IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Arduino Based Solar Tracking With Smart Street Light

[1]Sana subramanyam, [2]Janga Rahul, [3]Kukkala Harish, [4]Anavena Ajay Kumar, [5]Durshetti Nivas, [6]Suroju Manisai

[1]Associate Professor, Department of ECE,Jyothishmathi Institute of Technology and Science,Karimnagar
[2,3,4,5,6]B.Tech Final year students, Department of ECE,Jyothishmathi Institute of Technology and Science, Karimnagar

Abstract: In the recent years the demand is increasing day to day. It is found that large quantity of electricity in many countries is consumed in lighting the streets. Most of basic street lighting systems are switched ON/OFF at regular intervals of time. In this project the system is to develop a street light energy saving control system to reduce energy if no vehicles pass through certain roads. This paper suggests a low-cost Arduino microcontroller-based solar street lighting system that is energy-efficient. The primary goal is to provide energy-efficient solar streetlights for smart cities only, as well as for current lamps in rural and urban areas. The LDR luminaire, LDR driver, PV panel, charge controller, light sensor, motion sensor, and Arduino make up the system. The smart streetlight is adjusted according to the amount of traffic on the road and the time of day or night. This paper suggests energy efficient of automatic street light by using Arduino. The main objective is to design energy efficient automatic streetlight for energy conversation in present streetlights of rural area, urban area and completely for smart cities. The system LED, solar panel, charge controller, Battery, Arduino. The system is set to automatically turn OFF during the hours of daylight and only operate during the night.

Keywords: Smart LED street light; Solar; servo motor; Street Lighting.

I. Introduction:

During the day, the solar energy is captured by the solar street lights. The photovoltaic cells transform solar energy into electrical energy, which is then stored in the battery. The lamp turns on by itself at night, using up the battery's stored juice. An automatic control facility is to be designed and provided by the system. The mechanical or electrical timers that were formerly used to turn street lights on and off have been replaced by smarter models called street light controllers.Because electricity production is less than the utility of electric energy, it is now unable to provide consumers with a steady supply of electricity. Saving electrical energy instead of producing it could be the answer. It is more cost-effective to save energy than to generate electrical energy. Street light monitoring is the ideal way to save energy. The goal of the

wireless sensor network-based street light monitoring system is to remotely regulate the ON/OFF/DIM of lights to reduce energy and maintenance expenses while extending lamp life.

The need for electricity is growing every day. Thus, energy conservation is essential in the current environment.Energy is consumed at the same pace as it is generated, which is enormous. Additionally, non-conventional energy, which is running out daily, is primarily responsible for the generation of electrical energy. In the current situation, energy consumption is rising in response to demand; either the same amount of power needs to be produced or power consumption needs to be decreased. There are roughly 500 street lights along the national route, and each one uses about 150W. The street light stays on all night long, sometimes even into the day. Consequently, the energy usage will rise to 75,000W when 500 street lights are taken into account. The following techniques, which are shown below, can reduce this enormous power use. The first method is to use infrared sensors to detect vehicle movement on national highways, which causes the street light to illuminate appropriately. As a result, there is a 30% reduction in power use.and the use of LDRs is the second method. This detects light, and during the day, the light doesn't glow. This results in a 20% reduction in power consumption. As a result, these methods lower power consumption by 50%.

II. Motivation:

Green technology and smart cities are quickly rising to the top of the global agenda for bettering the future. One of the technologies that facilitates work linked to green and environmental issues is the smart street lighting system. The development of smart cities is now based on technology that advances with wireless connectivity and low-energy street lighting [1].

In addition to facilitating efforts toward a brighter future, smart city technologies enable advancements in response and maintenance, where malfunctions or breakdowns within the deployment area can be detected nearly instantly, enabling prompt action from the appropriate individual.

One of the most crucial components of a city's infrastructure is street lighting, which serves the primary purpose of illuminating the streets during the evening hours. The design of road lighting systems should take into account a number of variables, including reducing crime and its environmental impact, providing cost-effective public illumination, and ensuring a safe night for the general public and other road users.In addition to facilitating efforts toward a brighter future, smart city technologies enable advancements in response and maintenance, where malfunctions or breakdowns within the deployment area can be detected nearly instantly, enabling prompt action from the appropriate individual.

Street lights are often turned on all night and turned off during the day, however if there are no road users at night, they are not required. Given the daily depletion of energy supplies, reducing energy usage is becoming increasingly critical. There are extremely few alternatives for natural resources, and their depletion could cause many issues for our future generations [2].

Among the benefits of the Arduino microcontroller system are its low cost, ease of use, straightforward and unambiguous programming environment, open source and expandable software, and hardware that can be expanded. This is the rationale behind the selection of the Arduino microcontroller as the system's controller [3].

III. Problem Statement

The street lights are frequently left on all night, which is a huge energy waste. Every day, the amount of power consumed is comparatively considerable. Like the major city streets, some streets are not always completely inhabited; occasionally, they are deserted for a while.
Based on the issue, street lighting was observed in order to enhance the control system and ensure proper operation of the street lights. Both energy usage and electrical waste can be decreased by implementing this technique. Therefore, it's critical to understand how to reduce the solar street light's power usage.

IV. LITERATURE REVIEW

[1].In this paper, Street Light Glow is a system that uses the newest technology for light sources, such as LED lighting, to detect vehicle movement using a sensor. Additionally, it is utilized to maintain wireless connection between lampposts and control terminals using the ZigBee Wireless protocol, build flow-based dynamic control statistics using infrared detection technology, and automatically switch street lights based on light intensity. Additionally, it integrates a number of technologies, including power transistors, photodiodes, LEDs, a timer, and statistics on the volume of traffic flow.

[2].In this paper, The device functions in automatic mode, controlling the streetlight based on light intensity and a brightness and dimness algorithm. Seasonal variation can be used to make the control. To save more electricity, it has an automated control pattern and a time cut-out feature. A PIC microcontroller was used to implement the entire project.

[3].In this paper, they describe the implementation of a traffic flow-based street light management system that uses solar energy efficiently in 2015. For street illumination, they turned to solar energy, a renewable energy source. Additionally, they have employed an 8052 series microprocessor, which was created by substituting LEDs for conventional light bulbs, resulting in a threefold reduction in power consumption. On either side of the road are sensors that detect movement of the car and communicate this information to the microcontroller, which turns the lights on and off. Here, every street light is turned off and only illuminates when it detects movement from a car.

V. METHODOLOGY

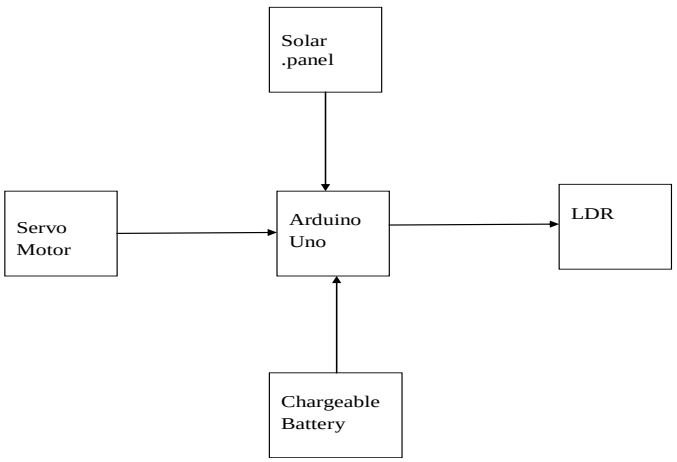

Fig 1: Block diagram of proposed method

The above fig.1 represents block diagram of the project carried out . The main aim is to reduce the power consumption by the street lights, the present situation is like the street lights on the national highway will be switched ON in the evening and OFF in the morning. But the actual timing of these street lights to be switched ON is when there is absolute darkness. With this the power will be wasted to some extent. This project gives the best possible solutions for the power wastage. In our project we are using LDR, whose resistance varies according to the

amount of light falling on its surface, this gives the indication whether it is day/night time. The IR sensors have been placed on both the sides of the road which are monitored by microcontroller. The IR'S will be activated only during the night times. If any obstacle that is vehicle or a person crosses IR automatically the light gets brighter till the obstacle crosses to certain distance and then the street light gets dimmer (less brightness). So as mentioned 50% of the power consumption is reduced. In this project we use microcontroller(ATMELGA328P) and a regulated voltage supply of 5V to the Arduino.

1.Solar Panel: One of the most crucial components of solar street lights is the solar panel, which transforms solar radiation into electrical power. Solar panels come in two varieties: polycrystalline and monocrystalline. Compared to polycrystalline solar panels, monocrystalline solar panels have a substantially greater conversion rate.

Fig 2:Solar panel

2. ARDUINO UNO: With the ATmega32 family controllers and an Integrated Development Environment for creating and uploading code to the microcontroller, Arduino is an open-source platform built on microcontroller boards. It features input and output pins for connecting to external devices including motors, switches, sensors, and more. Specifically, it features six analog inputs, 14 digital input/output pins, a 16MHz quartz crystal, a power jack, a USB port, an ISCP header, and a reset button. It has all the components required to support the microcontroller. It can be powered by a battery or an AC-to-DC adapter, or it can be supplied by USB. It receives inputs from the LDR, processes the information, and either sends the output directly to LEDS or via a transistor and relay.

The FTDI USB to-serial driver chip is not used by the Uno, which sets it apart from all previous boards. Rather, it has the Atmega16U2 (or Atmega8U2 before version R2) configured as a serial-to-USB converter. The SU2 HWB line is pulled to ground by a resistor on the Uno board, which facilitates DFU mode setup.

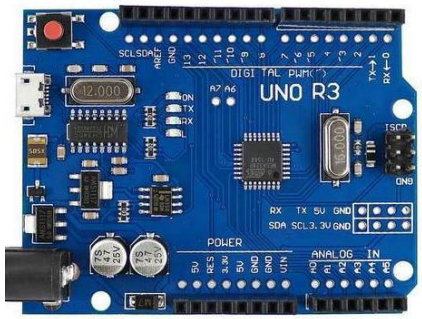

Fig 3:arduino Uno

3.Chargeable Battery: To prevent batteries from overcharging, a charge controller, also known as a charge regulator, essentially acts as a voltage and/or current regulator. It controls the current and voltage that enters the battery from the solar panels. The majority of "12 volt" panels generate between 16 and 20 volts, so overcharging will harm the batteries if there is no regulation. Then the logical question arises: "Why aren't panels designed to emit 12 volts?" The rationale is that if you do that, the panels will only generate electricity when it's chilly, ideal, and in full light. In most locations, this is not a reliable aspect of the situation.

Fig 4:Battery

VI WORKING PRINCIPLE

Solar street lights essentially function by automatically turning on and off at predetermined intervals determined by a controller that regulates the circuit. By the time dusk falls, the voltage drops to about 5V. This instructs the LED light to turn on and draw power.
The photovoltaic effect is the basis for how solar lights operate. With the aid of solar cells, solar panels capture sunlight and transform it into direct electrical current, which is then stored in solar batteries for later use using a charge controller.

Solar radiation is converted into electrical energy by photovoltaic solar cells. Through the use of a charge controller, the electrical energy that is received is stored in batteries. Typically, charge controllers are

employed to safeguard the battery. By utilizing Arduino to provide the necessary time delay, the circuit is made automatic, enabling the light to turn on at night and off during the day.

It is doubtful that the solar cells have fully charged if the days have been overcast most of the time. Weak electrical output from these batteries will result from this, which suggests that the lights won't last through the night. However, the photoreceptors will activate to turn on the lights if the sky suddenly gets overcast.

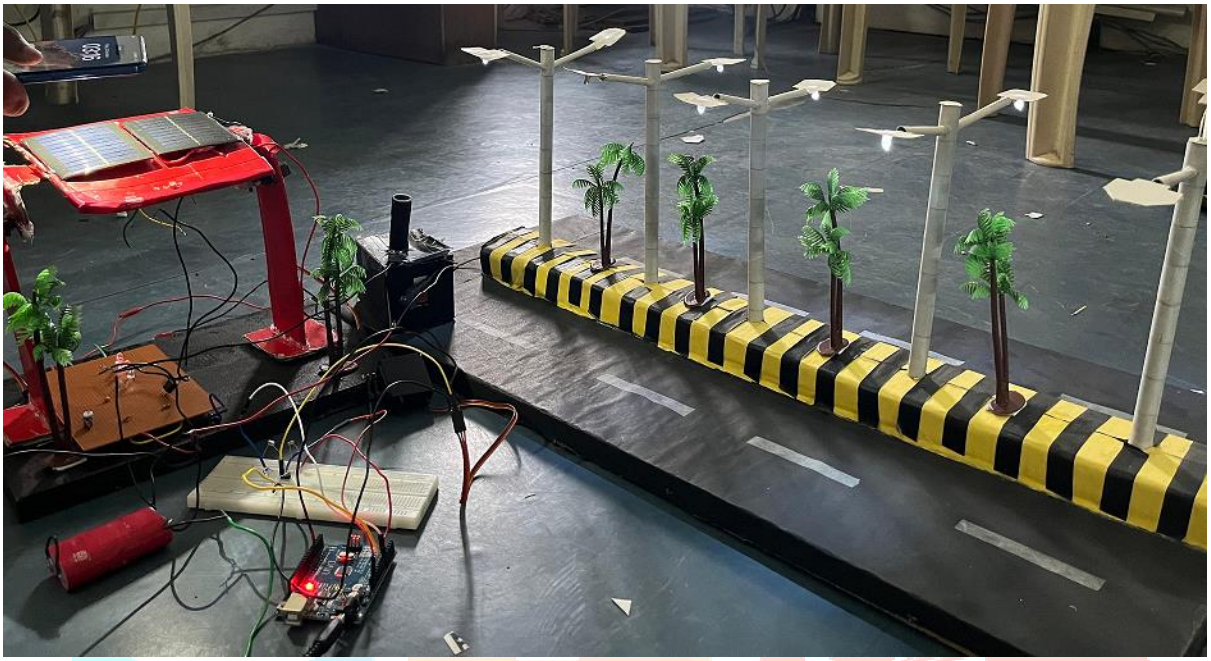

Fig 5: Experimental setup

VII. Conclusion:

The paper describes an automatic solar panel based LED street lighting system; it integrates latest technology such as LED technology and Renewable Energy Source in order to reduce power consumption, cost and manual controlling method. 20-25% of power consumption and maintenance cost is reduced through this prototype. This street lighting system is appropriate for rural and urban areas. The designed system is flexible, extendable and fully adjustable to user needs.

The safest and most economical method of lowering electricity usage is the suggested streetlight automation system. It assists us in eliminating the manual switching issues of today's globe, and more significantly, it makes it simple to reduce primary costs and upkeep. With its cool-white light emission, the LDR uses less energy and lasts longer than lights that use a lot of energy. This system can be improved by switching from traditional LDR modules to solar-based LDR modules in order to transition to new and sustainable energy sources. These effective justifications give this work additional benefits that can get past its current drawbacks. Remember that because of these long-term advantages, the initial investment would never be an issue due to the extremely short return on investment period. Street lights, smart cities, home automation, agriculture field monitoring, timely automated lights, parking lights at hospitals, shopping centers, airports, universities, and businesses, among other locations, can all be readily integrated with this system.

REFERENCES

[1] S. Suganya, R. Sinduja, T. Sowmiya & S. Senthilkumar, "Street Light Glow On Detect ing Vechile Movement Using Sensor", International Journal For Advance Research In Engineering And Technology, 2015, Volume 1, PP.No 114-116.

[2] K.Santha Sheela, S.Padmadevi, "Survey on Street Lighting System Based On Vehicle Movements", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 2, February 2014,PP.No. 9220-9225.

[3] M.Abhishek, Syed ajram shah, K.Chetan, K,Arun Kumar, Design and implementation of traffic flow based street light control system with effective utilization of solar energy, International journal of Science Engineering and Advance Technology, IJSEAT, Vol 3, Issue 9, September-2015

[4] C.Bhuvaneshwari, R.Rajeswari, C.Kalaiarasan, Analysis of Solar energy based street light with auto tracking system, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol 2, Issue 7, July-2013.

[5] A.C. KALAIARASAN, Vol.01 | Issue 08 | November 2015 | International journal of Advanced Research in engineering & Management

[6] A.Rao and A. Konnur, "Street light automation system using Arduino uno," Int. J. Innovative Res. Comput. Commun. Eng., vol. 5, no. 11, pp. 16499-16507, 2017.

[7] S. Jalan, "A survey on automatic street lightning system on Indian streets using Arduino," Int. J. Innovative Res. Sci. Eng. Technol., vol. 6, no. 3, pp. 4139-4144, 2017.

[8] International Journal of Scientific & Engineering Research, Volume ISSN 2229-5518 IJSER (c) 2018 http://www.ijser.org

[9**]** Md. Sazol Ahmmed "Automatic Street Light Control System using Light Dependent Resistor and Motion Sensor Global Journal of Researches in Engineering: A Mechanical and Mechanics Engineering Volume 18 Issue 1 Version 1.0

[10] S. Jalan, "A survey on automatic street lightning system on Indian streets using Arduino," Int. J. Innovative Res. Sci. Eng. Technol., vol. 6, no. 3, pp. 4139-4144, 201