send this message to the receiving unit through the zigbee module. Then the virtual terminal displays the number of the car in the street as shown in the figure8.

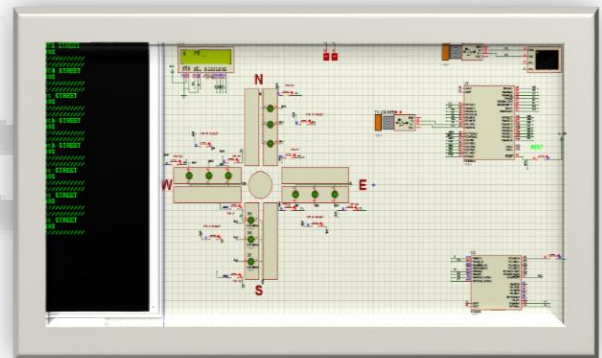


Figure 8: Normal case1

If we use the road in case N the IR sensor senses seven cars or more in the road it sends signal to the MCU of the transmission unit .the MCU send this signal to the receiving unit through the zigbee module. Then change the LED lighting from green to red and send a report contains street status to MCU of the transmission unit and the MCU repeater sends the same report to control unit through zigbee receiver as shown in figure 9.

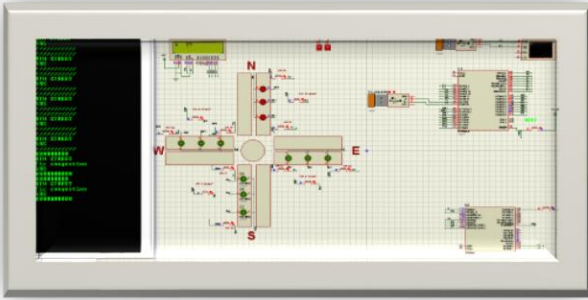


Figure9: Crowded road (Normal case)

V. CONCLUSION

Control of street lighting is described that integrates new technologies, offering ease of energy savings and reduce the power consumption of the street lighting system about 20-35% compared to conventional design . This is obtained by using the highly economical LED technology supplied by renewable energy provided by the solar panels and by using the intelligent management of the lampposts. The proposed system is especially appropriate for street lighting in remote urban and rural areas where the traffic is low at times. Independence of the power network permits to implement it in remote areas where the classical systems are prohibitively expensive. The system is versatile, extendable and totally adjustable to user needs. Resolve the problem of crowded the road by controlling the RGB LED. This system is fully automated and is using ZIGBEE so that the control station can analyze all the performance of the system.

REFERENCES

- [1] Archana M, Mahalahshmi R, "E-Street: LED Power Intelligent Street Lighting System with Automatic Brightness Adjustment Based On Climatic Conditions and Vehicle Movements", International Journal of Advanced Research in Electrical Electronics and Instrumentation Engineering (ISSN: 2320-3765), Volume No.3, Special Issue No.2, pp: 60-67, April 2014.
- [2] Fabio Leccese, Zbigniew Leonowicz, "Intelligent Wireless Street Lighting System", Environment and Electrical Engineering (EEEIC), PP: 958-961, May 2012.
- [3] Chaitanya Amin, Ashutosh Nerkar, Paridhi Holani, Rahul Kaul, "GSM Based Autonomous Street Illumination System for Efficient Power Management", International Journal of Engineering Trends Technology, Volume No.4, 2013.
- [4] B.K.Subramanyam, K.Bhaskar Reddy, P.Ajay Kumar Reddy, "Design and Development of Intelligent Wireless Street Light Control and Monitoring System Along With GUI", International Journal of Engineering Research and Applications (IJERA)(ISSN:2248-9622), Volume No.3, Issue No.4, pp: 2115-2119, Jul-Aug 2013.
- [5] Richu Sam Alex, R Narciss Starbell, "Energy Efficient Intelligent Street Lighting System Using ZIGBEE and Sensors", International Journal of Engineering and

- Advanced Technology (IJEAT) (ISSN: 2249-8958), Volume No.3, Issue No.4, pp: 41-44, April 2014.
- [6] Azpilicueta, José Javier Astráin, Francisco Falcone, Jesús Villadangos, "Easily Deployable Streetlight Intelligent Control System based on Wireless Communication", Ubiquitous Computing and Ambient Intelligence (ISSN: 0302-9743), Volume No.7656, pp: 334-337, 2012.
- [7] Samir A. Elsagheer Mohamed, "Smart Street Lighting Control and Monitoring System for Electrical Power Saving by Using VANET", Int.J.Communcation, Network and System Sciences (IJCNS), Volume No.6, pp: 351-360, February 2013.
- [8] Lakshmi prasad ,Keerthana , "Smart Street Lights", International Journal of student Research in Technology and Management (ISSN:2321-2543), Volume No.2, pp: 59-63, April 2014.
- [9] Dr. D.V.PushpaLatha, Dr. K.R.Sudha , Swati Devabhaktuni , "PLC based Smart Street Lighting Control", I.J. Intelligent Systems and Applications, Volume No.01, pp: 64-72, 2014.