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Implementation of Solar Energy on Street Light Which Glows on Detecting Vehicle Movement

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Abstract-This project is based on utilization of solar energy on street light all about to control the electric power consumptions of Street Lights and eliminating manpower. This is designed to switch ON only a block of street lights and to switch OFF the trailing lights by detecting object movement on street 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- NE555P, Solar Power, Specific IR Sensors, LDR, Detect Vehicle Movement, LDR.

1. Introduction

This project introduced here gives solution to this by eliminating manpower, reducing power consumption & utilize the solar power. 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 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 lamppole. The operating power which is most essential to operate street light by the help of renewable energy source like "solar" [4].

2. Architecture Model

The street light control system adopts a dynamic control methodology. According to this, the initial state of the lights is set as off. Street light schematic is shown in Figure 3 and control flow in Figure 4. When the signal is detected at the point S, the state of lamp A switched (On to Off or Off to On), when the signal gets detected at the point B, the states of lamp A and lamp C are switched on or off simultaneously, while point D detects the signal, lamp C and lamp E are switched on or off simultaneously, while S' detects the signal, lamp E is switched on or off.

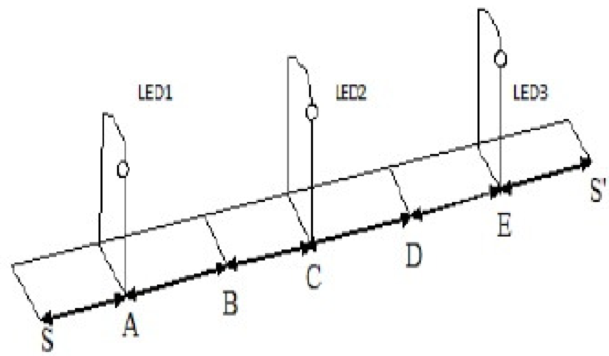


Fig 1: Streetlights schematic

3. 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 renewabletechnology (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]

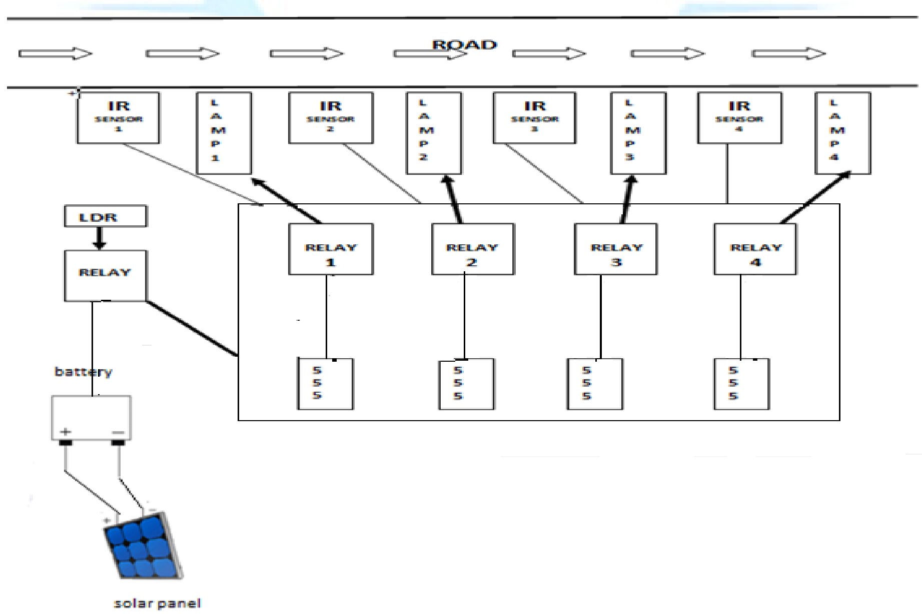


Fig 2: Block Diagram

4. Circuit Working

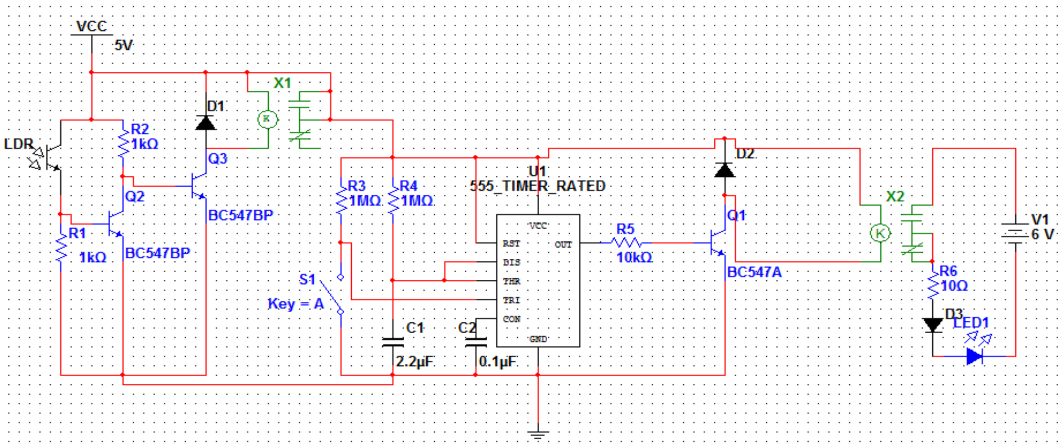


Fig 3: Circuit Diagram

The street model consists of 4 led as streetlights and 4 pairs of IR LED and IR Photodiodes used as sensors, variable resistors, ICLM358, 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 withoutOFF. 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.

5. Technical Details

5.1Hardware required

1. Resistors (1MΩ, 1kΩ,10kΩ,47kΩ)
2. Capacitors (2.2µf, 0.1µf)
3. Relay(6V)
4. Transistor(BC547)
5. IC NE555P
6. Solar Panel
7. Diode(IN4001)
8. IR sensor
9. LDR
10. LED

5.2 Circuit Diagram and Proposed Model

5.2.1 IC NE555P

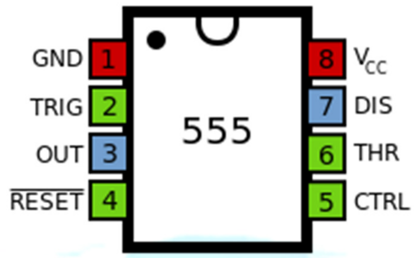
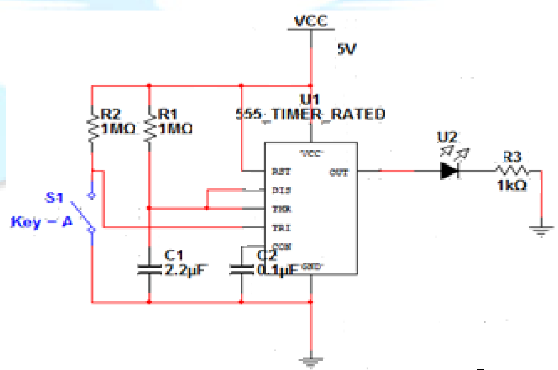


Fig 4: Pin Diagram of 555 Timer

Pin	Name	Purpose
1	GND	Ground reference voltage, low level (0 V)
2	TRIG	The OUT pin goes high and a timing interval starts when this input falls below 1/2 of CTRL voltage (hence TRIG is typically 1/3 V_{CC}, CTRL being 2/3 V_{CC} by default, if CTRL is left open).
3	OUT	This output is driven to approximately 1.7 V below $+V_{CC}$ or GND.
4	RESET	A Timing Interval May Be Reset By Driving This Input To GND, But The Timing Does Not Begin Again Until RESET Rises Above Approximately 0.7 Volts. Overrides TRIG Which Overrides THR.
5	CTRL	Provides "control" access to the internal voltage divider (by default, 2/3 V_{CC}).
6	THR	The timing (OUT high) interval ends when the voltage at THR is greater than that at CTRL (2/3 V_{CC} if CTRL is open).
7	DIS	Open collector output which may discharge a capacitor between intervals. In phase with output.
8	V_{CC}	Positive supply voltage, which is usually between 3 and 15 V depending on the variation.

5.2.2 Monostable Multivibrator



5.2.3 Proposed Model

5.2.4 Advantages

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

5.2.5 Applications

- Parking Lightings
- Street Light
- Stair case
- Balcony
- Garden Lights

6. Conclusions

This project 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 LED shave long life, emit cool light, donor have any toxic material land 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.

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