International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 6.392|

||Volume 9, Issue 4, April 2020||

Automatic Street Lighting System Using PIR Sensor and Arduino Uno

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ABSTRACT: The project describes the design of an innovative and low cost self-assistive technology that is used to facilitate the control of street light by using electronic components. The purpose of this project is to design a prototype model of "Object Controlled Street Light". Also this will save energy by automatically switching ON and OFF street lights during night and day time respectively. In day time solar input provide about 18 volts and maximum battery voltage is 12 volts so battery is charged during day time using solar input.
When the motion from any vehicle will be detected through PIR sensor it will switch the relay to provide 100% intensity of lamp, and when the vehicle gets passed away the street light gets back to initial intensity state of 50% which will save a large amount of electric power.

KEYWORDS: Self-assistive, PIR Sensor, Automatically Switching, Solar Input, Prototype model.

I.ITRODUCTION

Smart street light system with automatic switching and intensity control, the main objective of this project is to implement an auto-intensity control of LED-based on Charge control circuit which is interfaced to an Arduino board. As we know the majority of light is during the morning time from 7'oclock till 6'oclock in the evening .this phenomena occurs majorly occurs but except the rainy reasons or days. Thus, the lights switch on at the evening and light intensity increases till midnight and regressively decrease till dawn and then finally switch off automatically. The process repeats every day. As stated earlier, application includes: path ways lights, street lights, head light in automobile and many at the different places around us. The goal is to reduce the amount of energy consumed and hence reducing the cost incurred due to energy loss thus proving to be a cost and energy effective strategy. This intelligent lighting system is an advanced and secured lighting solution integrating any kind of light, lithium ion battery and a PIR motion sensor in the front panel and circuit switches in the back. This system also has a secured system for the emergency occurring situations.
Example: At the time of no sunlight during the day time or in the improper working conditions of solar panel. It has a backup batteries which can serve up to 2 days without any disturbance. Electricity is one of the frequent and important demands for the people around us. We know that till now we have many efficient ways to generate the electricity and these conventional and dam based resource electricity need to be consumed at that very time or need a very efficient way to control the power and its production. Now days 60% of the electricity produced is used for the lighting system due to its continuous consumption during night time. In order to minimize the electricity consumption, wealthy technology has to be implemented for the street lighting system, Hence project discusses about the Lighting System, which reduces the wastage of energy and CO_2 emissions.

II.DESIGN OF SYSTEM

Design of Box: Our first package dimensions were about 15cm x 10cm x 5cm so that it can be easily placed near the solar panel. We were supposed to use the battery of dimension 6cm x 4cm x 1cm but it was not available in market so we used 12V battery with dimension 11cm x 5cm x 6cm. So, we choose our package of dimension 30cm x 20 cm x 10cm.

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Box Chosen: UPS Case: The size of box is appropriate to accommodate the whole circuitry. The microcontroller and the PCB board are placed at the upper side inside the box. Length of the wires is so chosen that the box can be opened and operated easily. The transformer and other components is so placed that it is not movable.

Arrangement of Street light:
Poles: Instead of using large poles, holders are used to replace them in model. In real case this system can be implemented on poles by attaching the circuitry to the end of poles.
Lamp: The poles or holders are connected to the LED which produce light. Here we have used 0.2 watts/led panel for lightning but in real life this system is suitable for high voltage operating lamps as well.
Location of Box: The box is so placed that it is approachable to the user for switching ON/OFF the Street light.

III.THE NEW SYSTEM

This design aims to reduce the carbon footprint and the overall costs of street lighting by integrating light-emitting diodes (LEDs) and wireless technology. The principle of operation is to efficiently control the intensity of the streetlights to respond to the needs of road users. The following is a list of requirements our system aims to fulfill such to solve the problems that the current lighting system presents:
Arduino: The Arduino will act as the processing unit. It will have the following functions:

- **Process Data:** It must process the data received from the various sensor and work accordingly.
- **Control Output:** This output controls the intensity of the light and power of LED's according to the results of data processing.
- **Communication with network interface:** It must be able to receive and send control signals through the network.
- **Dimming:** This involves adjusting the lighting levels of LEDs such that lower lighting levels are used when there are no persons or cars on the streets.
- **Control:** Intelligent algorithms will be used to smartly control the LED's to quickly respond to the needs of road or street user.
- **Power Consumption:** Adjusting the brightness level of lights introduces a problem of unmatched power consumption which affects power companies carefully forecasted usage. This is required in order to produce the correct amount of power such to over production.

IV.COMPONENT DESCRIPTION

Hardware Requirements: 1) Arduino Uno, 2) Power (USB or Barrel jack), 3) Power Led Indicator, 4) TX RX LED's, 5) Voltage Regulators, 6) Relay's, 7) PIR Sensors, 8) Resistors (15k, 10k, 4.7k, 1k), 9) Capacitors, 10) Diode (1N4007) 11) Zener Diodes (1N4739A, [9V])**,** 12) MOSFET (IRFZ44)**,** 13) Transistor (2N2222)
Software Requirements: 1) Proteus**,** 2) ISIS (Intelligent Schematic Input System), 3) VSM (Virtual System Modelling), 4) DIP TRACE, 5) COREL DRAW.

V.WORKING OF CHARGE CONTROL CIRCUIT AND CIRCUIT DIAGRAM

A solar model charge controller is main voltage or current controller to charge the battery and keep electric cells from overcharging. It collects the voltage and current hailing from the solar panels setting off to the electric cell. Mainly, 12V panels put out in the ballpark of 16 to 20V, so if there is no stoppage, the electric cells will be damaged from overcharging. Generally, electric storage devices requires around 14 to 14.5V to get fully charged. The solar charge controllers are available in all aspects. The unit range of charge controllers are from 4.5A and up to 60 to 80A. The circuit can be beater explain in the figure 1.
The solar charge controller circuit diagram comprises of the following hardware components: Arduino UNO microcontroller, MOSFET, BJT and few discrete components such as solar panel, rechargeable battery, resistors, capacitor, diodes, charge control and load control. The system diagram is shown in figure 2.

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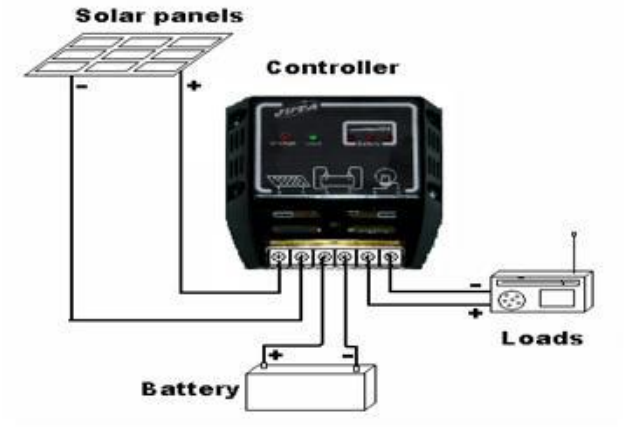

Fig 5.1 Working of Charge Controller Circuit

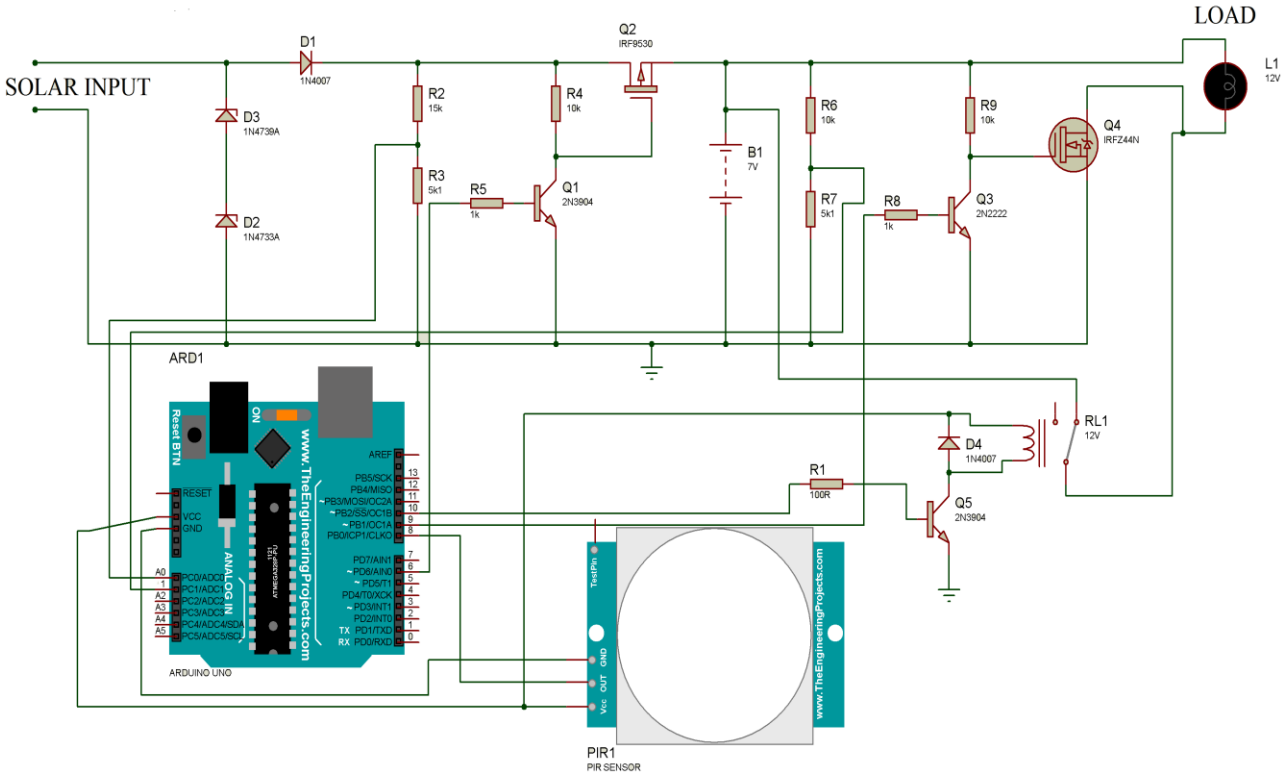

Fig.5.2 Circuit Diagram

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VI.RESULTS & DISCUSSION

SIMULATION RESULTS:

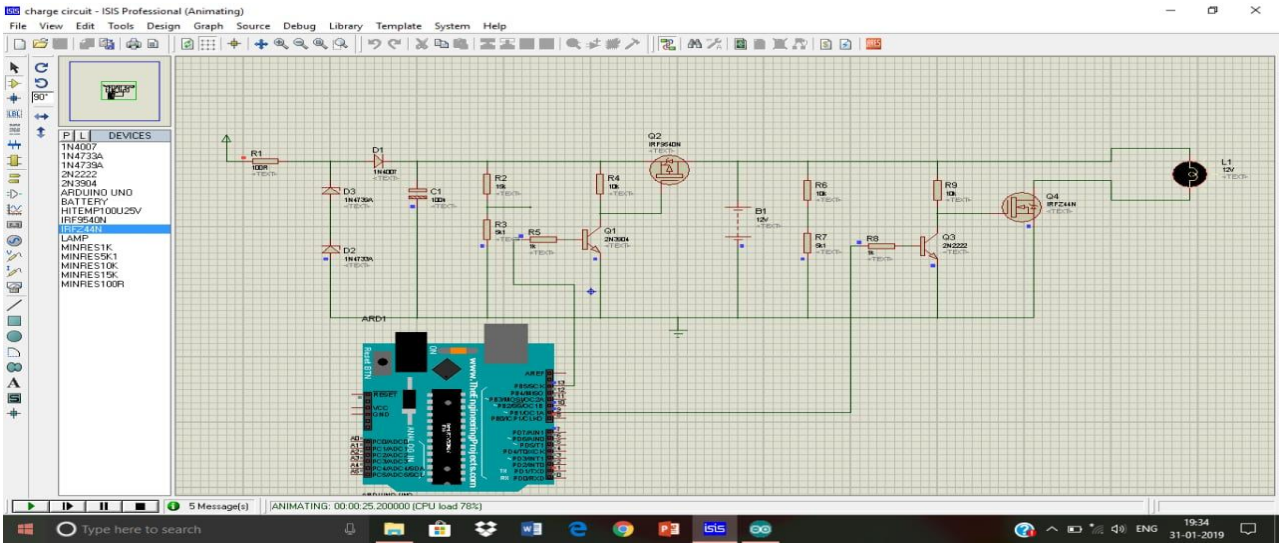

Fig. 6.1 Interfacing with Relay

HARDWARE OUTCOME:

This is intensity controlled street lightning system which is used to save the power consumption by street light at night. First action is done by charge controller circuit which turns circuit ON and OFF automatically during day and night, and also charges the battery in day time. Once circuit is ON during night then PIR sensors come in action. When PIR sensor detects the motion of any vehicle it sends signal to microcontroller and then microcontroller changes the intensity of LED lamp that will be mounted on the pole. Once vehicle have passed through the sensor, the intensity of lamp is reduced to basic i.e. 50% intensity and remains at same until next vehicle comes

Fig.6.2 Complete integrated System

ARDUINO INTERFACING:

The VCC port of Arduino must be connected to 12v supply and ground port must be grounded properly.

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All connection of Arduino must be neat and proper and wires must not short with each other.

Fig. 6.3 Interfacing with Relay

CHARGE CONTROLLER CIRCUIT CONNECTOR PORTS:

The charge controller circuit ports should be connected to a 12 V battery through provided plug at the backside of UPS box. Also pins are available for solar input that can be connected to the solar output. Arduino defined pins and Load for the respective compression according to various defined condition.

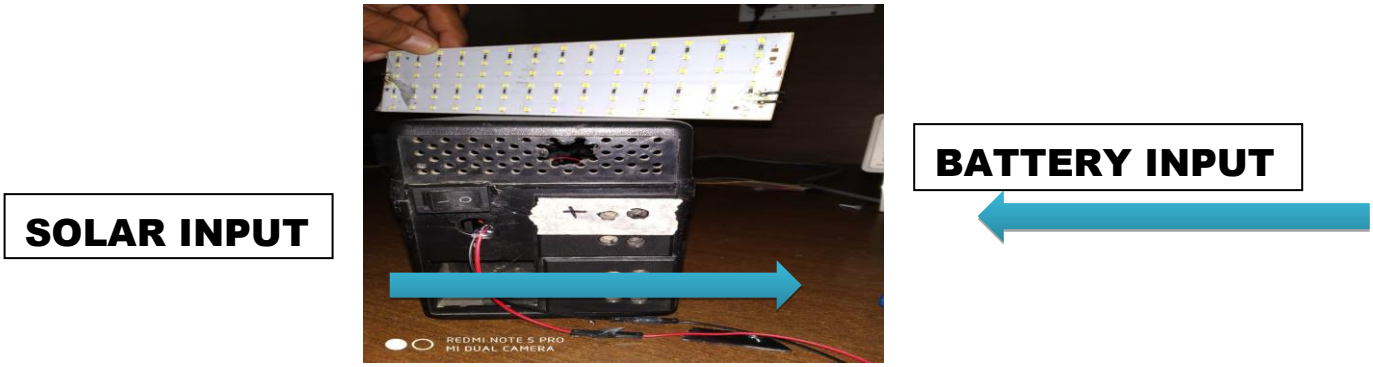

Fig 6.4 **Charge controller circuit connector ports**

VII.EXPANSION

This present street light system can be modified in the future with inclusion of certain unique features that will help to improve its functionality and provide more comfort to the user. Certain features than can be added to the present system are:

1. Narrow-Band Amber (NBA) LED Street Lamps:

Narrow-band amber (NBA) LED street-lights are the smart and Emerging new technology. In place of emitting all the colors of the rainbow and a lot of blue light, they emit mostly in the yellow. They have good color rendition, meaning that they do not make the surroundings look grey like LPS lamps do. Because this technology is so smart, these bulbs are not widely available and as such, are still expensive and less available. They are very efficient and compatible.

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2. Wireless street lights:

The present street light can be made wireless and more attractive by using wireless connectivity between the lights to make the connection.

3. Reduced Distance between solar panel and UPS package:

In future expansion the distance of solar panel and UPS package containing the circuitry can be reduced by keeping the box near to the solar panel so as it provides proper current value of solar panel to the circuitry. If the distance is large then the current loss takes place through wires.

VIII.CONCLUSION

This project focuses to the design and construction of automatic light control system circuit. Circuit works properly to turn lamp ON/OFF. Charge controller circuit is the main conditions in working the circuit. If the conditions are satisfied the circuit will do the desired work according to specific program installed in it. The lights has been successfully controlled by using microcontroller of the Arduino. With commands from the controller the lights will be ON in the places of the movement when it's night. So this control circuit can be used in various purposes in various fields.

IX.FUTURE SCOPE

Operating control: This sensor will be useful to improve fault management and system maintenance.

ZigBee network: ZigBee is a technology of wireless communication based on the IEEE802.15.4 standard for communication. In proposed system, the network is built in such a way that it transfers system information from the lamp posts to the base station control.

REFERENCES

[1] "Intelligent Street Lighting System Using Gsm", K.Y. Rajput, G. Khatav, M. Pujari, P. Yadav, "International Journal of Engineering Science Invention", Vol2, Issue 3, March 2013, PP. 60-69.

[2] "Voice operated intelligent street light" by Ms S.D suryawanshi, Mr. J.S Chitode, Ms.S.SPethakar ,"International journal of Advanced Research in computer science and software engineering" volume 3,Issue 5, May 2013.

[3] "Intensity based smart street light using Arduino" by Prathyusha, K.S Roy Mahaboob Ali Shaik, 'International Journal of Engineering Trends and Technology (IJETT) Volume 4 Issue 4 April 2013.

[4] "An intensity based street light" by Gabriel Pires and urbansNunes "Journal of intelligent and street light systems "34:301-314, 2002.

[5] "Design and Implementation of CPLD based Solar Power Saving System for Street Lights and Automatic Traffic Controller", by D.A. Devi and A. Kumar "International Journal of Scientific and Research Publications, Vol. 2, Issue11, November 2012.

[6] "Automatic Street Light Intensity Control and Road Safety Module Using Embedded System", by R.Priyasree, R.Kauser, E.Vinitha and N. Gangatharan "International Conference on Computing and Control Engineering", April 2012.

[7] "Smart street lights – A literature society" by Richard Simpson "Journal of Rehabilitation Research and Development", Volume 42, Number 4, Pages 423-486 July/August 2005.