

Survey on Solar Powered Automatic Street Light System

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Abstract: Harvesting energy from the environment responsibly is important. Conventional sources are depleting now a days so we are turning towards usage of renewable sources for various electrical applications. One of those most applications is lightening the streetlights. Hence our concept is to mimic the natural tree replacing the leaves as solar panels in all possible directions, electric power generated from those panels are fed into streetlights. Also, the system provides a power-saving mode of operation by adapting the method of automation. A dark sensor and a light sensor provides the automatic “ON”/“OFF” facility to the street lights so that it will glow automatically when it is required(i.e. when the surrounding will be dark) and will be turned “OFF” automatically if sufficient light is available in the surrounding.

Keywords: Solar energy, Street Light, Light Sensing, Solar Panel, LDR (Light Dependent Resistor), IR (infra-red) sensors.

I. INTRODUCTION

Streetlights are one of the significant power-consuming systems in our country. More innovations can be adopted into the traditional street lighting system. One of the ways to implement efficient power consumption is by incorporating the Internet of Things (IoT) and automation into our street lighting systems. The proposed model is a combination of both efficient power generation and smart power consumption. By detecting the presence of objects, the street lights are made to glow at maximum brightness to minimize energy consumption. In short, the street lights are controlled based on the traffic density. The number of street lights glowing over a period of time will be directly proportional to the traffic density at that period of time. For instance, if a single vehicle passes by a particular street at a given time, only those street lights within the range of the IR sensor will glow with high-intensity mode, while the others remain in low-intensity mode. This paper also proposing renewable energy sources instead of conventional ones. Renewable energy sources are used, instead of conventional energy sources, being in turn environment friendly and a great relief to the problems overcome by excess power consumption. Solar streetlights are a major benefit for the society.

II. LITERATURE SURVEY

Urja Jain , Anindya Jain , Deepali Shukla, developed Microcontroller Based Solar Powered Automatic Street Light Intensity Controller. According to the proposed plan, when it was a dark time it will on automatically all the street lights. When the vehicle or any person passed through a block of street light then it will increases the intensity of the light, if any vehicle is not detected then it decreases the intensity of the light.so that if light is in off condition, there is more reducing in the power consumption. And also it will support to energy saving aspects, automated system were less in manual operation , high flexibility, and accuracy. The main disadvantages is transmission loss will be more in this case[1].

Using Renewable Energy for Safety for the Turtle Mountain Band of Chippewa. These street lights are not connected to the electrical power grid: solar panels will generate the own power by using an renewable sources like a sun(photovoltaic cell) , electrical system where it transmits the electricity from the producer and a consumer where it is interconnected to network, micro grid are using in these concept where this system is large in size and out of feilds The disadvantage is It would have been too expensive to try to connect to the grid and the stand-alone systems were easier to work with versus a micro grid syste[2].

An energy saving streetlight controller where that integrate both solar power and the power grid and use inductive sensing to control the streetlight's brightness. The streetlight can be powered by using solar energy stored in a battery and only alternates are grid when the battery levels are very low. The disadvantages that the chosen LEDs only turns on at very high voltages. They only work when the battery is at least 80% full[3].

In the traditional street lights where it will glow during day time also so that there are more increases in the power consumption. And also due to rapid growth in the urbanization, the maximum power can require, now it's time to save the energy and power and utilize the power to the residential and commercial areas. And the main advantage is save the accumulated energy by optimized utilization of the street lights due to the use of sensors and programmed Arduino Uno R3. Accumulated the cost of Smart Street light will be reduced. The disadvantage is transmission loss is more[4].

To replace the growing energy demand by using renewable energy source as solar. The solar energy can be converted into electrical energy by the photovoltaic cells, where the received electricity can be stored in the battery. During night-time the lamp will turn on automatically and the electricity already stored in the battery gets consumed. The battery gets recharged during the day-time and the process keeps on repeating every day. The main disadvantage is detecting physical damage of bulb is done manually[5].

The automatic street lights works depending on the light intensity from natural sources. Here the uses transistor as switch to switch ON or switch OFF the street light automatically. This work is done by a sensor called LDR. They used because energy consumption is reduced. This main purpose is to minimize the cost and electricity loss and also man power. This idea proves to be very useful for city infrastructure to reduce the conventional power and also the confirmed that 48% of energy is conserved, but the batteries replaced by solar panels for usage of energy [6].

Researches came up to conduct street lighting system powered by solar panels. They designed a prototype and they focused on the development, evaluation of a lighting system and a sensor device that automatically lights up the lamp at night. They also study another application into development of a street light which stores charges and stores the energy at daytime. Here the LED consumes less power and a longer life span. In this idea the prototype was built with super capacitors, solar panel and a battery of 12VDC[7].

The photovoltaic panels charges a rechargeable battery, most solar panels turn on and turn off automatically by sensing the lighting a light source. They installed solar lights in windy regions are equipped with flat panels cope with winds. In this Technology can operate a network with each light performing on or off the network. In this idea it can implemented economically affordable solution to the energy crisis and also we can drive the DC loads[8].

Yared brhane implements the design and simulation of solar-powered generation system of automatic street lighting for Adigrat University, by using this system the energy consumption is reduced. This work was begun by investigate on the solar power generators. Here the solar panels are given in the form of solar radiation for the panels and this finds the renewable energy resources. They used simulation design by doing using proteus based micro C and cost analysis by software. By this simulation results have been generate street lights. In this project, they used to reduce your electricity bill and in return saving money[9].

Som Sanguan passago and his team implement the model of Research and development of Renewable energy: Prototype of LED street lighting from solar energy .This was investigated in Rajabhat Maha Sarakham University. The solar panels include solar cell of 80 Watts and the street lamps. In this the street lights consisted of the height of electricity poles as 6 meters. A rapid return on investment and added the benefits due to save the energy through the LED's. With this idea, they focused on the prototype of street light for inventing and designing the renewable energy from the solar energy in Maharashtra Campus area[10].

The advanced light-emitting diode street light with auto intensity control and automatic streetlight system. The circuit is stationed in a suitable location and is exposed to sunlight so that the lamps will switch "ON" if it is dark and when the illumination is above 50 lux they automatically switched "OFF"[11]. Implement a system for detecting the fault in the battery or solar panel & provide theft detection using the Internet of Things (IoT) as well as conservation of energy by reducing electricity wastage. In this paper, they present a system for monitoring the battery/solar voltage or if in case, it gets removed, and then an SMS will be generated and sent to the provided mobile number[12].

Ajay M and his teammates worked on solar powered LED street lighting with auto intensity control. In this paper, auto intensity controlled solar power driven LED streetlight is implemented. In conclusion, around 30% to 45% of the power utilization can be saved with existing streetlights without any control[13]. System works on the relay timer which constitutes a timer and relay. When the signal through the LDR sends to the relay timer module the timer starts and the led street lights also start glowing when the timer stops the led street light stops[14].

The idea of maintaining maximum utilization and minimum loss of available energy. The plenty of solar energy available during the day time is stored in a battery and the stored energy is used to glow the street light whole night, so that street light will glow automatically when is required and it will be turned OFF automatically if sufficient light is unavailable in surrounding. Hence the loss of energy due to unnecessary glow of the street lights can be avoided. This model will not only save the electricity produced from non-renewable source but also will illuminate the path in an eco-friendly way[15].

Designing energy efficient Smart Street light for energy conservation in existing streetlight. While controlling and managing of the system is based on the movement of vehicles this is detected by PIR Motion sensor. This system was programmed to automatically turn off during the hours of daylight and only operated during the time when vehicles cross the motion sensor during night. As of this model power consumption was reduced around 60% Compared with existing sodium vapour street light[16].

Kalainathi B and team proposed Efficient Power Generation to Automated street lights based on Traffic Density. In this model the street light is OFF on the traffic density i.e., street light is turned OFF in the absence of people and vehicles. The IR Sensors are used to sense the people and vehicles. IoT system uses various sensors to detect the presence of vehicles or pedestrian and illuminates itself based on the requirements. The Proposed model will have longer life than usual, as they are operated only when necessary but when someone passes between two streetlight it will be completely dark[17].

A smart street light using wind-solar Hybrid Energy system with an idea of generating electric power by making use of Renewable sources of energy like solar energy and wind energy and supplied the same to street light. After implementation it is concluded that the additional energy generated is around 25-30% with very less consumption by the solar PV system itself. This idea is useful when sun radiation are unavailable with the use of wind turbine but also finding some problem like wind turbine height, slope angle as given limitation[18].

The automatic street light control with solar where worked on automatic switching ON/OFF of street light based on sunlight. This is done by the LDR(light dependent resistor) sensor which senses the sunlight exactly like human eyes. This system uses the electric power generated by the solar energy. This idea has lower chances of the automatic street light overheating and cost of operating is far less when compared to the conventional street lights but rechargeable battery were replaced few times[19].

III. CONCLUSION

Based on the survey conducted, it was identified that the existing systems employed lightening of street light from electric power that was produce by the solarpanels. But solar radiation falling on the solar panels was in single direction, this can be replaced by artificial tree where all the panels on the tree are placed in all direction which solar radiation fall on panels in all direction. Automation was done only in turning ON/OFF of streetlights based on light sensor this can be extended by using object sensor based on which intensity of streetlight are controlled on requirement. The existing system also can be extended by using IoT technology to automatically detect the physical damage of the bulb. Hence usage of conventional sources for electrical application can be reduced.

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