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SOLAR BASED LED STREET LIGHT WITH AUTO INTENSITY CONTROL

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Abstract: **This project is based on 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 solar cell and the stored energy is used to glow the street lights during the whole night. 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 it will be turned "OFF" automatically if sufficient light is available in the surrounding. Again the auto intensity control mechanism has been applied by the help of a microcontroller to control the light intensity of the luminaries as per the requirement. Hence the loss of energy due to unnecessary glow of the street lights can be avoided.**

Index Terms **- PV Module, LDR (Light depending Resistor), IR Sensor (Infra-red Sensor).**

I. INTRODUCTION

Nowadays, a human has become too busy and is unable to find time to switch the lights wherever not necessary. The present system is like the lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the outside. But the actual timing for these lights to be switched on is when there is absolute darkness. With this, the power will be wasted up to some extent. The energy conversation is very important in the current scenario and should be done to a maximum extent where ever it is possible. Energy can be effectively conserved if we can control the traffic lights on the highways by glowing them only when there is traffic on the road, and this is all most impossible to detect the arrival of a vehicle manually without the presence of light. So in this situation we should think about a system which is capable of sensing the arrival of vehicle and ON the lights and turn OFF as soon as the vehicle leaves the area. Our solar panel based street light controlling system is the result of this idea. This was designed with a vehicle detecting sensor which is capable of sensing the arrival of a vehicle. It drives the same information to a micro controller. The ATMEGA328 micro controller is interfaced with the street lights and it is the responsibility of the controller to switch the status of the lights with respect to the acknowledgement received to it from the vehicle sensor.

II. LITERATURE REVIEW

A. "Solar Powered LED Street Light with Auto Intensity Control", International Journal of Technical Innovation in Modern Engg. & Science, Vol. 3,
Describes LED Street lighting system, use of LDR sensor, use of IR sensor, Automatic modes search as switching on at the sunset & off at the sunrise. Dimming the lights during less traffic hours by using PIR sensors

B. "Survey on Street Lighting System Based On Vehicle Movements", International Journal of Innovative Research in Engineering and Technology, Vol.3,
Describes about monitoring system, use of infrared circuit, use of LCD display circuit, a digital temperature-humidity sensor, how solar panels are aligned, and IR sensor monitoring the distance between poles of street lights.

III. PROBLEM IDENTIFICATION

The 21st Century is striving hard to save electrical energy. A Critical issue nowadays is the energy Crisis taking place in many parts of India. Energy loss takes place due to street lights which consume enormous electric energy. Due to increasing concerns about global warming and climate change, renewable energy sources like wind and solar are receiving greater attention from researchers world-wide. The main Problem that manual controlling of the Street light is a time taking and tedious process. The present system is like the lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the outside. But the actual timing for these lights to be switched on is when there is absolute darkness. With this, the power will be wasted up to some extent. Therefore, there is needed to come up with a system which reduces manual control and would efficiently save energy. This could be done by using low power, robust and efficient components.

IV. PROJECT OBJECTIVE

The purpose of this project is to provide the following objective to fulfill the available energy utilization is optimized as Per the expectation.

- Use of Solar energy
- Automatic "ON/OFF" mechanism
- Auto Intensity control
- The power saving facility.

V. HARDWARE DESIGN

The present system employs power delivery via a single-phase line to the streetlight. The proposed system involves IR sensors, resistors, one LDR (Light Detecting Resistor), an Arduino board, a cluster of LEDs (Light Emitting Diodes) components to regulate the power delivery. An Infrared Proximity Sensor at the base of the street light detects the presence in a small area around the street light. The data from the sensor is sent to the Arduino which forms brain of the circuit. The Arduino then commands to switch between dim and bright modes depending upon the Requirement and thus controls the brightness of the street light. A battery eliminator, also Powered by the single-phase line, is used to supply 5V inputs to the sensors and Arduino.

The design basically includes three working modes: -

1. **OFF mode:** When there is enough natural light in the surrounding i.e. during the daytime, the entire system is switched off and the batteries are charging.
2. **Active mode:** When the natural light drops below a certain level the system automatically turns on and the motion sensors are powered.
3. **ON mode:** On the presence of pedestrians, the sensors turn on which in turn switches on the LED lights. These lights turn off after a period.

When power supplied, the LDR senses the brightness in surrounding environment and sends the value to Arduino into PWM signals to MOSFET and the MOSFET then decides the amount of voltage to be sent to LEDs and sends that value to Arduino for providing that much voltage to the LEDs. The intensity depends on the voltage provided by LEDs. LED lights are the future of lighting, because of their low energy consumption and long life they are fast replacing conventional lights world over. White 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 during late nights while traffic density on the streets is low. Solar panel can overcharge a battery. The charge rate depends on the solar panel voltage, the output current, and the battery voltage. Overcharging is eliminated by using a switching circuit. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan and may pose a safety risk.

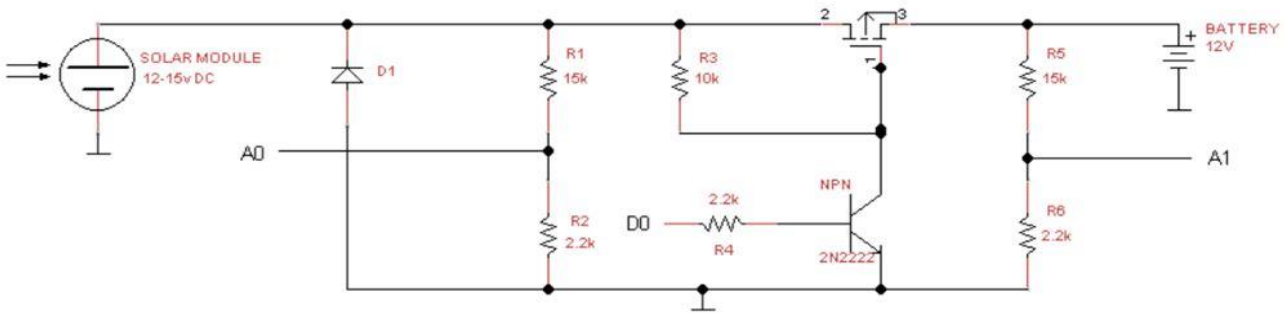

Fig.1. Switching Circuit

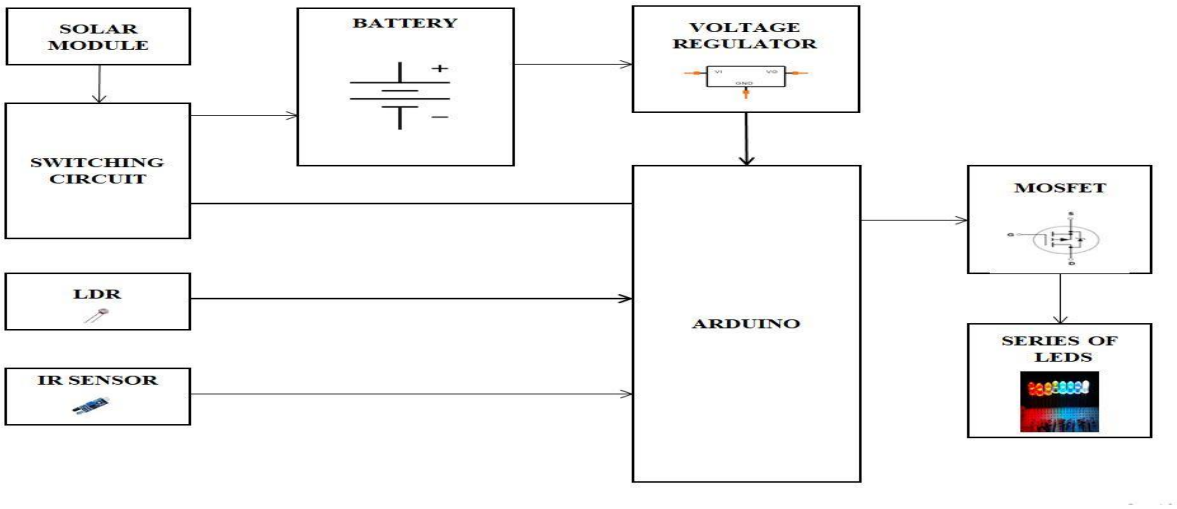

Fig.2. Block Diagram of the System

This block diagram describes the solar panel of 10Watt is used here with will convert the incoming sunlight into electrical energy and used to charge the battery using switching circuit which converts the varying voltage into stable voltage. Now this charged battery is used as a supply source to rest of the system. Through battery, we will provide supply to Arduino which is controlling the functioning of LDR. LDR senses the intensity of sunlight which is falling on it and passes this information to the Arduino Uno as shown in block diagram. Then the Arduino Uno processes this value and compares this value with the predefined threshold. If the sensed value by LDR is less then predefined threshold then the Arduino Uno switches the relay to a closed switch and the LED will glow, when the sensed value is greater than the threshold then the Arduino switches the relay to off state and the LED will turn off automatically. The luminosity of LEDs increase as the darkness increases. Our system also senses external moving conditions such as passing a vehicle nearby street light or any person is moving to vary the light intensity using IR sensor. Based on these conditions the intensity of inner lights is varied using relay driver circuit. So when vehicle passesor such condition happen, the light intensity is high and as the vehicle passes over, the light intensity decreases to save power.

VI. RESULT

- The solution to energy conservation is to eliminate time slot and introduce a system that could sense brightness environment and act accordingly so that seasonal change would not affect the intensity of street lights.
- Also, LEDs should replace HID lamps due to their dimming feature, another reason are that they are more reliable.
- This system is designed for outdoor application in un-electrified remote rural areas.

VII. CONCLUSION AND FUTURE WORK

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. The system could sense brightness environment and act accordingly to seasonal change would not affect the intensity of street light. Also the automatic solar street light system is completely Noiseless, Smoke-free and free from fire hazards. Hence it will not only Save the electricity bill but also will illuminate the path in an Eco-friendly way.

In future this system is used in public places, hospitals, and malls with sms feedback system. Auto intensity of light control is used in automobiles headlight system.

VIII. REFERENCES

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