

## Smart Power Consumption Street Light That Glows On Detecting Vehicle Moment Utilizing The Solar Power –An Energy Saving Approach

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**Abstract:** This project is all about to control the electric power consumptions Street Lights and eliminating manpower. The project is designed to detect vehicle movement on street to switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy. During night all the lights on the street remains ON for the vehicles, but lots of energy is wasted when there is no vehicle movement. For auto power consumption when there is no vehicle on the Street Light this includes controlling a circuit of street lights with NE555P, specific IR Sensors & Light Dependent Resistor (LDR) is a type of sensor which actually does this work and senses the light as our eyes does. As soon as the sunlight comes, visible to our eyes it automatically switches OFF lights .Total process operation in Solar Power.

**Key Words:** Detect Vehicle Movement, LDR, NE555P, Solar Power, Specific IR Sensors

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### I. Introduction

Street lights are the major requirement in day to day life of transportation for safety Purpose and avoiding accidents during night. Despite that in today's busy life no one bothers to switch it off/on when not required. This project introduced here gives solution to this by eliminating manpower, reducing power consumption & utilize the solar power.

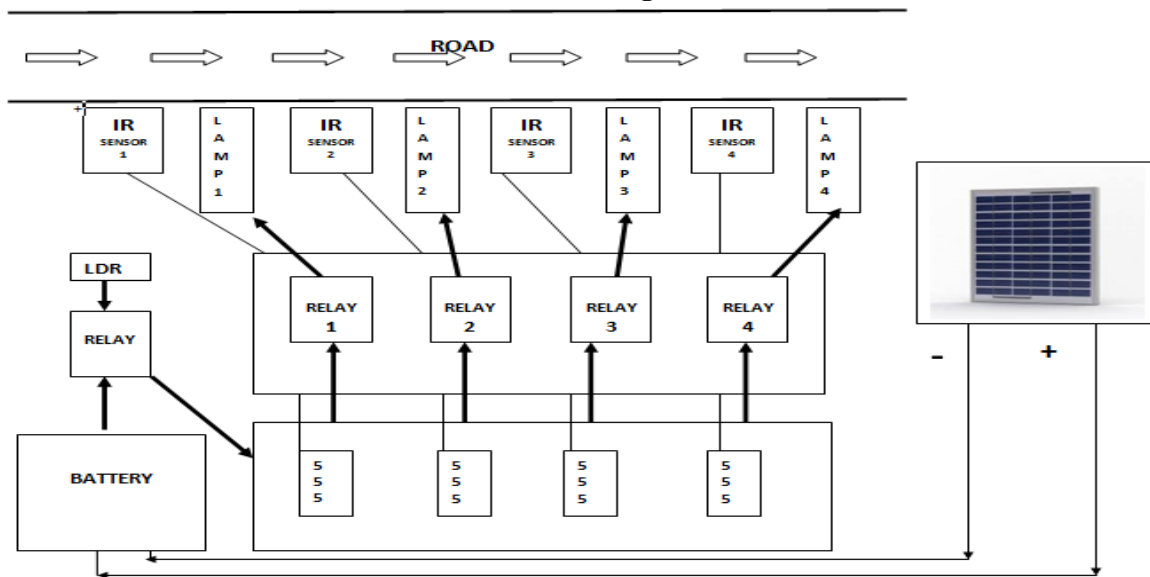
This requires four basic components i.e. 555Timers, IR Sensors, LDR, and Solar panel. During daytime there is no requirement of street lights so the LDR keeps the street light off until the light level is low or the frequency of light is low in environmental, the resistance of the LDR [1] is high. This prevents current from flowing to the base of the transistors. Thus the street lights do not glow. As soon as the light level goes high or if light falling on the LDR is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron conducts electricity, thereby lowering resistance so circuit goes in on condition and the 555timer set the delay time for light ON (i.e.  $t = 1.1R_1C_1$ ), by varying or changing the R1 and C1 we set the delay time. The major roll hear to ON/OFF of street light by the sensing (i.e. IR sensor) to vehicle before the lamp pole. The operating power which is most essential to operate street light by the help of renewable energy source like "solar" [4].

### II. 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 color rendering index, rapid start up speed, long working life etc. This proposed system makes use of infrared photoelectric sensor (G12-3C3PA) for vehicle detection. [2]

### III. Block Diagram



### IV. Circuit Working

The street model consists of 4 led as streetlights and 4 pairs of IR LED and IR Photodiodes used as sensors, variable resistors, IC LM358, Relay, LDR, and NE555P. The IR LED and IR Photodiodes are placed near lamp pole.

Consider the case when there is no vehicle on the street .In this case IR LED transmitting IR infrared ray up to some range. When the vehicle comes in the (IR) infra range, the IR waves hits the object or vehicle and come back to some angle to the photodiode this function is due to the IR LED and IR Photodiode which are close together. The IR Photodiode receives the reflected signal and sends to the NE555P IC to trigger the timer, the timer operate at some delay time i.e.  $t = 1.1R_1C_1$  by variable the  $R_1$  and  $C_1$  we can delay glowing time of the lamp. The output of the timer glows the lamp at some delay time. In this delay time a vehicle moves from one lamp to another lamp. In this process switch OFF trailing light and switch on the forward light. If the street busy the lamp glow continuously without OFF. That's the grate advantages.

The rechargeable battery which is connecting to the solar panel, charger the battery in day time and utilizing the saving power in night time. The battery main source connect to LDR for automatic switch ON and OFF in night and day time respectively.

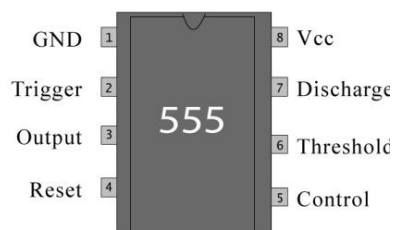
### V. Technical Details

#### 5.1 Required Hardware

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|--|------------------|
| 1. Resistors (1M $\Omega$ , 1k $\Omega$ ,) | 6. Solar Panel   |
| 2. Capacitors (2.2 $\mu$ f, 0.1 $\mu$ f)   | 7. Diode(IN4001) |
| 3. Relay(6V or 12v)                        | 8. IR sensor     |
| 4. Transistor(BC547)                       | 9. LDR           |
| 5. IC NE555P                               | 10. LED          |

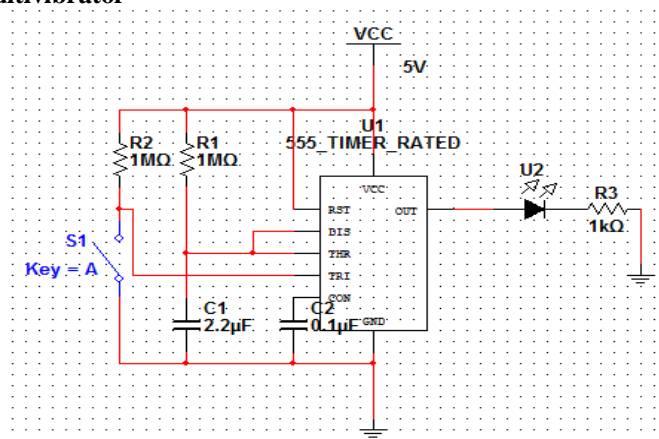
#### 5.2 Circuit Diagram And Proposed Model

##### 5.2.1 IC NE555P



Pin Abbrv.	Name	Function
1	GND	Ground Supply This is the 0V Power Supply pin for the IC
2	TRI	Trigger A low voltage (less than 1/3 Vcc) starts the timer
3	Q	Output This is where the output signal comes from
4	RST	Reset A low state on this pin resets the timer, which will not be enabled until the Pin goes high again.
5	CV	Control Voltage This is used to adjust the trigger voltage. Usually, it is unused, and is connected to ground to avoid noise in the circuit.
6	THR	Threshold This pin stops the timer when the voltage reaches 2/3 Vcc.
7	DIS	Discharge This pin is connected to ground when the output goes low. This is used to control timing in certain applications.
8	VCC	Positive Supply The positive voltage supply to the chip. Must be between 3 and 15V.

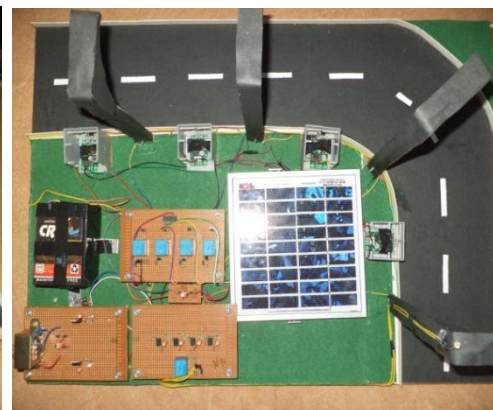
### 5.2.1 Monostable Multivibrator



### 5.2.2 Proposed Model



**Sight View**



**Top View**

### 5.3 Advantages

- Complete elimination of manpower
- Reduced energy costs
- Reduced maintenance costs
- Higher community satisfaction
- Higher security aspects
- Fast payback

### 5.4 Applications

- Parking Lightings
- Stair case
- Balcony
- Garden Lights
- Township Management

## **VI. Future Aspects**

- Add to the Smart Grid to monitoring all the lights and energy backup purposes
- With adding other renewable energy sources
- Railway signaling aspects

## **VI. Conclusions**

This project smart power consumption system is a cost effective, eco-friendly and the safest way to utilization of solar energy. It clearly tackles the two problems that world is facing today, saving of energy & global warming, very efficiently. According to statistical data we can save more that 70 % of electrical energy that is now consumed by the street light. Initial cost and maintenance can be the draw backs of this project. With the advances in renewable 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. The LEDs have long life, emit cool light, don't have any toxic material and can be used for fast switching. For these reasons our project presents far more advantages which can over shadow the present limitations. Keeping in view the long term benefits and the initial cost would never be a problem as the investment return time is very less. The project has scope in various other applications like for providing lighting in industries, campuses, office and parking lots of huge shopping malls. This can also be used for surveillance in corporate campuses and industries.

## **References**

- [1] "Energy Saving Using LED Automatic Street Light Control System" ,Mitsu Shah<sup>1</sup>, Charmi Shah<sup>2</sup>, Hardik Shah<sup>3</sup>, Riddhi Shah<sup>4</sup>,J. M. Rathod<sup>5</sup> T. D. Pawar<sup>6</sup>, V. N. Kamat<sup>7</sup> .IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 2, Issue 2, Apr-May, 2014
- [2] "Street Light Glow On Detecting Vechile Movement Using Sensor" ,S. Suganya<sup>1</sup>, R. Sinduja<sup>2</sup>, T. Sowmiya<sup>3</sup> & S. Senthilkumar<sup>4</sup>, International Journal For Advance Research In Engineering And Technology, ISSN 2320-6802, ICIRET-2014
- [3] "Electronic Devices and Circuit Theory", Robert Boylestad & Louis Nashelsky.10<sup>th</sup> Edition.
- [4] "Solar at a Glance-2008",Secondary Energy Infobook, Page:40-43