Solar Based Intelligent Street Light Control By Detecting Vehicle Movement

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ABSTRACT

Now-a-days the amount of power consumed by lighting and streets shares a major energy demand. The vehicles are passing over always and a part of places will be consisting of less density areas and even no vehicle moments itself in few areas. But during night all street lights will be on in conventional street lighting system. To overcome from this issue, a proper energy saving methods and lighting control to be implemented. The proposed work is to have two controls like, one is to switch of lights during no vehicle moments in streets and automatically switch it on when vehicles arrive and the other modes are to give less intensity light for pedestrian and to switch on bright mode during vehicle moments at sides on the roads. In this work the LED lights are used for street arrangement, the Photo diodes and IR sensors are used to sense vehicle moments. Sensor control signals were supplied into the microcontroller 8051. In the microcontroller the control logic is implemented to control lights based on vehicles and pedestrian moments with bright and dim mode of operation and to switch off lights during no vehicles and pedestrian. From the proposed method the overall energy being utilized now-a-days for lighting can be minimized. Furthermore, due to the growth of cities and the style of living, automatic and intelligent control schemes are necessary to govern the sophisticated lighting system.

Keywords *— High Intensity Light, Low Intensity Light, Light Emitting Diode, Pulse Width Modulation.*

1.INTRODUCTION

This paper shows the design to detect the vehicle movement on roadways to switch ON just a block of road lights in front of it, and to turn OFF the trailing lights to save energy. During night each one of the lights on the expressway stay ON for the vehicles, yet loss of power is experienced when there is no vehicle movement. This proposed framework satisfactorily works for energy saving. This is accomplished by detecting a vehicle moving towards the street and turns ON a block of street lamps in front of the vehicle. As the vehicle moves forward by, the trailing lamps turn OFF on its own. By doing this, a considerable amount of power is saved So each of the road lights stay in OFF condition when there are no vehicles on the street. There is another method of operation where instead of turning OFF the lights totally, they stay ON with ten percent of the extreme intensity of the light. As the vehicle approaches, the block of road lamps change to hundred percent intensity and as the vehicle moves forward by, the trailing lights return to ten percent power once more. HID lamps are utilized for metropolitan road lights.

Because HID is based on the idea of gas release, no voltage reduction technique can control the intensity. In road lighting, white LED-based lights will soon supersede high-intensity discharge lights. Intensity is likewise conceivable by PWM created by the microcontroller. The photodiode and IR LEDs delivers logic signal to microcontroller to turn ON or OFF depending upon the operation. Consequently, this progressively changing from ON/OFF sides in saving a great deal of power. This venture utilizes an 8051- arrangement microcontroller. Proposed venture can be upgraded by utilizing proper sensors for recognizing the unsuccessful road light and afterward delivery a short message service to the control division by means of GSM modem for suitable action.

2.PRESENT SYSTEM

The road lighting frameworks have been rapidly evolving in recent years as a result of the rapid development of industry and urban community connectedness. In today's world, the mechanization of optimal power usage and cost reduction is a critical factor. The different types of road light control frameworks are implemented to control and keep up complex road lighting systems. For controlling and diminishing energy utilization of a town's open lighting system, the effective systems are created. The current work is shows utilizing High intensity discharge (HID) lights. As of now, the HID is utilized for urban road light where power is not managed by any of the methods to reduced or switch off the lights during less density or unmanned areas.

High-intensity discharge lights (HID lights) are a type of electrical gas-release light that emits light via an electric circular segment between tungsten terminals attached inside glassy or simple mixed quartz (colorless glass made of almost pure silica or melded alumina curve tube). The gas and metal salts are loaded in tube. The gas excites the circular segment's underlying it. Once the circular segment is begins, it warms and evaporates the metal salt forming plasma which enormously builds the force of light delivered by the curve and decreases its energy utilization. High force release lights are a sort of circular segment light.

3.METHODOLOGY

A dynamic control strategy is given for the smart road control project. As per the proposed arrangement indicates, all the road lights continuously glow for a few moments and switches off. At the point when a vehicle is moving by, a block of road lights switch ON and as the vehicle moves ahead, the following block of lights turns ON whereas the preceding light turn OFF. The present HID lights are more costly then, LEDs. Due to this reason, the high intensity discharge lights are replaced by light emitting diodes. The power utilization and cost can be saved in the present field of utilization of electrical gadgets and their advancements. The road lighting systems are becoming complex systems with proper energy conservation techniques due to the fast development of industries and urban areas.

For controlling the complex road lighting system, the advancement techniques have been used which includes infrared sensors to differentiate the movement of vehicle after which the lights switch ON. As the vehicle passes away the sensors, the road lights, which were in switched ON condition will turn OFF (Minimum Light Intensity) and the preceding lights will switched ON (Maximum Light Intensity) as shown in flowchart below Fig. 1.

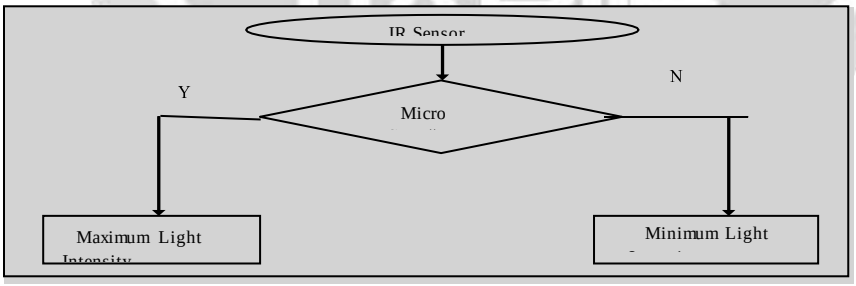

Fig 1. Flow chart for detection of Vehicle.

3.HARDWARE DESIGN

As street lamps, there are fourteen light emitting diodes (LEDs), eight sets of photodiodes (or infrared diodes) as sensors, variable resistors, and switch transistors in the hardware model. The infrared diodes are on one side of the roadway, while the photodiodes are on the other side, directly facing the IR diodes.

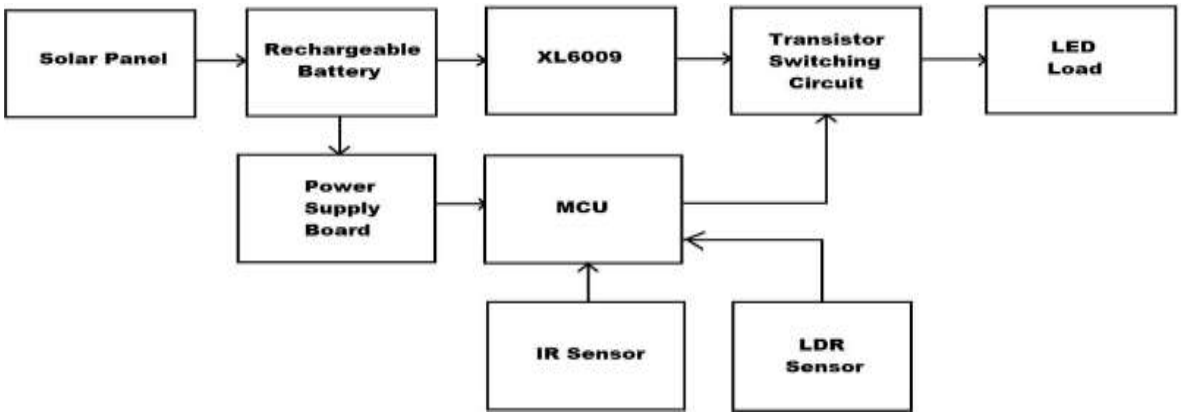

Fig. 2. Proposed Block Diagram for automatic light control

In this proposed block diagram consisting of the IR sensors which is used for interruption detection and send logic signal to microcontroller for the glowing of the LEDs ahead of the Vehicle as shown in FiG.3

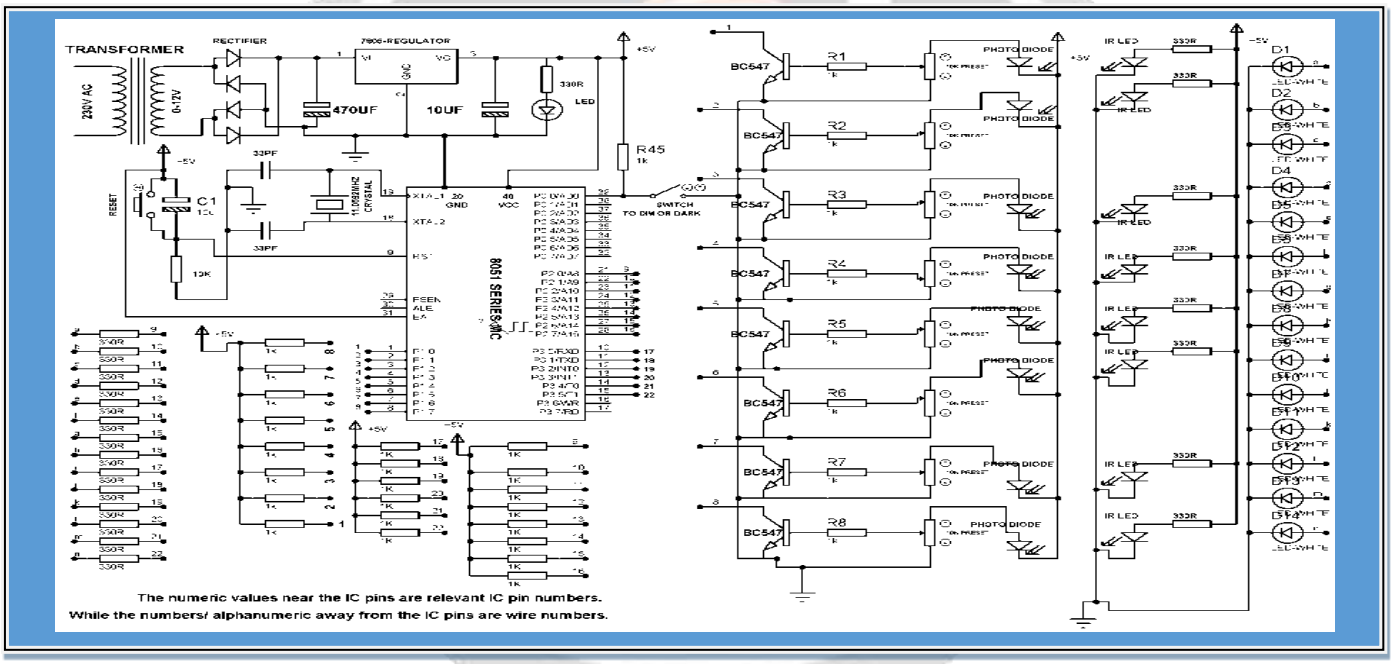

Fig. 3. Circuit Diagram with necessary hardware.

Consider the case where there isn't a single vehicle on the road. In this case, the infrared light from the infrared diode is incident directly on the photo sensor, which is facing the IR sensor. As a result, the photo sensor conducts and current pass es through it. The current passes through the photodiode and the variable resistor on its way to the transistor's base-emitter region. The emitter is connected to ground in the circuit schematic. The collector of the transistor is associated with the input port (port 1), which goes to ground i.e., rational ZERO. Therefore, when the vehicles are absent, at that point a sensor output to the microcontroller port 1 is ZERO.

The Fig. 3 shows the arrangement of hardware model, in which consists of PIC micro-controller in series with voltage regulator and transformer at input end. Towards the output, consists of LED lights and IR sensors, the similar arrangement as shown in Fig. 5.

Consider the situation when a vehicle deters the IR radiation way. For this situation, IR radiation is blocked and consequently it doesn't fall on the photo sensor then the sensor will switched off. Consequently, there is no current moving through this first transistor. Then collector moves to HIGH state. The Photodiode-IR diode match IR way is blocked. This prompts a move from ZERO to HIGH at P1.0.

The microcontroller is modified such that, at whatever point the pin P1.0 goes high, at that point a frame of seven lights ahead from the vehicle movement start glows and the two pins of port 2 and port 3 go HIGH. This procedure goes ON i.e., as the vehicle advances, the road lights intensity increased to 90% and the trailing lights intensity reach to 10%.

5.RESULTS AND DISCUSSION

The hardware have been implemented and the model performance were checked for two modes of operation as shown below and the arrangements of IR sensors and Lighting devices as shown in Fig. 4 and Fig. 5.

1.Transition of street lamps from dark to bright state for less density areas.

2.Transition of street lamps from dull to bright state for more density areas.

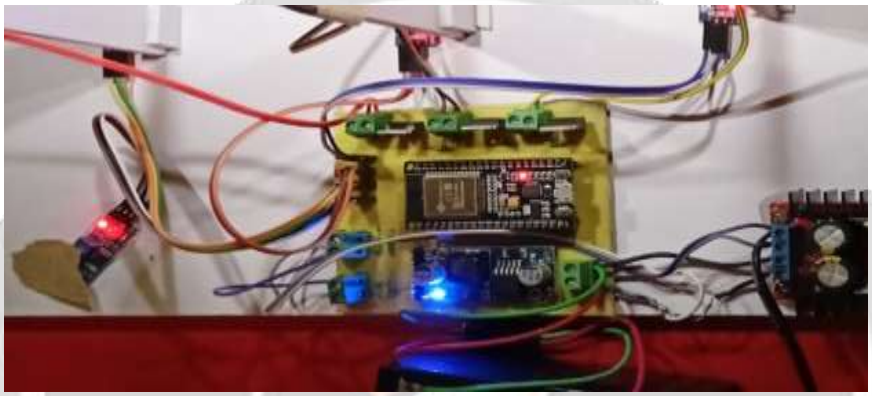

Fig. 4. The mode of switch and reset button with microcontroller setup.

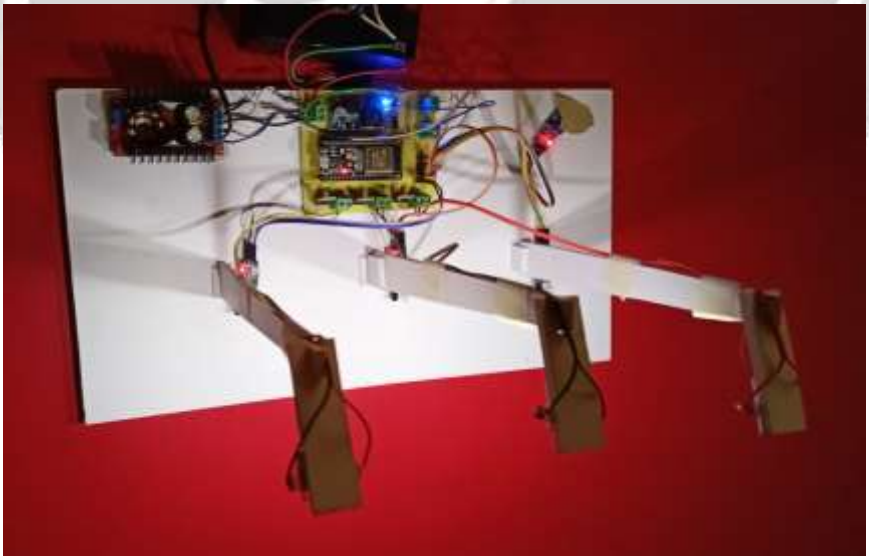

Fig. 5. Street lamp arrangement with IR sensors.

Mode 1:

When there is no vehicle detected, all of the street lights will be turned off. Tuning ON/OFF of street lights is performed using a pulse width modulation technology and a programme stored in the microcontroller. When there is no car on the road, the street lamps are switched on for about one millisecond before being shut off for a hundred millisecond (First two LEDs). Hence, we get street lamps with less shine. At the point when a vehicle is detected, each one of the street lamps are on for 1ms and the window of street lamps are lit up for 100ms. Therefore, we have a PWM wave of 99% obligation cycle for those seven LEDs as shown in Fig. 6.

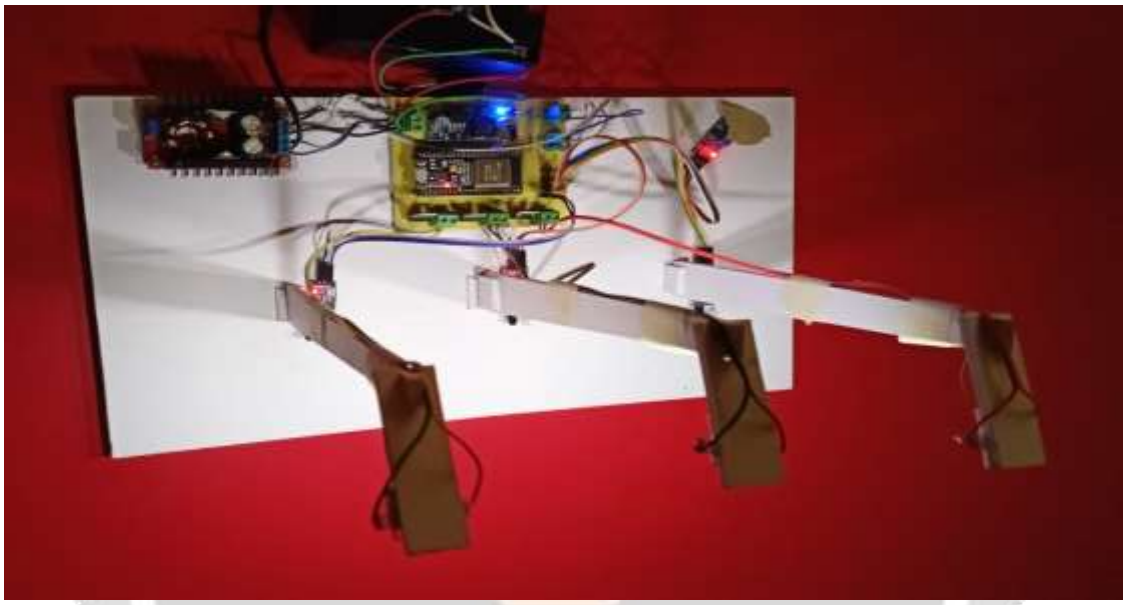

Fig. 6. Mode 1 operation setup.

Mode 2:

In this mode, when there are no vehicles, the street lights will be in very low brightness. Once the vehicle is detected, the block of street lights in front of the vehicle lights up. The mode 2 operation shows the LEDs are glowing at 10% intensity when no vehicle. The moment at any vehicle comes in between the sensors then the light will increase to 100% intensity ahead of the vehicle and the trailing lights will revert back to 10% intensity (First five LEDs) as shown in Fig. 7.

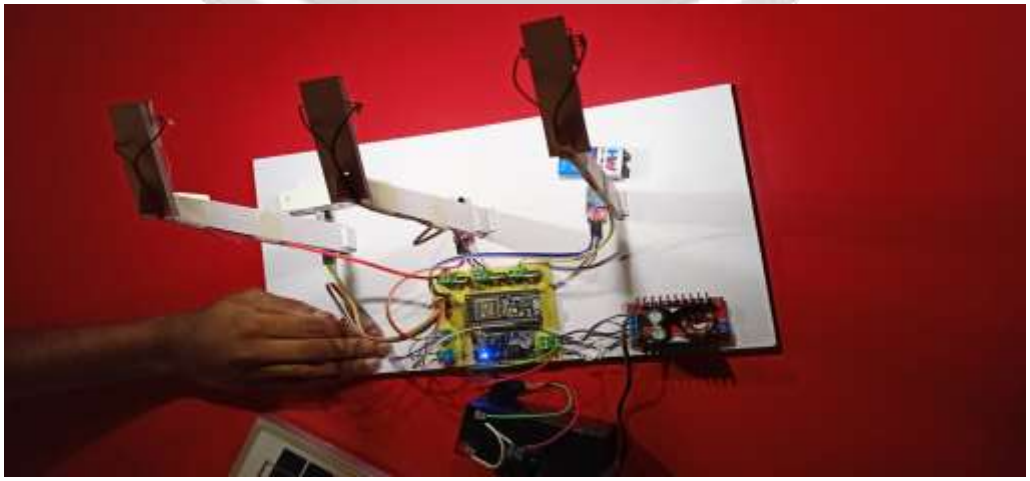

Fig. 7. Mode 2 operation Setup.

6. CONCLUSION

The implemented model is a less cost, pragmatic, ecofriendly and the most secure approach to save energy. As per the statistical information 35%-40% of electrical energy is currently utilized by the national highways, state highways and local street lights. The initial investment cost and erection may be the disadvantage, but with the bulk production of the module the overall cost of investment can be reduced further due to advancement in innovation and technology the cost of the project can be furt her reduced. The project has scope in different applications like providing lighting for office, building, grounds, walking paths and parking garages of large shopping Centre's. This can also be used for security surveillance in places like corporate buildings, business centers, and schools.

7. ACKNOWLEDGEMENT

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