Night Lamp Controller

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Abstract---This paper proposes energy efficient of automatic street lighting system based on low cost LDR circuit. The main objective is to design energy efficient based controller for controlling the Light Emitting Diode (LED) based street lamp via appropriate lighting levels control. This system is consists of a simple light detecting resistor, sunlight detecting sensors and LEDs. While, the controlling and managing of the system is based on the number of traffic and five different level of street light brightness has been used for lighting up the street and proportional to the number of traffic. The system was programmed to automatically turn off during the hours of daylight and only operate during the night and heavy raining or bad weather. Several numbers of tests have been conducted to test and validate the proposed prototype in the different environments. LDR based project main idea is to develop a application which can control the electricity usage in street lights or saving the energy when nt in use. LDR is used in this application for sensing light intensity. LDR controls power by controlling output resistance which is dependent on light intensity. This application can also be used in industries, house hold applications and many other fields where power consumption is more. The solar panels will feed the system with solar power, which will be charging the battery during the day. At night the battery will be discharge through the project processes. The battery and the streetlights will be monitored to observe their level and performance in the operating board. Research have been done about transmission medium which will be wireless by using transmitters and receivers. This medium will allows the information to transfer from part to another in the system.

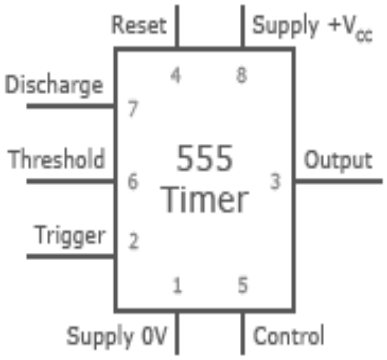
I. INTRODUCTION

Electronics night lamp controller can be of help. The Electronics night lamp controller is a very useful gadget for homes and offices. The circuit uses single Monolithic -555 in dual in line plastic package and a few external components. Here light depending resistor (LDR) is used as a sensor to detect the presence of light. Thus this circuit solves the problem of switching the light again and again. In this circuit, two LEDs are used to indicate if the sun light is avail or not, when during the day the night lamp will remain switched off and red led ll glow. When there is no light the night lamp ll get switch on, i.e. the green LED will glow. As soon as a sun light gets dim , the red LED goes OFF, and the red LED will glow.

The sensitivity of a photo detector is the relationship between the light falling on the device and the resulting output signal. In the case of a photocell, one is dealing with the relationship between the incident light and the corresponding resistance of the cell.

The theoretical concept of the light sensor lies behind the LDR (Light Dependent Resistor) which is used in this circuit as a darkness detector. The LDR is a resistor and its resistance varies according to the amount of light falling on its surface. When the LDR detect light its resistance will get decreased, thus if it detects darkness its resistance will increase.

A. 555 Timer



1) *Pin 1: Grounded Terminal:*
All the voltages are measured with respect to the Ground terminal.

2) *Pin 2: Trigger Terminal:*
The trigger pin is used to feed the trigger input hen the 555 IC is set up as a mono stable multivibrator. This pin is an inverting input of a comparator and is responsible for the transition of flip-flop from set to reset. The output of the timer depends on the amplitude of the external trigger pulse applied to this pin. A negative pulse with a dc level greater than Vcc/3 is applied to this terminal. In the negative edge, as the trigger passes through Vcc/3, the output of the lower comparator becomes high and the complimentary of Q becomes zero. Thus the 555 IC output gets a high voltage, and thus a quasi stable state.

3) Pin 3: Output Terminal:
Output of the timer is available at this pin. There are two ways in which a load can be connected to the output terminal. One way is to connect between output pin (pin 3) and ground pin (pin 1) or between pin 3 and supply pin (pin 8). The load connected between output and ground supply pin is called the *normally on load* and that connected between output and ground pin is called the *normally off load.*

4) Pin 4: Reset Terminal
Whenever the timer IC is to be reset or disabled, a negative pulse is applied to pin 4, and thus is named as reset terminal. The output is reset irrespective of the input condition. When this pin is not to be used for reset purpose, it should be connected to + V_{CC} to avoid any possibility of false triggering.

5) Pin 5: Control Voltage Terminal:
The threshold and trigger levels are controlled using this pin. The pulse width of the output waveform is determined

by connecting a POT or bringing in an external voltage to this pin. The external voltage applied to this pin can also be used to modulate the output waveform. Thus, the amount of voltage applied in this terminal will decide when the comparator is to be switched, and thus changes the pulse width of the output. When this pin is not used, it should be bypassed to ground through a 0.01 micro Farad to avoid any noise problem.

6) Pin 6: Threshold Terminal:

This is the non-inverting input terminal of comparator 1, which compares the voltage applied to the terminal with a reference voltage of 2/3 V_{CC}. The amplitude of voltage applied to this terminal is responsible for the set state of flip-flop. When the voltage applied in this terminal is greater than 2/3Vcc, the upper comparator switches to +Vsat and the output gets reset.

7) Pin 7 : Discharge Terminal:

This pin is connected internally to the collector of transistor and mostly a capacitor is connected between this terminal and ground. It is called discharge terminal because when transistor saturates, capacitor discharges through the transistor. When the transistor is cut-off, the capacitor charges at a rate determined by the external resistor and capacitor.

8) Pin 8: Supply Terminal:

A supply voltage of + 5 V to + 18 V is applied to this terminal with respect to ground (pin 1).

II. LITERATURE REVIEW

Our proposal is not the first procedure to implement the home automation technique. Basically, street lighting is one of the important parts of a city's infrastructure where the main function is to illuminate the city's streets during dark hours of the day. Previously, the number of streets in the town and city is very small. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density which highlighted in [1].There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps. It is called first generation of the original street light. After that, another method that has been used was optical control method.

This method is using high pressure sodium lamp in their system. It can be seen that this method is widely used in the country nowadays. This method operates by set up an optical control circuit, change the resistance by using of light sensitive device to control street lamps light up automatically at dusk and turn off automatically after dawn in the morning. Due to the technological development nowadays, road lighting can be categorized according to the installation area, performance and their used, for an example, lighting for traffic routes, lighting for subsidiary roads and lighting for urban center and public amenity areas. While, the wireless sensor network (WSN) helps in improving the network sensing for street lighting as highlighted in [2]-[3]. Meanwhile, street lighting technology can be classified according to the type of lamps used such as incandescent light, mercury vapour light, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light. Different type of light technology used in lighting design with their luminous efficiency, lamp service life and their considerations is given in Table 1.

Light Technology	Average Lamp Life in Hours	Lumens per Watt	Consideration
Mercury vapour	12000-24000	13-48	Very inefficient, ultraviolet radiation and contains mercury.
Metal halide	10000-15000	60-100	High maintenance UV radiation contains mercury and lead, risk of bursting at the end of life.
High Pressure Sodium	12000-24000	45-130	Contains mercury and lead.
Fluorescent	10000-20000	60-100	UV radiation contains mercury, prone to glass breaking and diffused non-directional light.
LED	50000-100000	70-150	Relatively higher initial cost.

Table. 1: Light Technologies and their Avg Life Span

LED is considered a promising solution to modern street lighting system due to it is behavior and advantages as emphasized in [4]-[6]. A part from that, the advantages of LED are likely to replace the traditional street lamps such as the incandescent lamp, fluorescent lamp and High Pressure Sodium Lamp in future but LED technology is an extremely difficult process that requires a combination of advanced production lines, top quality materials and high-precision manufacturing process. Therefore, this paper highlights the energy efficient of street lighting design using LED lamps through intelligent sensor interface for controlling and managing. Three parts have been included under this topic for completed this study. Design architecture is the main block function for the proposed design. While, the hardware specification will detail out the components involved in this design from the sensor components until the controller selection. Software development based on the proposed design will be detail out in software part where the flow ofthe system operation will be detailed out elaborated.

A. Design Architecture

The system development is start with the design architecture of the proposed design. Transparent block diagram has been used to outline the proposed design as

Shown in Figure 1. Four main components have been identified as the input to the system; clock, power, vector input and water sensor. While, two components have been declared as the output two this system; display and LED module.

III. PROPOSED METHODOLOGY

As seen from the figure the charging and the discharging of capacitor defines the output frequency of the 555 timer.The charging is specified by Ra and Rb with time constant (Ra +Rb)*C and and discharge by Rb given by (Rb)*C

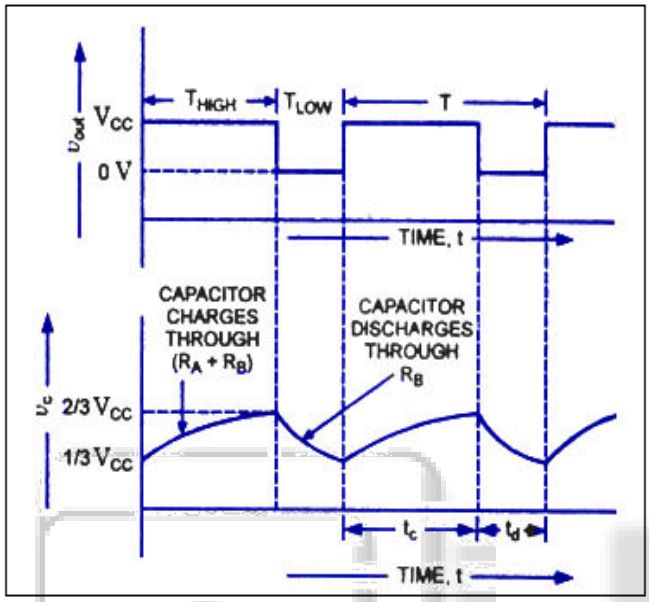


Fig. 2: Working diagram of 555 Timer

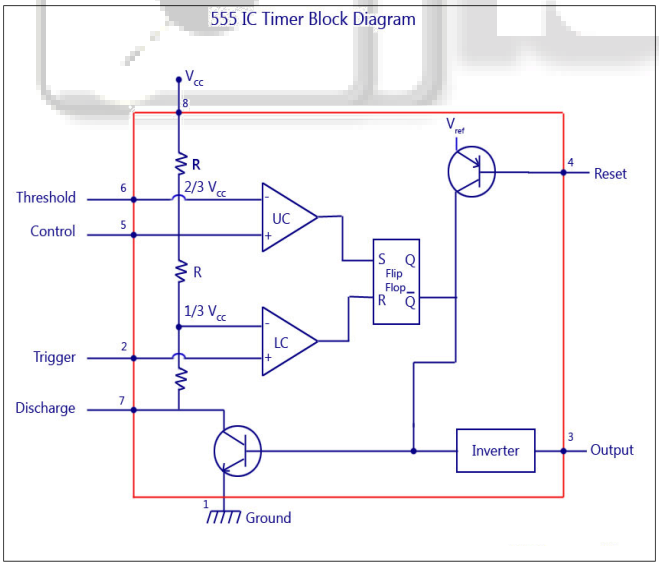


Fig. 3: Circuit diagram of 555 Timer

A. *Components*

- LDR (LIGHT DEPENDENT RESISTOR) – 1
- SWITCH– 1
- 9V BATTERY – 1
- LED – 3
- IC 555 – 1
- RESISTORS – 3 (470 OHM EACH)
- POTENTIOMETER(100K)
- CONNECTING WIRES
- BREAD BOARD
- GCB(General Circuit Board)
- MALE JUMPER
- SOLDERING GUN
- SOLDERING WIRE

B. *CIRCUIT DIAGRAM*

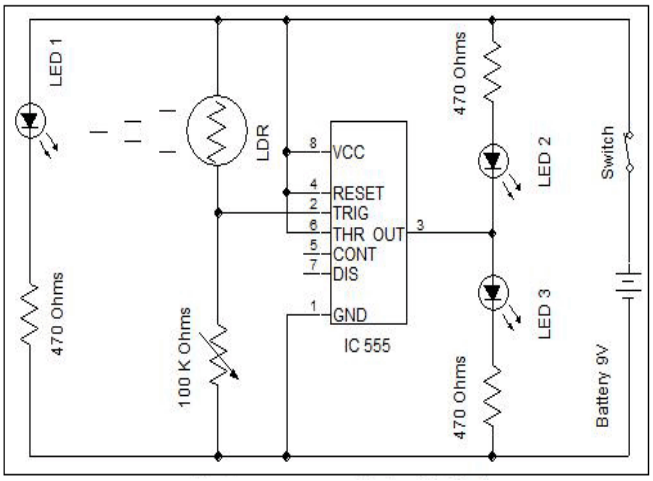


Fig. 4: Circuit Diagram LDR and other sensors

C. *Working*

This circuit uses a popular timer I.C which is 555. I.C 555 is connected as comparator with pin 6 connected with positive supply, the output goes high-1 when the trigger pin 2 is at lower than 1/3 level of the supply voltage. Conversely the output goes low-0 , when it is above 1/3 level. So small change in the voltage of pin 2 is enough to change the output of pin 3 from 1 to 0 and 0 to 1. The output has only two states high and low and can not remain in any intermediate stage. It is power by 9V battery for portable use. The circuit is economic in power consumption. Pin 4,6&8 is connected to the positive supply and pin 1 is grounded. To detect the present of light we have used LDR and a source of light. LDR is a special type of resistance whose value depends on the brightness of the light which is falling on it. It has a resistance of about 1 mega ohms when in total darkness, but a resistance of only about 2-5 k ohms when brightly illuminated. It responds to a large part of the light spectrum.

The source of light and LDR is so adjusted in the night lamp that light will directly fall on the LDR but when there is no light in the atmosphere and LDR will be under darkness. We have made a potential divider circuit with LDR and 100 K variable resistance connected in series. Voltage is directly proportional to conductance so more voltage we will get by this divider when LDR is getting light and low voltage in darkness. Divided voltage is given to pin 2nd of 555. As soon as LDR gets dark the voltage of the pin 2 drops 1/3 of the supply voltage and pin 3 gets high and LED glows. We can also use two LED at output pin 3, for present LED 1 and for absent LED 2. For this method one LED is connected as forward bias and other is connected as reverse bias to indicate both high and low conditions. To limit the current of LED resistance is used in series.

IV. CONCLUSION

In our proposed system we implement a new design to save energy and reduce man power with automation power controller. We can develop various applications using LDR to make it more efficient and thus save energy. Model is simple and energy saving can be fitted at any place to save the work load like in Solar Plants , auto detection of sun light when the sun light is available the solar plant will start on its own . It has wide applications can be used from households to big industries. It has large industrial application For further development of the technology we have to find a source or the material which can store energy for hours.

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