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A Project Report on

“AUTO-STREET LIGHTING SYSTEM”

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In
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Submitted by

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Certificate

Certified that the project work entitled “**AUTO-STREET LIGHTING SYSTEM**” carried out by Mr. Mohit, USN 1CR16EE047; Mr. Raktim Dutta, USN 1CR16EE058; Mr. Rupesh Kr Singh, USN 1CR16EE061; Mr. Satyam Kumar, USN 1CR16EE069 are bonafied students of CMR Institute of Technology, Bengaluru, in partial fulfillment for the award of Bachelor of Engineering in Electrical & Electronics Engineering of the Visvesvaraya Technological University, Belgaum, during the year 2019-2020. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

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DECLARATION

We, [Mr. Mohit (1CR16EE047), Mr. Raktim Dutta (1CR16EE058), Mr. Rupesh Kr Singh (1CR16EE061), Mr. Satyam Kumar (1CR16EE069)], hereby declare that the report entitled “**AUTO-STREET LIGHTING SYSTEM**” has been carried out by us under the guidance of **Dr. K Chitra**, Professor & HOD, Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirement for the degree of **BACHELOR OF ENGINEERING in ELECTRICAL & ELECTRONICS ENGINEERING**, of Visveswaraya Technological University, Belagaum during the academic year 2019-20. The work done in this report is original and it has not been submitted for any other degree in any university.

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Abstract

The aim of an automatic street light system or smart lighting system is to reduce the extra power expended during minimum vehicle traffic movement during off-rush times. This proposed Street light will turn automatically turn ON when vehicle movement is detected and will be set to OFF during other spare times. In today's modernized automation is of the prime essence as the human error & intervention is sought to be reduced as humanely possible. Automation core principle is to reduce the amount of human interference during vital production and service, through the use of preset controlling guidelines and latest innovative technologies.

In terms of the concept of industrialization, automation is a step further than mechanization which has priorly achieved by human society around the world. This is done by giving human operators control over said apparatus to help the achieve poignant & tedious tasks. Automation is starting to play an important role in continuously evolving global economy and has started affecting many day-to-day experiences. Human or manual control is being phased out gradually to reduce the probability of human error in vital workings. This Automatic Street Lighting System is a possible example of the aforementioned automation revolution. I helps save vital power & energy by lighting up the street lights only when vehicle & transport movement is detected. If no vehicle movement is detected, i.e. there is no oncoming traffic on the said road, then the street lights stay off automatically, thus conserving vital energy and making the street lighting system more efficient.

Acknowledgement

(This is an example only; you can acknowledge others also here)

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CHAPTER 1**INTRODUCTION**

The Street Light system occupies an important strategic importance in the national economy as they are a major requirement in the transportation system. Daily tones of equipment, material, essential goods, etc. are transported via roadways to keep the national supply chain continuously thriving.

With passage of time, Street Lighting systems are becoming more & more complex as good & product penetration is increasing to the hinterland of the country. Specially the Tier-2 & Tier-3 cities has recently seen a huge surge in demand of products & services due to the country's growing economy.

To ensure efficient control and maintenance, several control systems are being installed along the national highways & roadways. This is done to ensure sufficient illumination to roadways to maintain transportation traffic for the national supply chain, as well as achieving efficient use of electricity & power.

The main considerations of street light control systems are:

- Automation
- Power Consumption
- Cost Effectiveness

For the street lightings system, the power requirement is varied than the general. That is a traditional street lights need power consistently to keep up.

So, when the lights are need to be turned on & off only by a human intervention through a switch. The drawbacks of traditional road lighting system is thus concluded as non-economical & not highly efficient. Also, it increases the workload on municipalities & various government maintenance for the maintenance of the lighting system. This is a slow process as street lights need to be first checked, leading to cordoning off a particular part of a road & subsequently adding traffic jam. Then, the test results have to be sent for verifications & finally after requisite bureaucratic permission, a street light is successfully replaced. Thus, automation is being aimed to reduce this stress on government administration and subsequently increase the efficiency of the street light system. Also, the streets & roads should be given proper illumination to ensure safe passage of traffic & vehicle movement. Thus this automatic street lighting system model is proposed to achieve the aforementioned targets & goals. This model ensures unnecessary wastage of

electricity when there is no electricity movement at night time. To achieve this, an IR motion sensor circuit is being installed to make the street lights glow. This situation can be distinguished with the assistance of the PIR sensors.

Thus, this paper basically has a single output to showcase that the automatic lighting system prevent wastage of power by turning the street lights to ON/OFF based on the vehicle movement sensed using sensors on the roads.

For the street lightening, it has kept forward higher necessities. Basically, a typical road lights does not keep up the power consequently.

When the lights are on it will dependably stay on until any labor turns off them. So that the support and the financial consumption utilization is more. It might require checking the board frequently. The inadequacies of conventional street lighting frame work not only convey monitory burden to the nearby money related part. Yet in addition it confines the administration and upkeep of the lighting system which leads to the inconvenience to the public since several lights aren't glowing and complaints for them hasn't been made. The advancement of green lighting is basic. An emerge among the most fundamental human advancement records is the improvement of a drop transportation association. These streets and roads must be ideally lit up with the target that an adequate perceivable quality is ensured to diminish the fiasco rate and expansion of the snapshot of vehicle.

To solve these problems, a solution is developed with the help of solar energy to develop the street lights, to connect them with the solar panels like photovoltaic panels (PV). To gather the energy from sun PV panels are used. These panels are associated with group of batteries and also with a charge controller. In the interim of day time the energy that is obtained from sun can be saved to these batteries in the course of electrical energy. At the end of the day the gathered energy can be made available with the help of batteries during the entire night. Make a point that at night time also there is a chance of wastage of energy whenever there is no traffic on the streets. To avoid this case, the motion sensing circuit can be used to make use of energy to make the street lights glow. This situation can be distinguished with the assistance of the PIR sensors. We are also adding the dust circuits to the entire setup which are used to clean the PV panel from the outside obstacles or dust particles which affects the top surface of solar panel.

Thus, the paper basically has three outputs to discuss, first that the street lights must get electricity so that there are connected to the rechargeable battery which will energize in day time with the help of day light. Secondly, Street lights are attached with a resistor sensor which dependent on light that will help change them on and off by its own nature.

For example, if the detection of LDR is daytime then the street lights gets turned OFF automatically and the detection of LDR is night time then the street lights get turned ON automatically and remains ON for the entire night without the closeness of individuals or vehicle. By cause of this, there is an imaginable wastage of power. To eliminate this wastage of power or electricity a new setup contains automation of street lights to glow ON/OFF based on the traffic on the streets and glows with low severity of 50% at night time to look after battery from reducing the charging of MPPT charge controller, secondly that the LEDS lightening will be controlled by three parameters which are timely based, light intensity and also the available vehicle.

The light sensors will detect the nearness of light capacity and inactive infrared PIR movement sensor will be utilized to distinguish movement. Lastly, because of dust, regularly solar panels lost 70% of efficiency.

Dust circuit is employed to clean the solar panels once a month. However, this avenues and streets are enlightened always for over 13 hrs every day. Formidable measure of electrical energy is required to light every one of these avenues and streets. Around 30% of the aggregate electrical energy of any country is used in lightening the streets and the lanes.

The speed breakers, paths and roadways must be adequately enlightened so that an acceptable perceivable quality is ensured with a specific extreme target to restrain the disaster or the accident rate and increment the stream of the vehicles and security. Be that as it may, these avenues and streets are lit up always for over 13 hours day by day. For this it requires an endless measure of electrical vitality to light each one of the roads and avenues. The spending cost for the vitality is high. Furthermore, condition contamination by the transmitted CO₂ is moreover high. That explains estimated number of Kilowatts every year, estimated yearly power cost for streetlights, estimated yearly CO₂ outflows because of streetlights for the number of residents available in the cities.

In the course of most recent years, LED road lights have transformed into genuine items that one can see out and about. They bode well for some reasons, for example, their minimized size, high viability (lumens per watt), life span, and vigour. Driven sources additionally take into account intriguing new structure frames, regularly with slimmer profiles than conventional metal halide circular segment lights. Driven is viewed as a promising answer for current road lighting framework because of its conduct and focal points as underscored. Aside from that, the upsides of LED are probably going to supplant the customary road lights, for example, the brilliant light, fluorescent light and

High-Pressure Sodium Lamp in future. However, LED innovation is an incredibly troublesome procedure that requires a mix of cutting-edge creation lines, top quality materials and high-accuracy fabricating process. Along these lines, this paper features the vitality effective of road lighting configuration utilizing LED lights through clever sensor interface for controlling and overseeing. The first commitment of this theory is to structure of a streetlight hub dependent on which the framework can be set to keep running in programmed mode, which control streetlight as per Sunrise and Sunset Algorithm and light power. This control can make a sensible change as indicated by the regular variety.

CHAPTER 2

LITERATURE REVIEW

Some authors mentioned the use of LED DC road lights as opposed to conventional AC lights in view of their longer lifespan, higher effectiveness, lower support costs and mercury free, thus eco-friendly. Some others suggested that changing lights with LED will save 50% energy from the street lights. To control and manage the street lights several new technologies are being developing as Tang, Hengyu [5] proposed a control core framework based on AT89S52 which controls street lights. This framework combines the various technologies of LCD, digital clock and a timer, photosensitive induction etc. when vehicles crossed by to conserve electricity the lights will turn on and vice versa. With this technology a large amount of power can be saved. In order to get the details of spoiled light and its information an auto-alarm function is used in this framework.

Xudan, Siliang [6] came up with a system with wireless sensor networks frame work to observe the progress. Based on latitude and longitude information the system is adjusted. Using sunset and sunrise procedures and the information of light intensity the system controls the street lights being kept in automatic programming mode. The system in addition makes use of digital temperature humidity sensor to humidity, real time and temperature of street lights.

Priyasree and Radhi [7] nominated control arrangement for a LED road lighting framework. The proposed control organization empowers disconnection of the road lighting framework from the mains amid pinnacle load time, lessening its effect in the

distributed power framework natural utilization, decline the administration cost and screen the status data of every road lighting unit. A.C. Kalaiarasan [8] volunteered a solar powered vitality-based road light with auto-following framework for augmenting power yield from a solar system that is desirable to increase the efficiency. So as to expand the power yielded from the sun light-based boards, one needs to keep boards lined up with the sun. by utilizing this approach, we can gain the maximum utilization from sun rays. This is a far most financially savvy arrangement than buying extra solar panels.

Budike. E.S. Lothar [9] invented a lightening control system consisting of modules like ballast control module, data processing module. The data processing module is connected with number of repeaters. The connections between data processing module, ballast module, repeaters and computer system through wireless connection comprises of a local area network. This system is developed to give the benefits of operating and controlling light intensity, automatic running of street lights and scheduling through web browser.

S.H. Jeong [10] set forth the development of Control System for street lights using Zigbee communication system. This system is presented in order to reduce the difficulties in maintenance of the lighting systems as well as to decrease the uneasiness of handling the same. This is monitoring and control system of street lights which makes use of system's control command to make the street lights on and off automatically. Rajput and katav [11] propounded an intelligent street lighting system to lessen the large amounts of power wasted in street lightening system. This system makes use of different kind of sensors like CO2 sensor, noise sensor, light intensity sensor etc. To receive and send data between concentrator and system GSM modules are utilized.

Somchai Hiranvarodom [12] describes a similar analysis of photovoltaic (PV) road lighting framework in three distinct lights. To be specific, a low weight sodium light, a high weight sodium light and a fluorescent light have been utilized for establishment in every pole to decide the reasonable framework to introduce in a regular provincial zone of Thailand.

CHAPTER 3

EXISTING SYSTEM

Industry of road lighting frameworks are developing quickly and going with fast development of industry and urban areas. Mechanization, Power utilization and Cost Effectiveness are the imperative contemplations in the present field of gadgets and electrical related advances. To administer and keep up complex road lighting frame of reference all the more financially, different road light control frameworks are created. These frameworks are created to control and diminish vitality utilization of a town's open lighting framework utilizing distinctive advancements. The current work utilizes the high power release light (HID). Stowed away by and utilized for urban road light and is dependent on rule of gas release,

In this manner the power isn't been controllable by any voltage decrease technique as the release path is broken. HID lamps are a category of electrical gas remittance lamp which bring forth light by means of an electric arc in middle of tungsten electrodes resided inside a translucent or crystalline fused quartz or inter fuse alumina arc tube. Gas and metal salts are recycled to permeate the tube. The arc's fundamental opening is done with the benefit of gas. Once the arc is initialized, it heats and disperse the metal salts materializing plasma, the plasma thus generated greatly boosts the concentration of light emitted by the arc and power consumption is curtailed. Arc lamps belongs to the category of high intensity exoneration lamps.

The existing system possess the main disadvantage of want of people to turn off and on the street lights to hand-operate which, requires formidable human competency to monitor the process. Also, we need to check regularly weather all the street lights are functioning properly or not. If the street lights stop functioning properly many accidents may occur. So regular monitoring of street lights is also required. We propose a contemporary method of which reduces cost, human potential and energy consumption.

PROPOSED MODEL

The Proposed work is to control exchanging of road light naturally as indicated by light force to create stream based powerful control measurements utilizing infrared identification innovation and keep up remote correspondence among lamp post and control terminal. The principle behind the working of the model lies in the functioning of IR Sensor; a Transmissive type IR Sensor has been used in this proposed model.

This proposed model uses economical & latest LED Lamps rather than traditional lighting lamps like the High compression Sodium Lamps, etc. The use of LED lamps is highly advocated because of its benefits over other conventional lamps because of its low maintenance cost, high shading rendering list, fast lighting up properties, working durability, etc. The main components used in the proposed system include are explained below.

CHAPTER 3.1**INFRARED LED**

An IR LED, also termed as IR transmitter, is known for its special purpose LED that funnel infrared beams in the compass of 760 nm wavelength. Such LEDs are typically made of gallium arsenide or aluminum gallium arsenide. They, alongside IR recipients, are generally utilized as sensors. Its appearance is same as a typical LED. Since the human eye can't see the infrared radiations, it isn't feasible for an individual to recognize whether the IR LED is working or, much the same as a typical LED. LEDs have an extremely long lifespan relative to every other lighting technology as new LEDs can last up to 50,000 to 100,000 hours or more. LEDs also possess very high light quality & a very low maintenance costs and hassle. A vital benefit of LED in this proposed model is its property of wasting very little energy in the form of infrared radiation & and its ability to emit light directionally (over 180 degrees versus 360 degrees) which means that there are far fewer losses from the need to redirect or reflect light). LEDs can be designed to generate the entire spectrum of visible light colors without having to use the traditional color filters required by traditional lighting solutions.



CHAPTER 3.2

MICROCONTROLLER

With a domestic core of 8000 bytes, 8-bit microcontroller which is of CMOS based, and embedded system programmable Flash memory acknowledged as .By bringing together an adaptive 8- bit CPU with embedded programmable on a firm chip of Flash category, the Atmel AT89C52 is an authenticated microcontroller which accommodates a highly-formable and cost compelling explanation to many embedded control applications. The AT89C52 accommodates the typical features of 16-bit counter and timers which are three in number, 32 Input and Output lines, timer with logic of Watchdog, two data pointers, 256 bytes of Main Memory, with two-level implementation of a six-vector interrupt architecture, clock circuitry, serial port with full duplex nature and an oscillator. In extension, the AT89S52 is originated with constant logic of operation which is down to zero prevalence and comforts two power saving modes which are software selectable. By disqualifying all alternative chip activities up till next interrupt or hardware rest, the power down mode economizes the RAM contents and the oscillator is freeze.



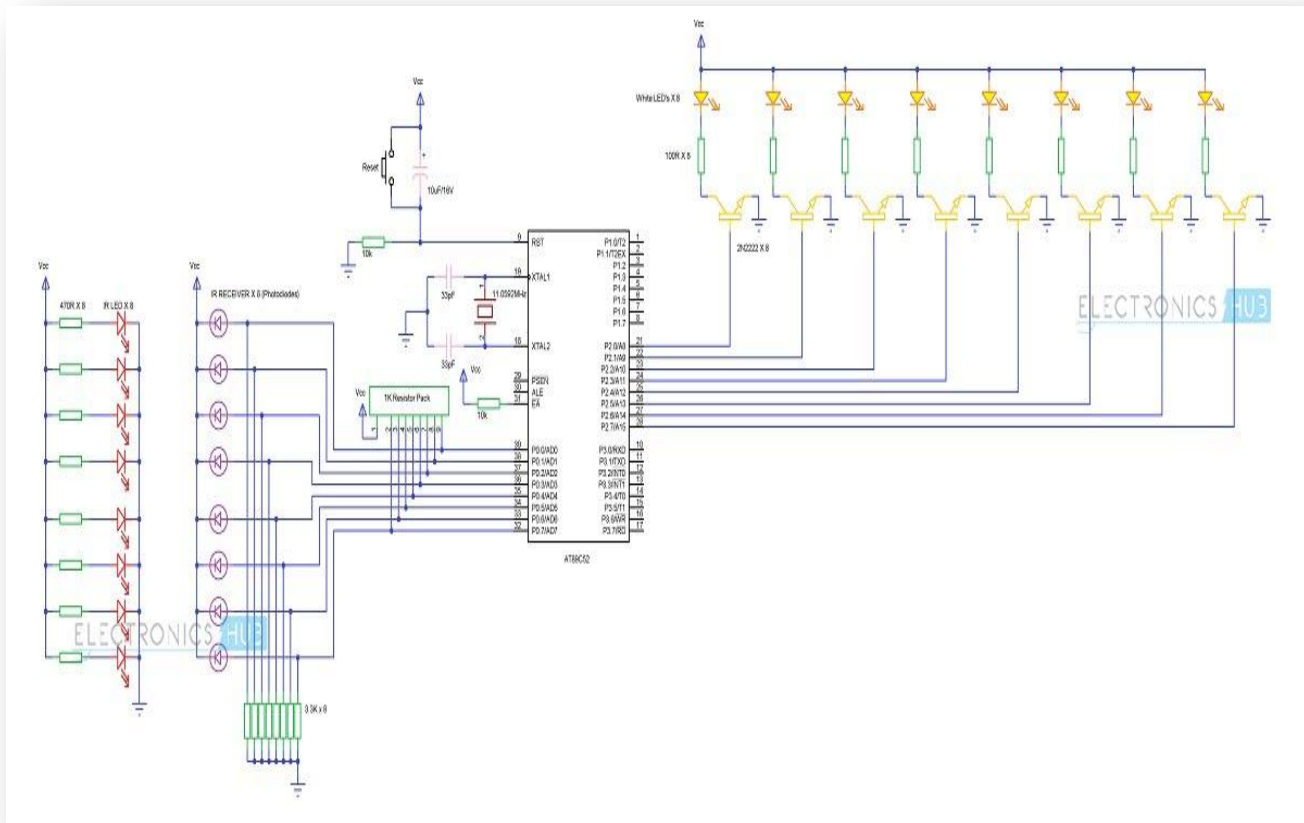
CHAPTER 3.3**SENSOR UNIT**

It dwells of controller, motion sensor, and the communication device. As soon as motion is detected message is communicated to other units. This unit can be placed in many regions such as street lights, electric poles, house gate, garage entrance, etc. to make sure sufficient illumination is obtained by switching on the required lights.



CHAPTER 3.4

CIRCUIT DIAGRAM



CHAPTER 3.5

CIRCUIT COMPONENTS USED

For Micro-controller Section:

- AT89C52 Microcontroller
- AT89C52 Programmer Board
- 11.0592 MHz Quartz Crystal
- 22pF Ceramic Capacitor
- 2 x 10K Resistor
- 10uF Electrolytic Capacitor
- Push Button

For IR Transmitter & Receiver Section:

- 8 x IR LED (IR Transmitters)
- 8 x 470R Resistor
- 8 x Photo Diode (IR Receivers)
- 8 x 3.3K Resistor
- 1K x 8 Resistor Pack

For Load Section:

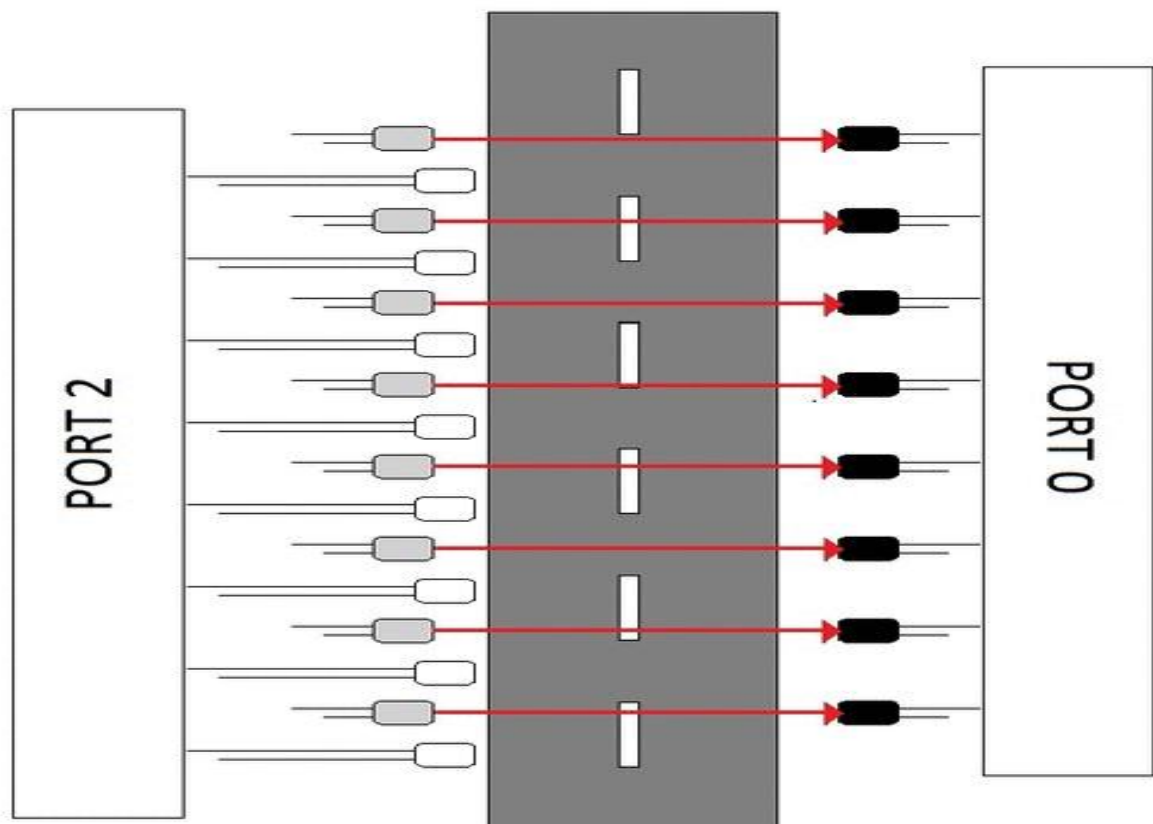
- 8 x 2N2222 NPN Transistors
- 8 x 100R Resistor
- 8 x White LEDs

CHAPTER 4

PROPOSED METHODOLOGY & RESULTS

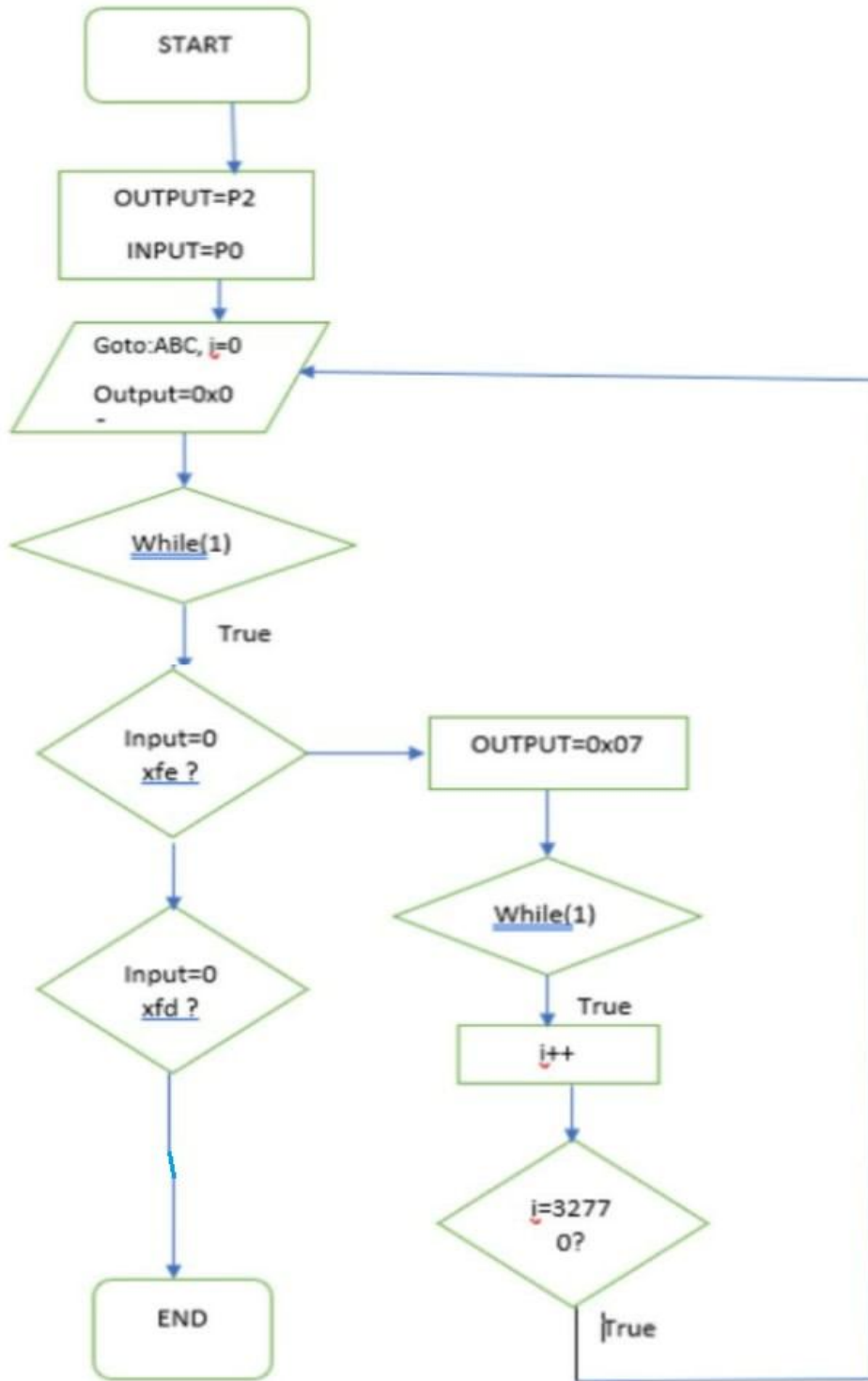
If vehicle movement is detected by the sensor section then the consecutive 3 street light glows with full intensity. As the vehicle passes, the initial street lights switch off on its own due to no vehicle movement obstruction is detected.

The main aim of this proposed model is to design an Automatic street light system using a 8051 microcontroller, which automatically turns on or off the street lights by detecting the movement of vehicles. When the IR sensor detects the vehicle moment on the road it sends the signal to the microcontroller where the microcontroller turns the street light on. If the vehicle detection is not sensed then the street lights stays off.



The IR transmitter is placed directly in line of sight with IR receiver, so that the IR receiver continuously receives infrared rays. Once the IR receiver receives infrared rays, the microcontroller will detect Logic 1. If the infrared rays are blocked by some means, the microcontroller will detect logic 0. So, the program for the microcontroller must be written in such a way that it will turn ON the LEDs, which means here the street lamp, when it detects Logic 0 and it will turn OFF the LEDs, when it detects Logic 1. Consider the two IR sensors i.e. IR Transmitter and IR Receiver are placed on the either side of the road. As per the circuit diagram, the IR receivers are connected to the PORT0 and the LEDs are connected to the PORT2 of the microcontroller.

At the beginning, when there is no obstacle, the IR receiver continuously detects IR light transmitted by the IR Transmitter. When a car or any other vehicle blocks any of the IR sensor, the microcontroller will turn ON the immediate three LEDs. If the car blocks the first IR sensor, the first three LEDs are turned ON by the microcontroller. As the car moves forward and blocks the second IR sensor, the corresponding next three LEDs will be turned ON and the first LED of the previous set is turned OFF. The process continues this way for all the IR Sensors and LEDs. The proposed method is depicted in the flowchart figure given below:



CHAPTER 5

CONCLUSION

This paper explains proposed model Automatic Street lighting control system circuit. Circuit meets desires suitably to turn street light ON/OFF. In the wake of designing the circuit which controls the light of the street as outlined in previously sections. LED and the IR sensors are the two basic conditions in satisfying the desires of the circuit. In case the two conditions have been satisfied the circuit will do the needed work as demonstrated by the specific framework. Each sensor controls the killing ON or the lighting section. The street lights have been successfully constrained by Microcontroller. With requests from the controller, the lights will be ON in the spots of the developments. Other than the drawback of the street light system using clock controller has been succeeded, where the system depends on upon photoelectric sensor. Finally, this control circuit can be used as a piece of a long roadway between the urban zones just as the provincial zones. The endeavor indicates were diminish the responses of the present road lighting structure and find a response for power misfortune. In this endeavor, the main activity is to set up the data sources and yields of the structure to control the lights of the road. This model demonstrates that street lighting can become more economical and fulfills all the present requirements if completed on a large scale.

The advantages of the proposed model are that if the lighting system implements all LED lights, the cost of the maintenance can be reduced as the life span and durability of LEDs is higher than Sodium based lights which are normally used as street lights. Also, as the lights are automatically turned ON or OFF, huge amount of energy can be saved. Automation is expected to play a vital job on the world's economy and in day to day experiences as more programmed based frameworks are being preferred over manual framework. Also, a plethora of application is possible for the proposed Idea, like street light control circuit can be used on inter-city roads, high-speed highways, express ways etc. Thus, the applications & ultimate profitability to the society in conserving energy is immense. The models further ability to innovate & develop into a solar energy amalgamation will ultimately help in meeting the National Clean Energy Target of 450 GW by the year 2030.

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