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## SOLAR POWERED LED STREET LIGHT WITH AUTO INTENSITY CONTROL

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### ABSTRACT

This report describes the design of the “Solar Powered LED street Light with auto intensity control” The project based on two modules.

1. Charge controller circuit.
2. Load intensity control circuit.

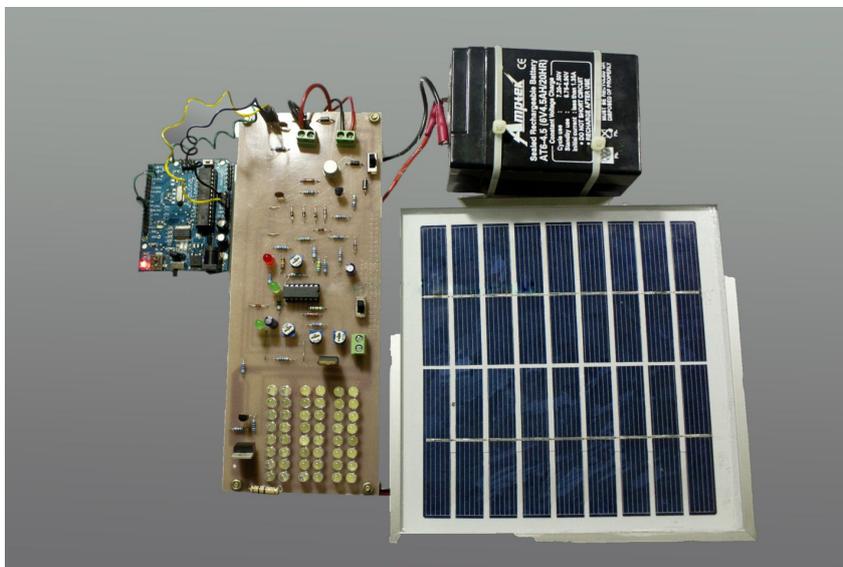
Using 18v solar panel we will charge 12v battery. The charge controller circuit can prevent the battery to flow high current through it after that we will convert 12v to 5v using voltage regulator circuit.

Using Light dependent resistor (LDR) we check its resistance with the help of sunlight, and the output of LDR is given to analog read pin of Arduino

To perform PWM we can generate different analog voltages using Arduino UNO software.

The circuit of the project is designed, simulated and built with hardware . The simulation results and design details are provided. Circuit diagram of our project is successfully tested on hardware

## 1. INTRODUCTION

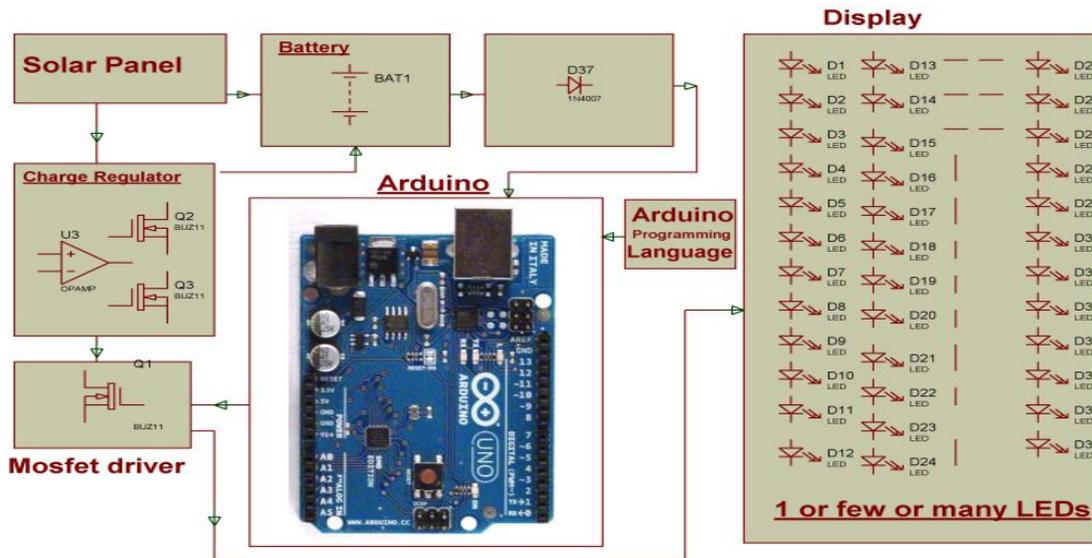


The project is designed for Solar Powered LED street Light with auto intensity control by an Arduino board using solar power from photovoltaic cells. As awareness for solar energy is increasing, more and more individuals and institutions are opting for solar energy. Photovoltaic panels are used for charging batteries by converting the sunlight into electricity. Intensity of street lights is required to be kept high during the peak hours. As the darkness on the roads tends to decrease slowly in late nights, the intensity can be reduced progressively till morning to save energy. Thus, the street lights switch ON at the dusk and then switch OFF at the dawn automatically.

The process repeats every day. LED lights are the future of lighting, because of their low energy consumption and long life they are fast replacing conventional lights world over . Intensity control is possible by pulse width modulation. The intensity control helps in saving energy during late nights while dark density on the streets is low.

A programmable Arduino board is engaged to provide different intensities at the different times of night using PWM technique, for energy saving for solar based system, using a charge controller for battery charging, overload and deep discharge protection. Further the project can be enhanced by using time programmed dusk to dawn switching based on latitude and longitude of a specific place. It can also be interfaced to a LDR to follow the switching operation precisely.

**Block diagram**



*Fig .1.1 Block diagram*

**Solar Panel:** A solar panel is a collection of solar cells . The solar panel converts the solar energy into electrical energy, out put of the solar panel is its power which is measured in terms of watt or kilo watt. Solar power uses multiple reflectors to collect more sun’s thermal energy . Thermal energy collected through the day to perform different operations. Performance of the solar panel depends on the number of factors like climate, conditions of the sky, orientation of the panel, intensity and duration of sunlight and it’s wiring connections.

**Charge controller circuit:** If the battery voltage is below 12v, then the current from LM317 IC flows to the battery . The current flow to the battery stops when the battery voltage rises to 13.5 V . Hence the charge controller circuit will prevent the battery to flow high current through it.

**Rechargeable Battery:** A rechargeable battery, storage, secondary battery or accumulator is a type of electrical battery which can be charged, discharge into a load , and recharged many times , while a non-rechargeable or primary battery supplied fully charged , and discarded onces discharged. Several different combinations of electrode materials and electrolytes are used . Including lead-acid, nickel cadmium(Nicd), nickel metal hydride(Ni-MH), lithium ion (Li-ion), and ,lithium ion polymer(Li-ion polymer).

**Voltage divider circuit:** A voltage divider is a simple circuit which converts a large voltage into a smaller one. Using 7805 IC and two capacitors parallel around the IC and an input voltage , we can create a fixed voltage regulator circuit . This circuit converts 12v to 5V which is the operating operating voltage of the Arduino board.

**Arduino UNO:** Microcontroller will control the intensity of light at different time slots. Microcontroller circuit will generate at a particular using RTC(Real Time Clock) these system provide sets of digital and analog I/O pins that can be interfaced to the street light circuit .Operating voltage of Arduino UNO is 5v so that we will convert 12v from battery to 5v

**2. SIMULATION OF VOLTAGE REGULATOR CIRCUIT**

Controller Arduino UnO understand only +5v so, by the help of voltage regulator circuit we convert the +12 to +5v

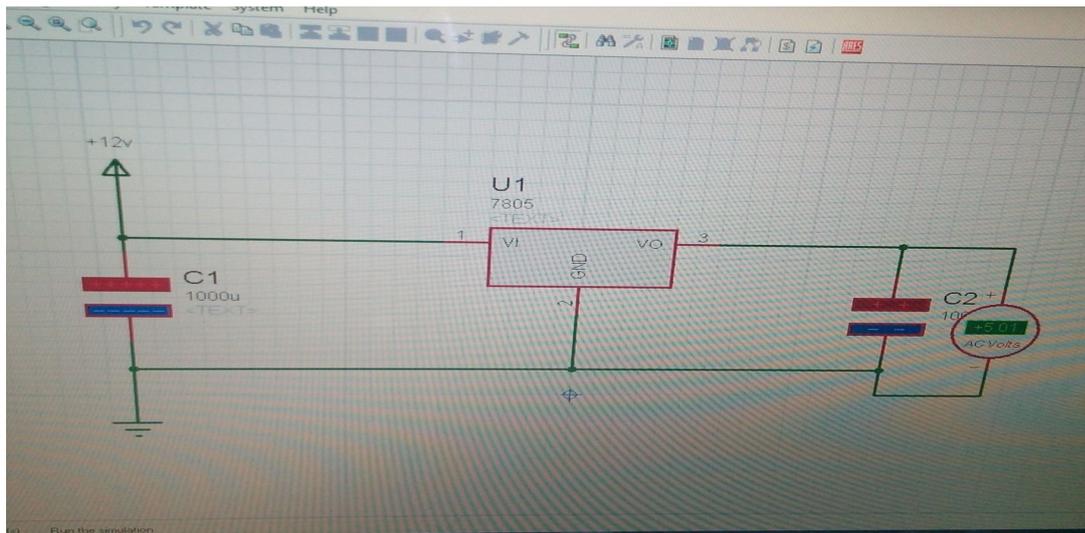


Fig. 1.2 : Voltage Regulator Circuit

### 3. CONCEPT OF PULSE WIDTH MODULATION

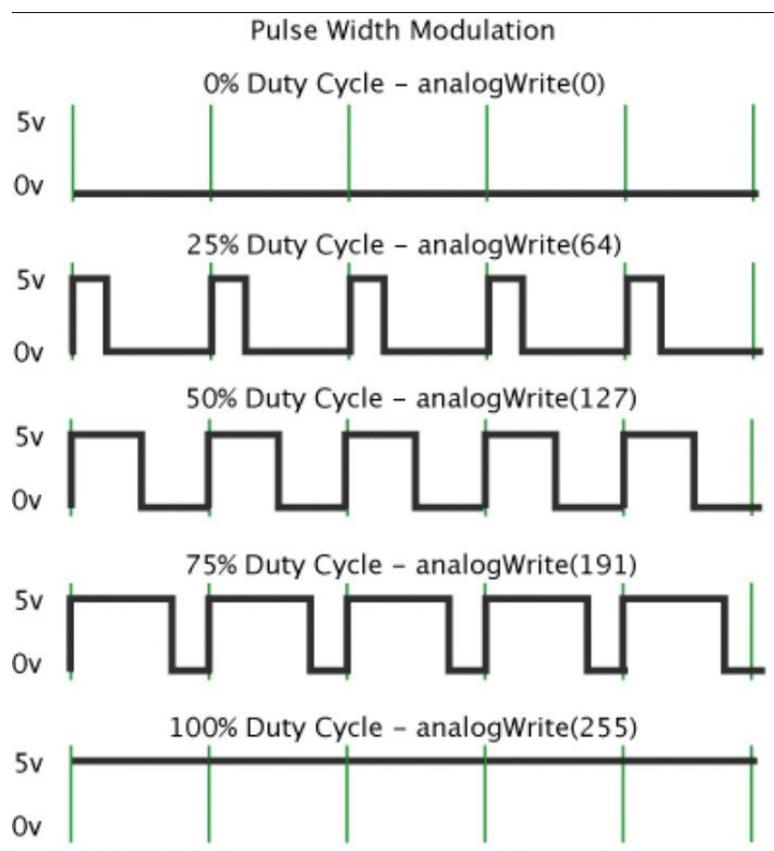


Fig 1.3. PWM

The green line represents a regular time period. This duration or period is the inverse of the PWM frequency. In other words, with Arduino PWM frequency at about 500HZ, the green lines would measure 2 milliseconds each. A call to analog write () is on a scale of 0-255, such that analog Write (255) requests a 100% duty cycle (always on), and analogWrite(127) is a 50% duty cycle(on half the time).

#### 4. CONCLUSION

- The solar energy is one of the important and major renewable sources of energy and has also proven it useful in functioning of applications like street lights.
- Solar powered automatic street light controller is one of the applications of electronics to increase the facilities of life. The use of new electronic theories has been put down by expertise to increase the facilities given by the existing appliance. Here the facility of ordinary street light is increased by the making it controlled automatically.
- The charge control is necessary in order to achieve safety and increase the capacity of the battery. In cities, currently thousands of street lights are operated and the yearly electricity maintenance cost is very high.
- The initial cost and maintenance can be the draw backs of this project. With the advances in technology and good resource planning the cost of the project can be cut down and also with the use of good equipment the maintenance can also be reduced in terms of periodic checks.
- It saves around 40% of electricity from per street light. So throughout the world if we use this concept then it will eliminate the energy crisis to a larger extent.
- It is eco-friendly and utilizes the renewable source of energy very well

#### 5. FUTURE SCOPE

- The Solar Powered LED Street light with auto intensity control can be control the charge and intensity of lights.
- This project can be enhanced by using with timer based products.
- We can use solar tracking system for fast charging.
- In monsoon season solar light is more difficult so that we use extra batteries in series to save more power.
- To improve lighting we use LED panel.