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SMART SOLAR STREET LIGHTING SYSTEM WITH BLUETOOTH CONNECTIVITY

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Abstract - *The project is designed for LED (Light Emitting Diode) based solar street lights with intensity control. These lights are powered by solar energy from photovoltaic cells. As awareness for solar energy is increasing, more and more individuals and institutions are opting for solar energy. Photovoltaic panels are used for charging batteries by converting the sunlight into electricity. An MPPT (Maximum Power Point Tracking) charge controller circuit is used to control the charging. Through a mobile application, the intensity of street lights can be controlled. LED lights are used instead of HID (High Intensity Discharge) lamps as the intensity control is possible in the LED lights. In this way, energy can be saved considerably.*

Key Words: Bluetooth module (HC 05), ARDUINO, Solar Panel, LED, Battery.

1. INTRODUCTION

We need to save or conserve energy because most of the energy sources we depend on, like coal and natural gas can't be replaced. Once we use them up, they are gone forever. Saving power is very important, instead of using the power in unnecessary times it should be switched off. In any city "STREET LIGHT" is one of the major power consuming factors. Most of the time we see streetlights are on even after sunrise thus wasting lot of energy. Over here we are avoiding the problem by having an automatic system which turns on and off the streetlights at given time or when ambient light falls below a specific intensity. LED lights are the future of lighting, because of their low energy consumption and long life. Light Emitting Diode (LED) can replace the HID lamps where intensity control is possible by pulse width modulation. The intensity control helps in saving energy. Users can control the intensity through a mobile application which communicates with the microcontroller using Bluetooth module. MPPT charger is used for charge controlling.

1.1 EXISTING SYSTEM

In the present system mostly, the lightning up of street lights is done through High Intensity Discharge lamps (HID), whose energy consumption is high. The control of intensity of HID lamps during non-peak hours is very difficult and not feasible. Thus, a system to control intensity has to be developed. The street lights of present system is controlled manually so a automatic control has to be developed. Traditional street lights very often stop functioning in the event of a grid failure due to their dependence on electrical energy. Thus, Solar driven lights keep the streets illuminated all through the night irrespective of power cuts or grid failures such a system needs to be developed.

1.2 DISADVANTAGES OF EXISTING SYSTEM

Source of energy: Traditional street lights are driven by electricity which is generated from non-replenishable sources.

Visibility and Illumination: Traditional street lights visibility can nowhere beat the visibility offered by solar-LED street lights

Lifespan of the Lights: Conventional street lights can last only for around 5,000 hours. The total life a solar street light using an LED lamp is as many as around ten times the lifespan of traditional street lights.

Dependability: Solar driven lights keep the streets illuminated all through the night irrespective of power cuts or grid failures. Traditional street lights very often stop functioning in the event of a grid failure.

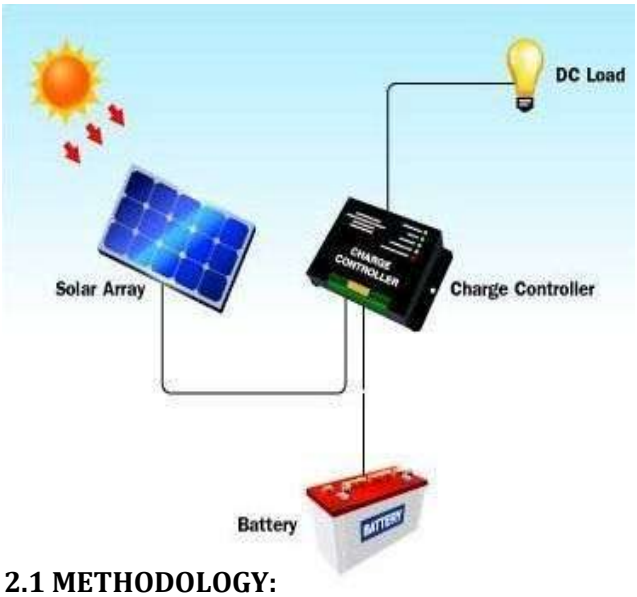
Intensity control: Intensity control is not possible in case of conventional street lights.

2. PROPOSED SYSTEM:

Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. To control and maintain complex street lighting system more economically, various street light control systems are developed. This proposed system utilizes the renewable technology (Solar) for the sources of light as LED Lamps instead of generally used street lamps such as High-Pressure Sodium Lamps, etc. The LED technology is preferred as it offers several advantages over other traditional technologies like energy saving due to high current luminous efficiency, low maintenance cost, high colour rendering index, rapid start up speed, long working life etc. In the proposed system, Solar panels are used for charging batteries. As the solar cell generates fewer amounts of charges we have to use a controller to maximize the efficiency. In this project MPPT is

used for this purpose. An MPPT (Maximum Power Point Tracking) charge controller circuit is used to control the charging. Through a mobile application, the intensity of street lights can be controlled. The intensity control helps in saving energy. Users can control the intensity through a mobile application which communicates with the Arduino Uno using a communication device, a power saving short distance device, such as Bluetooth module.

BLOCK DIAGRAM (fig.1.)



2.1 METHODOLOGY:

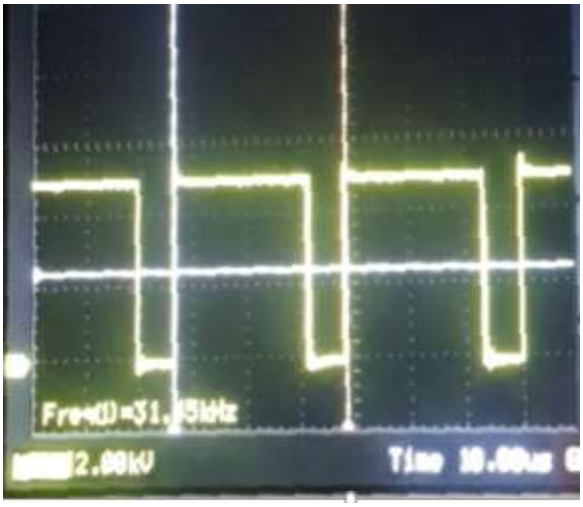


Fig. 2. Working Setup

Our project is a prototype implementation of Solar energy in Street Light and controlling it via low energy Bluetooth. Studies have made solar power cheaper and more efficient. This will make solar power smart and more available on the market.

Our project has smart technology and saves a lot of power because Switching ON and Off the lights as per the need saves 30% of energy, using dumb LED saves 70%, Timer based LED saves anther 30%, Lumen Intensity control saves around 40%, all this makes power conservation. We are using Bluetooth connectivity because Bluetooth technology is useful when transferring information between two or more devices that are near each other when speed is not an issue. It is best suited to low-bandwidth applications, cost is low, Range is 5-30m, Low power consumption and fairly simple to use. Our project gives optimum results because it has Microcontroller based constant current LED driver, Maximum power point tracking charger, Light intensity programmable via Bluetooth, Temperature compensator battery charging, and Protection features like Battery high, Battery low Array Reverse, Battery Reverse, Load shunt circuit and Temperature compensator.

3. CONCLUSION

An MPPT charge controller is designed to efficiently charge the battery from the solar panel. This is done with the help of a buck and boost converter and works on the principle of PWM. The led array's intensity is controlled with the help of a Bluetooth mobile application named 'SSL'. The control signal from Bluetooth module communicates with the microcontroller and with the help of PWM technique, the light intensity is controlled. The battery charges above 17V and discharges below 17V. The output can be displayed on the CRO (Figure is shown below). The waveform shows the charging of the battery. Maximum point is tracked and the point is maintained (Float state). The android application controls the intensity from 0% to 100%.

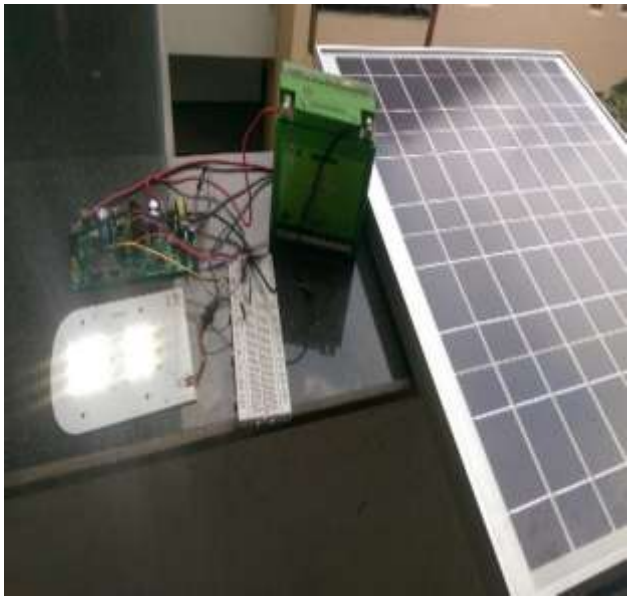


Fig.3 Output Waveform

FUTURE SCOPE:

Smart Street Lighting can be a conduit to achieve the following:

1. Smart traffic control: For ambulance, VIP vehicles.
2. Smart city surveillance case of any threat, we can divert all the cameras to a particular area.
3. Smart street lighting can a health monitoring and reporting system without a technician physically going there to inspect.

BLUETOOTH mesh gives rise to group and individual control.

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