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Iot Based Automatic Street Light System

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Abstract— *This paper aims for coming up with and execution the advanced development in net systems for energy saving of street lights. Currently we've got a manual system wherever the road lights are going to be switched ON within the evening before the sunsets and that they square measure shifted within the next day morning after there is sufficient light on the outside. But the particular temporal order for these lights to be switched ON is once there's absolute darkness. With this, the facility is going to be wasted up to some extent. This paper gives solution for electrical power wastage. Also the manual operation of the lighting system is totally eliminated. The papered system give an answer for energy saving. This is achieved by sensing and approaching a vehicle using an IR transmitter and IR Receiver sensor module. Upon sensing the movement the device transmit the information to the microcontroller that what is more the sunshine to modify ON. Similarly as before long because the vehicle or AN obstacle goes away the sunshine gets shifted because the device sense any object at an equivalent time the standing (ON/OFF)of the road lightweight will be accessed from anyplace and anytime through net. This paper is implemented with smart embedded system which controls the street lights based on detection of vehicles or any other obstacles on the street light. Whenever the obstacle is detected on the road among the required time the sunshine can get mechanically ON/OFF in step with the obstacle detection and therefore the same data will be accessed through internet. The real time data of the road lightweight (ON/OFF standing) will be accessed from anytime, anyplace through net.*
Keywords— *PIC Microcontroller, IR Sensor, Current Sensor, LDR, Intel Galileo Gen2.*

I. Introduction

The street lighting is one amongst the most important energy expenses for a town.An intelligent street lighting system will cut municipal street lighting prices the maximum amount as five hundredth - seventieth.An intelligent street light-weighting system could be a system that adjusts light output supported usage and occupancy, i.e., automating classification of pedestrian versus bicyclist, versus automotive.An intelligent street light-weight management proposes the installation of the wireless primarily based system to remotely track and management the particular energy consumption of the road lights and take acceptable energy consumption reduction measures through power learning and management.The street light-weight controller ought to be put in on the pole lights that contains microcontroller in conjunction with varied detector and wireless module.The street light-weight managementler put in on the road light-weight pole can control junction rectifier street lighting counting on traffic flow, communicate knowledge between every street light-weight.The data from the road light-weight controller may be transferred to base station mistreatment wireless technology to watch the system.The mode of operation of the system may be conducted mistreatment automotive vehicle mode and manual mode.The system can switch on-off the light-weights at needed timings and might additionally vary the intensity of the road light in keeping with demand.

AN EMERGING technology. Internet of Thing (IoT) is expected to offer promising solution to transform the operation and role of many existing industrial systems such a transportation systems and manufacturing systems. For example, when IoT is used for creating intelligent transportation systems, the transportation authority will be able to track each vehicle's existing location, monitor its movement, and predict its future location and possible road traffic. The term IoT was initially proposed to refer to uniquely identifiable inter operable connected objects with radio frequency identification (RFID) technology. Later on, researchers relate IoT with more technologies such as sensors, actuators, GPS devices, and mobile devices.Today, a unremarkably accepted definition for IoT could be a dynamic world network infrastructure with selfconfiguring capabilities supported customary and practical communication protocols wherever physical and virtual 'Things' have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network. Street lighting provides a secure getting dark surroundings for all road users as well as pedestrians. Providing street lighting is one amongst the foremost necessary and valuable responsibilities of a town. Lighting will account for 10–38% of the entire energy bill in typical cities worldwide.

Street lighting could be a significantly essential concern for public authorities in developing countries as a result of its strategic importance for economic and social stability. Inefficient lighting wastes vital money resources once a year, and poor lighting creates unsafe conditions. Energy economical technologies and style mechanism will scale back price of the road lighting drastically. The main objective of this project is to scale back the ability consumption and economical utilization of renewable sources for the appliance of street lightening and traffic signalling. Hence, this paper is aimed toward style Associate in Nursing implementation of an automatic system to regulate the traffic and scale back energy consumption of streets public lighting system up to the maximum possible extent. The density of traffic is perceived by victimization Associate in Nursing array of Infrared Sensors (IR), which senses the traffic movement. LDR is used to detect the presence of day light. The projected system is in a position to regulate the traffic throughout the day likewise as night. In this system, the streetlights are switched ON/OFF automatically during the presence of the traffics only during the nights.

Streetlights area unit associate integral a part of any developing vicinity. They are gift on all major road-ways and within the suburbs too. Every day, streetlights are powered from sunset to sunrise at full strength, even when there is no one around. On a global scale, millions of dollars are spent each day on these street lights to provide the required electrical energy. This paper provides the most effective resolution for power wastage. Also, the manual operation of the lighting system is totally eliminated. The energy consumption in entire world is increasing at the quickest rates because of increase and economic development and therefore the accessibility of energy sources remains deplorably strained.

We use the word "smart" as a result of the system not solely give power to the road lights however conjointly helps in police investigation the direction of movement of the pedestrian and helps him by suggests that of illuminating the trail of movement until the close to next street lightweight. A simple and effective resolution to the present would be dimming the lights throughout off peak hours. Whenever presence is detected, the lights around it will glow at the normal (bright) mode. This would save plenty of energy and conjointly cut back value of operation of the streetlights. We can check the status of street light on internet using IOT (Internet of things) from anywhere in real time and solve the issues if happen during the processing.

II. Background And Current Research Of Iot

IoT can be considered as a global network infrastructure composedof numerous connected devices that rely on sensory, communication networking, and information processing technologies. A foundational technology for IoT is the RFID technology, which allows microchips to transmit the identification information to a reader through wireless communication. By mistreatment RFID readers, people can identify, track and monitor any objects attached with RFID tags automatically. RFID has been widely used in logistics, pharmaceutical production, retailing, and supply chain management, since 1980s. Another foundational technology for IoT is the wireless sensor networks (WSNs), which mainly use interconnected intelligent sensors to sense and monitoring. Its applications embrace environmental observance, healthcare monitoring, industrial monitoring, traffic monitoring, and so on. The advances in eacRFID and WSN considerably contribute to the event of IoT. In addition, many other technologies and devices such as barcodes, smart phones, social networks, and cloud computing are being used to form an extensive network for supporting IoT. So far, IoT has been gaining attraction in industry such as logistics, manufacturing, retailing, and pharmaceutics.

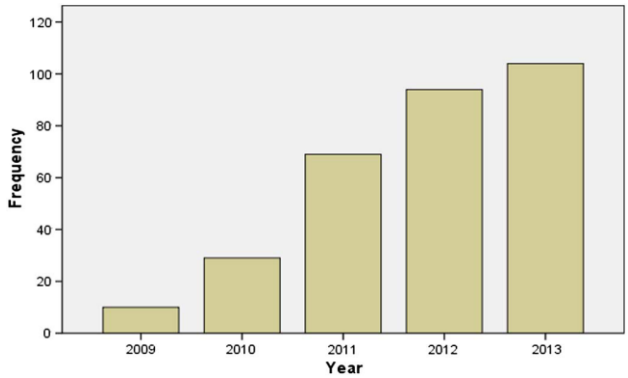

Fig 1. Number of IoT Journal articles by year in Web of Knowledge.

With the advances in wireless communication, smartphone, and sensor network technologies, more and more networked things or smart objects are being involved in IoT. As a result, these IoT-related technologies have also made a large impact on new information and communications technology (ICT) and enterprise systems technologies. In order to provide high-quality services to end users, IoT's technical standards need to be

designed to define the specification for information exchange, processing, and communications between things. The success of IoT depends on standardization, which provides interoperability, compatibility, reliability, and effective operations on a global scale. Many countries and organizations have an interest within the development of IoT standards as a result of it will bring tremendous economic advantages within the future. As numerous organizations are concerned within the development of IoT standards, a robust coordination between totally different standardization organizations is important to coordinate and govern the relationships between international standards organizations and national/regional standards organizations. By establishing wide accepted standards, developers and users can implement IoT applications and services that would be deployed and used on a large scale, while saving the development and maintenance cost in the long run.

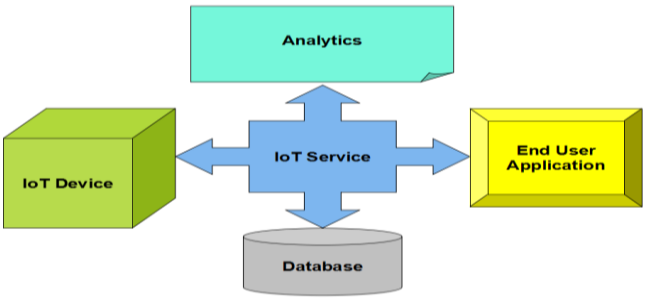

Fig 2. IoT Services

In Europe Union, the IoT European Research Cluster (IERC) FP7 (http://www.rfid-in-action.eu/cerp/) has proposed a number of IoT projects and created an international IoT forum to develop a joint strategic and technical vision for the utilization of IoT in Europe. China takes IoT seriously and plans to invest $800 million in the IoT industry by 2015. China aims to require a number one role in setting international standards for IoT technologies. In the U.S., IBM and ITIF (The Information Technology and Innovation Foundation) reported, in 2009, that IoT can be an effective way to improve traditional physical and information technology infrastructure, and can have a larger positive impact on productivity and innovation. Japan launched u-Japan and i-Japan methods, severally, in 2008 and 2009, so as to use IoT to support daily lives.

III. Releted Work

In the paper describes about the circuit that switches the street light ON detecting the vehicle movement and remains OFF after the fixed time. In this system the street light automatically ON/OFF during the night and the day time. In this system the GSM technology has been used in which the manual switching OFF/ON of the street light using GSM. Here the system controls the intensity of the road lightweight by dimming and brightness the intensity on the detection of any object victimisation PIR detector. In this paper is focused on the necessity of the automated street light system and the peculiar way of implementation with embedded system tools. In this system the piezo electric sensor is used to detect the movement of the object on the street instead of using IR sensor. A microcontroller msp430 as a This paper offers an answer to the dominant the intensity of the sunshine considering the movement on the road. In this project is designed to detect the vehicle movement on the highways to switch ON only a block of the street light ahead of it and switch OFF the trailing light to save energy. During the night all the lights on the highways stay ON for the vehicle, but lot of energy is wasted when there is no vehicle movement on the highways. In this paper 2 quite detectors has been used that area unit lightweight sensor, photo electric sensor. In Automatic Street Light Control System is not only easiest but also the powerful technique. Relay uses as a automatic switch during this system. It releases the manual work on most upto100%. As shortly because the daylight goes beneath the visible region of our eyes this method mechanically switches ON lights. As shortly because the daylight comes, visible to our eyes it automatically switches OFF lights. Such variety of system is additionally helpful for reducing energy consumption. In this system the system with LDR sensor, PIR sensor, Zigbee is used to intimate the status of humans use, light intensity and street light ON/OFF status to the EB section to avoid wastage of energy by glowing street lights in unwanted areas. The whole system is operated by victimisation artificial energy supply referred to as star and with battery backup. The PIR and LDR sensors sense the persons and light intensity of a particular place and transmits the data in wireless to the EB section with Zigbee. Depend upon the info received the controller can flip ON/OFF the road lightweight in wireless communication.

A. Intelligent wireless street light control and monitoring system Author: B. K. Subramanyaml. K. Bhaskar Reddy, P. Ajay Kumar Reddy.

This paper proposes on intelligent wireless street light control, which integrates new technologies, offering ease of maintenance and energy savings. Using solar array at the lamp post By exploitation LDR it's attainable to avoid wasting some a lot of power and energy, and conjointly we will monitored and controlled the road lights exploitation interface application, that shows the standing of the lights in street or main road lighting systems.

B. Design of Wireless Framework for Energy Efficient Street Light Automation Author:P.Nithya, N.Kayalvizhi

This paper suggested an Intelligent management of the lamp posts by sending data to a central station by ZigBee wireless communication. With the steered system, maintenance are often simply and with efficiency planned from the central station, allowing additional savings. This lamp system helps in energy savings, detection of faulty lights and maintenance time and increase in generation of system.

IV. Problem Defination

We have seen within the range of cities wherever the road lights is that the one amongst the massive energy expense for a town. Currently we've manual system wherever the sunshine are going to be switched ON within the evening before the sunset and that they square measure transitioned next day morning when there's sufficient light outside. So there's heap of energy waste between ON and OFF temporal arrangement.

A. Existing system

In the existing system, the street lights are switched on and off manually by the public itself, This involves a disadvantage in the way that at many times the public forget to switch it OFF, This is overcome in our proposed system.

1) Disadvantages of Existing System

a) Manual Switching off/on of Street Lights.

b) More Energy Consumption.

c) More manpower and High expense.

B. Proposed system

In our proposed system, we make use of the property of LDR, which is its resistance varies with respective to the light intensity, In our proposed system the night and day is identified using LDR, Then during the day time the street light will be switched off and then during the night time street light will be switched on automatically, IR sensor is used to detect the presence of vehicle in the Road, If the crowd of the vehicle is low in the street then it will be sensed using IR sensor and light will be switched off, If the vehicle is present in the street then light will be turned on.

1) Advantages of the Proposed

a) Automatic Switching of Street lights.

b) Maintenance Cost Reduction.

c) Reduction in CO_2 emission and light pollution.

d) Wireless Communication.

V. Methodology

i. Mplab Ide

MPLAB IDE could be a free, integrated toolset for the event of embedded applications on Microchip's PIC and ds PIC microcontrollers. It is known as Associate in Nursing Integrated Development atmosphere, or IDE, as a result of it provides one integrated atmosphere to develop code for embedded microcontrollers. MPLAB IDE runs as a 32-bit application on MS Windows, is straightforward to use and includes a bunch of free package elements for quick application development and super-charged debugging. MPLAB IDE conjointly is one, unified graphical interface for added micro chip and third party package and hardware development tools. Moving between tools could be a snap, and upgrading from the free package machine to hardware right and programming tools is completed in a very flash as a result of MPLAB IDE has the same user interface for all tools.

ii. OrCAD

OrCAD could be a blessing once it involves PCB style and also the sequent manufacture. This utility helps from planning the schematic to implementing the routes of the electrical connections and additional mounting diagrams of the parts. In general it offers a complete answer for core style schematic and PCB layout. The Capture program includes a project wizard that gives a straightforward methodology for making a project,

complete with library and simulation resources. Creating a project doesn't produce a style at intervals the project. A new design inherits characteristics from the settings in the design template dialog box, so we should always check those settings before we create a design. After making a schematic folder will we are able to move existing pages into it and that we can produce new pages in it.

VI. Architecture

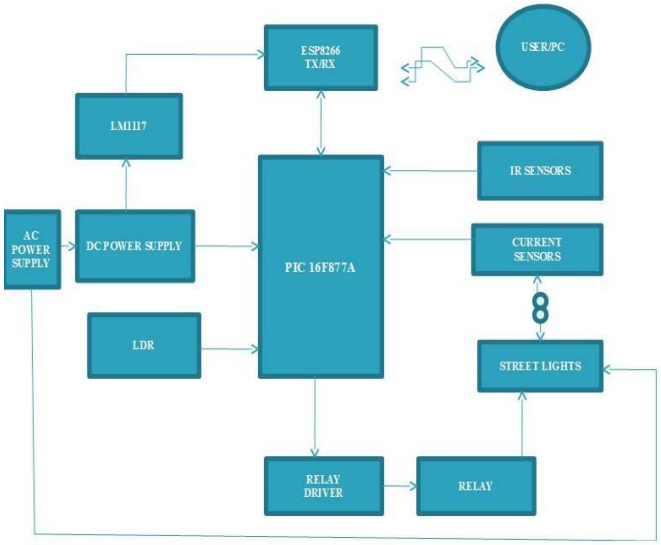

Fig. Block diagram IoT Based Automatic Street light system

a) PIC16F877A MICROCONTROLLER

High-Performance reduced instruction set computing hardware it having thirty-five single word directions to be told, all directions area unit single cycle (1μs) aside from program branches and also the in-operation speed: DC - 20MHz clock input. It having eight k Bytes Flash Program Memory, 368 computer memory unit RAM knowledge Memory and 256 computer memory unit EEPROM knowledge Memory. Two 8-bit timer/counter (TMR0, sTMR2) with 8-bit programmable prescalar, One16 bit timer/counter (TMR1).PIC (usually pronounced as "pick") is a family of microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC at the start stated Peripheral Interface Controller, then it absolutely was corrected as Programmable Intelligent pc. The first components of the family were out there in 1976; by 2013 the corporate had shipped over twelve billion individual components, utilized in a large type of embedded systems. Early models of PIC had computer storage (ROM) or field-programmable read-only storage for program storage, some with provision for erasing memory. Data memory is 8-bit, 16-bit, and, in latest models, 32-bit wide. The hardware capabilities of PIC devices vary from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips, with distinct I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types. PIC devices unit of measurement well-liked every industrial developers and hobbyists due to their low worth, wide accessibility, massive user base, extensive collection of application notes, availability of low cost or free development tools, serial programming, and re-programmable Flash-memory capability.

b) LDR

A photoresistor (or light-dependent resistance, LDR, or photo-conductive cell) could be a light-controlled resistor. The resistance of a photoresistor decreases with increasing incident lightweight intensity; in different words, it exhibits electrical conduction. A photoresistor is created of a high resistance semiconductor. In the dark, a photoresistor will have a resistance as high as many megohms (MΩ), while in the light, a photoresistor can have a resistance as low as a few hundred ohms. If incident lightweight on a photoresistor

exceeds a definite frequency, photons absorbed by the semiconductor provide sure electrons enough energy to leap into the physical phenomenon band.

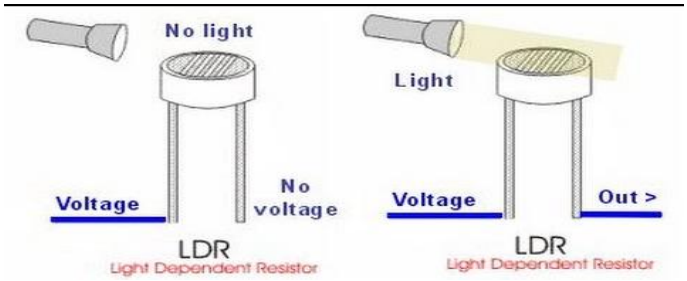

Fig. Working of LDR

The ensuing free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance vary and sensitivity of a photoresistor will well disagree among dissimilar devices. Moreover, distinctive photoresistors could react well otherwise to photons inside bound wavelength bands. A physical phenomenon device may be either intrinsic or unessential. An intrinsic semiconductor has its own charge carriers Associate in Nursingd isn't an economical semiconductor, as an example, silicon. In intrinsic devices the sole accessible electrons area unit within the valence band, and thus the gauge boson should have enough energy to excite the negatron across the complete bandgap. Extrinsic devices have impurities, conjointly referred to as dopants, other whose state energy is nearer to the physical phenomenon band; since the electrons don't have as so much to leap, lower energy photons (that is, longer wavelengths and lower frequencies) area unit enough to trigger the device. If a sample of semiconductor has a number of its atoms replaced by phosphorus atoms (impurities), there'll be further electrons accessible for physical phenomenon. This is an example of an extrinsic semiconductor.

c) IR Sensor

An infrared sensing element is associate degree instrument that's accustomed sense bound characteristics of its surroundings by either emitting and/or detective work actinic radiation. It is additionally capable of measure heat of associate degree object and detective work motion. Infrared waves aren't visible to the human eye. In the spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, but shorter than microwaves. The infrared region is just about demarcated from zero.75 to 1000μm. In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies relying upon its receiving of IR rays.When the IR receiver doesn't receive a symbol, the potential at the inverting input goes higher than that non-inverting input of the comparator IC(LM339) shown in below figure.

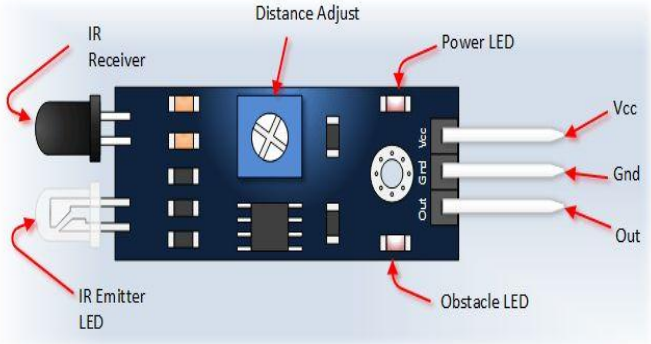

Fig. IR Sensor module

Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and also the crystal rectifier starts glowing. Resistor R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is employed to regulate the output terminals. Resistor VR1 (preset=10k) is employed to line the sensitivity of the circuit Diagram. Read more about IR sensors.

d) Relays

A relay is sometimes associate mechanical device that's motivated by associate electrical current. The current flowing in one circuit causes the gap or closing of another circuit. Relays area unit like device switches and area unit employed in several applications attributable to their relative simplicity, long life, and proved high responsible ness. Although relays area unit typically related to electrical electronic equipment, there area unit several different sorts, like gas and hydraulic. Input is also electrical and output directly mechanical, or the other way around. Relays are mainly made for two basic operations. One is low voltage application and also the different is high voltage. For low voltage applications, a lot of preference are going to be given to cut back the noise of the full circuit. For high voltage applications, they're chiefly designed to cut back a development referred to as arcing.

g)Wi-Fi Module

Node MCU is an open source IoT platform. It includes code that runs on the ESP8266Wi-FiSoC from Espressif Systems, and hardware that relies on the ESP-12 module. The term "Node MCU" by default refers to the code instead of the dev kits. The firmware uses the Lua scripting language. It is supported the eLua project, and designed on the Espressif Non-OS-SDK for ESP8266. It uses several open supply comes, like lua-cjson, and spiffs. Espressif Systems ‟Smart property Platform (ESCP) of high performance wireless SOCs, for mobile platform designers, provides best ability to infix Wi-Fi capabilities inside different systems, at all-time low price with the greatest functionality. ESP8266 offers a whole and self-contained Wi-Fi networking resolution, allowing it to either host the applying or to dump all Wi-Fi networking functions from another application processor. Alternately, serving as a Wi-Fi adapter, wireless web access may be intercalary to any microcontroller based mostly style with straightforward property through UART interface or the computer hardware AHB bridge interface.

e) RESISTORS

A electrical device is Associate in Nursing electrical element that limits or regulates the flow of electrical current in Associate in Nursing electronic circuit. Resistors. All different factors being equal, in a very direct-current (DC) circuit, this through a electrical device is reciprocally proportional to its resistance, and directly proportional to the voltage across it. This is the well-known Ohm's Law.

f) CAPACITORS

Capacitor could be a passive part accustomed store charge. The charge (q) hold on in a very condenser is that the product of its capacitance (C) worth and also the voltage (V) applied thereto. Capacitors supply infinite electrical phenomenon to zero frequency in order that they square measure used for obstruction DC elements or bypassing the AC signals.

VII. Working Principle

system architecture of the intelligent street light system consists of IR sensors, LDR, PIC16F877A The microcontroller, Relay, UART and Wi-Fi Module. LDR‟s unit light-weight dependent devices whose resistance decreases once light-weight falls on them and can increase inside the dark. When a lightweight dependent electrical device is unbroken in dark, its resistance is very high. The vehicle that passes by the road lightweight is detected by IR detector. Relay square measure used as a switch to modify on/off the road lightweight bulb. A UART (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached street light system. The highway model consists of LED's as street lights and pairs of photodiodes-IR diodes used as sensors. The IR diodes are placed on one side of the road and photodiodes are placed on the other side of the road, directly facing the IR diodes. Consider, when there is no vehicle on the highway. In this case, the IR radiation emitted from the IR diode directly falls on the photodiode which is exactly opposite to it. This causes the photodiode to fall in conductivity state. This implies that photodiode conducts and current passes through it. The current passes through the photodiode and goes through the resistance. So, to summarize we will say that, when there is no vehicle on the highway, then all the inputs to the microcontroller port 1 is ZERO. Consider the case when a vehicle obstructs the IR radiation path. In this case, IR radiation is blocked and thus it doesn't fall on the photodiode.

This in turn implies that photodiode doesn't conduct. All the components are to be connected with Arduino board. In this input module of the project, we used 2 IR sensors which are interfaced with Arduino Mode MCU(ESP8266) and work individually with respective to each other. In this we are connecting the output pins of IR sensor to pins D0,D1 of Arduino Mode MCU(ESP8266) to give status of IR sensor.IR sensor senses the presence of a vehicle or a pedestrian on the road and will increase the intensity of junction rectifier street lamps on the road through output module. All IR sensor works on 5V and Arduino Mode MCU(ESP8266) is

working on less than 5V supply (Battery or Laptop USB driver).two virtual switches are connected to Arduino mode mcu though blynk application.

VIII. Conclusion

The use of power natural philosophy is increasing exponentially across varied sectors of human life. The components used in the project, like Arduino Mode mcu and sensors are slowly becoming an indispensable part of our daily routines. So, it's solely fitting that we tend to use them to enhance potency in each walk of life. Keeping in mind the urgent need for energy conservation, IoT based smart street lighting system is an excellent and effective solution. It combines safe lighting protocols with consumption of tokenish quantity of power. The energy savings, as discussed before are phenomenal. The future scope of this project expands into speed detection and customizable space of illumination. An additional part which might cause higher functioning of the thought would be the employment of LED bulbs. Despite their high initial prices, they are a viable option as they drastically reduce the power consumption. They will aid in any saving of energy and reduction in operational prices.

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