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SMART STREET LIGHT

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ABSTRACT

Using IOT the smart streetlight is made for the conservation of energy by reducing the wastage of electricity as well man power. Streetlight facilitates better night vision, secured roads, and exposure to public area but it consumes the large amount of electricity. The manual streetlights which are being used is powered from sunset to sunrise with high intensity. So this wastage of electricity can be avoided by switching off the streetlights automatically. The electricity which is being saved can be efficiently used for other purpose like residential, commercial, transportation etc. This can be achieved through smart streetlights based on IOT. Here we use light emitting diodes (LED) that do not consume much amount of electricity to replace the power consuming traditional HID lamps. The proposed has been achieved the better performance compared to the existing system. Hence it makes power consumption and reduce accidents. The proposed has been achieved the better performance compared to the existing system. Hence it makes power consumption and reduce accidents.

Keywords *: Internet of Things, Arduino UNO,NODEMCU ESP8266,Basic shield, Ultrasonic sensor, Cloud, Smart.*

I. INTRODUCTION

IOT is the network of physical devices. Internet of Things will transform the real world objects into intelligent virtual objects. The termed IOT was coined by Kevin Auston, the executive director of Auto –ID labs in MIT in 1999. IOT consist of real world things along with sensors these are connected to internet via wired and wireless network structure. In near future IOT will become more complex and broader in scope.

This IOT sensors can use various types of connections such as RFID, Wi-Fi, Bluetooth to allow wide area connectivity using GSM, GPRS, 3g and LTE technologies. The design of Internet of Things standards is required to consider the efficient use of energy and network capacity. IOT consists a system with real world things along with sensors these are connected to Internet via wired and wireless network structure. This IOT sensors can use various type of connections such as RFID, Wi-Fi, Bluetooth and Zigbee inorder to allow wide area connectivity using GSM, GPRS, 3G and LTE technologies. The whole world becomes very smarter with this Internet of Things. It has lot of challenges which makes impact on their performance. Applications of IOT have been used widely in every field like social production, energy, industries etc.

Everyday, streetlights are powered from sunset to sunrise at full strength. In any places the electricity is wasted mostly due to the street lights. Because even though people or vehicles are not present the street lights will be ON. Based on the new technologies our cities are upgrading into smart cities in all aspects. So the smart street light is useful to meet the largest energy expenses for any city. The smart street light can be very much beneficial to municipal street lighting as it will cut down the (50 %-70 %) expenses. It adjusts the light output based on the usage of the pedestrian or the automobile drivers. It will automatically ON or OFF the street lights according to the situations present in that place. Smart traffic lights or lights are a vehicle traffic control system that combines traditional traffic lights with an array of sensors and artificial intelligence to intelligently route vehicle and pedestrian traffic.

The rest of the thesis is divided into eight parts. Above is the introductory part which describes the information of advantages, disadvantages and applications. Chapter 2 Describes the relevant work based on IOT sensors for detecting the objects which is far from street lights. Chapter 3 It depicts the software used in project and also

describes the packages used. Chapter 4 It shows the hardware components used in our project such as Arduino UNO, Ultrasonic sensor, Basic shield, NODEMCU ESP8266.

Chapter 5 Will tell about the proposed architecture.Chapter6 Describes the implementation part. Finally concluded by the result and conclusion.

II. LITERATURE SURVEY

In [1] B.K.Subramanyam et.al have developed a model which provides smart street lighting system which depends mainly on the solar panel. Most of the criminal activities occur during late nights on the road and also people work for late nights. Under these situations to provide security and controlling, monitoring of the street lights is developed together with GUI. Solar panel is useful for saving the power and also money. Graphical User Interface (GUI) plays an important role for controlling the lamps on streets. For monitoring and controlling the lamps on the streets, Zigbee technology is being used. Using LDR and IS sensor more power and energy is saved. This model works on two operational modes. i) Auto mode. ii) Manual mode. In the auto mode lights are on and offed by LDR's which measures the intensity of light. In Manual mode, the street lights are controlled and monitored by using GUI and Zigbee technology. This proposed system is useful to provide the street lighting in the places where the traffic is low at a time. This system maintains the user satisfaction and is versatile.

In[2]Michele Mango et.al proposed smart lighting system based on low cost, wireless, adaptable sensor which makes uses of PIR sensor and motion sensor. It is useful for controlling the light intensity and power consumption using LED's. Only in the presence of obstacles or objects dimming of light is achieved using PIR sensor. One of the main advantages of this system is energy conservation. The sensors used in this smart street lights are very useful for conservation of energy. More power and electricity can be saved using solar panels.

In [3] Hengyu Wu, MinliTang et.al, propose about The core technology of the street light control system is an AT89S52 single-chip microcomputer. It integrates a power circuit, a fault detect circuit, a photosensitive detection circuit, an infrared detect circuit, an LCD display circuit, a street light control circuit, an a1ann circuit, a pressed key control circuit and so on. This system cans automatically tum on or off the lights and controls the switches according to traffic flow. It expands the fault detect circuit and the corresponding a1ann circuit. It also has a convenient and flexible button control circuit to switch on and off fictions mentioned above. Main weakness is that they didn't say about the working principle behind the system. It also said to use fault detection circuit which when it is damaged, the voltage is zero, so it will create a problem. This paper is and theoretic proof and shows only simulation result but not as a real time set up experiments. The focus of this paper to build a way for the framework which may leads to many follow up research activities in the Low-rate and also plan to investigate the applicability of this proposal to detect performance.

In [4] GongSiliang et.al describes a remote streetlight monitoring system based on wireless sensor network. The system can be set to run in automatic mode, which control streetlight according to Sunrise and Sunset Algorithm and light intensity. This control can make a reasonable adjustment according to the latitude, longitude and seasonal variation. Also this system can run in controlled mode.

In this mode, we can take the initiative to control streetlights through PC monitor terminal. In addition, the system integrates a digital temperature-humidity sensor, not only monitoring the streetlight Real-time but also temperature and humidity. The system is equipped with the high-power relay output and can be widely applied in all places.

In [5]KapseSagar Sudhakar1, AbhaleAmol Anil2, Kudakechetan Ashok3, ShirsathShravan Bhaskar et.alexplained 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 thissystem 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 street light by dimming and brightness the intensity on the detection of any Object using PIR sensor.

In [6]Mustafsaad, AbdalhalimFarij, Ahamed Salah "Automatic Street Light Control System Using Microcontroller et.al explained 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 brain to control the process involved. This paper gives a solution to the controlling the intensity of the light considering the movement on the road.

In [7]SaksheeSrivastava et.al proposed, 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 remain ON for the vehicle, but lot of energy is wasted when there is no vehicle movement on the highways. In this paper two kind of sensors has been used which are light sensor, photo electric sensor.

In [8]Prof. K.Y.Rajput, GargeyeeKhatav, Monica Pujari, PriyankaYadavet.al proposed, Automatic Street Light Control System is not only easiest but also the powerful technique. Relay uses as a automatic switch in this system. It releases the manual work atmostupto 100% . As soon as thesunlight goes under the visible region of our eyes this system automatically switches ON lights. 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. Such type of system is also useful for reducing energy consumption. In [9] L. Jasio, T. Wilmshurst, D. Ibrahim, J. Morton,M. Bates, J. Smith D. Smith and C. Hellebuyckthis et.al explained 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 using artificial energy source called solar 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 data received the controller will turn ON/OFF the street light in wireless communication. This system is appropriate for street lighting in remote urban and rural areas where the traffic is low at times.

III. PROPOSED IOT

As electricity became major one in every aspect without that the whole world will be stopped. Because all industries, household works, institutions etc depends on electricity. We are not only using the power but also wasting it. Our main motto of this project is to save electricity with this smart street light.In general, our research cover the literature review from different sources which targets mainly on street lighting. In this smart street light using IoT we made a circuit which consists of some apparatus like Arduino UNO, Ultrasonic sensor, Basic shield ,NODEMCU (ESP8266), Jumper wires. By connecting all these apparatus it works as a device which senses the movement of the objects. By this we are save electricity which is being wasted in all places. In this a vehicle or object comes near a street light then the Ultrasonic sensor will sense the movement of that object and automatically the light glows. If the vehicle moves from the particular place the light will automatically stops glowing. By this, we are not only going to save electricity, but also we can reduce the accidents.

Light control system will play a crucial role in the reduction of electricity consumption without impending comfort goals. Energy is the most important parameter to be considered when assessing the impact of technical systems on the environment. Energy related problem responsible for the global environmental impacts and hazards, including climate change, acid deposits, smog and particulates. Thus it is saving the energy. About 30% of urban energy consumption are due to public lightning in streets, tunnels, city centers, ports and squares etc. The maintenance cost are very high for this. Our country is facing lots of difficulties due to huge energy crisis which has to be addressed. Our places need smart energy management system urgently for energy saving, cost reduction and reduction of emission. These are based on the economical and environmental problems.

For developing LED street lights the demand is growing highly because of its better performance. Using wireless system network(WSN) one can increase the functionality of light installations for a wide range of applications and

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introduce a platform for new services. The system is composed of WSN nodes integrated with light sources. These sources will enable many services not only directly related to lighting but also additional services as telemetry, monitoring of noise, humidity, temperature and also services related to road information systems, intelligent transportation system and intelligent roads.

System Hardware: The main Hardware of the system consists of Arduino UNO, Nodemcu Esp8266,Ultrasonic sensor, Basic shield , Jumper Wires.

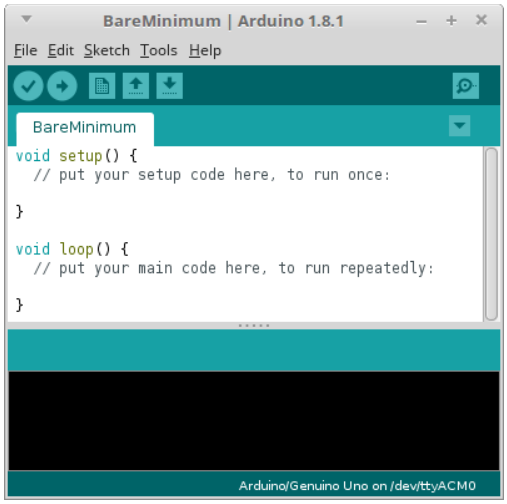

Figure 1 sample program using Arduino

Ardiuno UNO :Based on the microchip ATmega328p micro controller Arduino UNO is developed.It is an open source micro controller.The board consists of set of digital and analog input/output pins that may be interfaced to many expansion board and other circuits.This board consists of 14 Digital pins and 6 Analog pins and programmable with the Arduino IDE(Integrated Development Environment)via a type B USB cable.It can be powered by three ways 1st way is it can be powered by a USB cable 2nd way is by external 9 volt battery,3rd way is it also accepts the voltage between 7 to 20 volts. It is also similar to Leonardo and Arduino nano .In this the Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.[4] It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.[5][6] The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.[1] The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases.[4] The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.[3] The ATmega328 on the Arduino Uno comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.[3] It communicates using the original STK500 protocol.[1] The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.[7]

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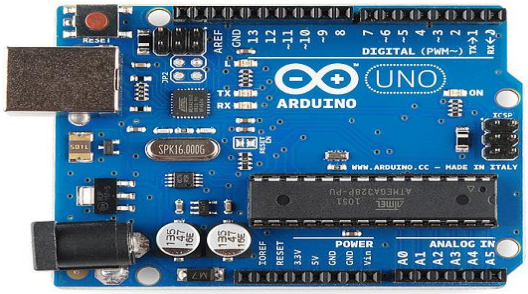

Figure 2 Arduino UNO

Ultrasonic sensor

An Ultrasonic sensor is an instrument that measures the distance to an object using distance to an object using Ultrasonic sound waves. An Ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relayback information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

How Ultrasonic sensor works?

The HC-SPO4 ultrasonic sensor uses sonar to determine distance to an object.It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2cm to 400cm or 1" to 13 feet Ultrasonic sound vibrates at a frequency above the range of human hearing. Transducers are the microphones used to receive and send the ultrasonic sound.Our ultrasonic sensor like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonicpulse.

Figure 3 Ultrasonic Sensor

Nodemcu DEV 1.0 ESP8266

NodeMCU development board is an open source IOT development kit. It includes firmware which runs on theESP8266 Wi-Fi SoC from Espress if Systems, and hardware which is based on the ESP-12E module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scriptnig language. It is a low cost hardware platform available for development of IOT application

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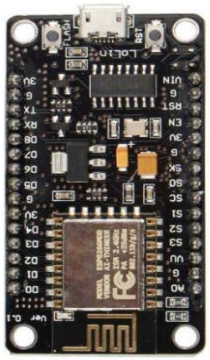

Figure 4 NODEMCU DEV 1.0 ESP8266

Basic Shield

Basic shield consists of eight LED's pins which are four different colors. in our project we are using one of them to indicate that the light glows when any vehicle enters .It also consists of two switches and Vcc and ground. When connections are given between supply and ground the light glows indicating that the sensor sensed the signals from ultrasonic senor and the light gets ON.

Figure 5 Basic Shield

IV. RESULT

Due to smart street light 30% of city's electricity will be saved and also it is good energy savage method. Another good advantage of this project is we can cut down the wastage of electricity and the electricity would be preserved for future use. These lights work over any temperature or in any seasons moreover they are beneficial over winter months. The LED lights produces more accurate color the rendering, making it easier for drivers and others to recognize objects. As a result there will be savage of light energy in the country. the energy which is saved can be used for different purposes. There will be development in the country. Instead of wasting of the light energy on highways we can use them in those are areas where there is no source of electricity and power. It lifetime is also upto 5-6 years. Currently in the whole world enormous energy is consumed by street lamps, which are automatically turn ON when it becomes dark and it automatically turn OFF when it becomes bright background. The lights in our smart street light turn on before pedestrians and vehicles come and turn OFF or reduce power when there is no one It will be difficult for pedestrians and drivers of vehicles to distinguish our smart street lamps and conventional street lights, since our street lamps all turn on before they come. The present status and the future prospects of our smart start light project will be advantageous in every aspect.

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Figure 6 Smart street light(final result)

V. CONCLUSION

Over past years, technology has been developed more and more in such a way that it has become more competitive in present world. we have discussed here about challenges and technologies of IOT. Accordingly, the future of IOT structure relies on integration among real and physical world. Based on the above data we can consider that IOT environment is rich search area and flourishing area to research a particular topic with cloud computing. Every aspect including technology, business resist the rate of IOT. Acceptance of technology by people is essential and should be taken into consideration. People who are not fond of using gadgets will face difficulties .To overcome this problem IOT will engage with them. By this we are going to conclude IOT is an useful one which makes our lives better. Due to smart street light 30% of city's electricity will be saved and also it is good energy savage method. Another good advantage of this project is we can cut down the wastage of electricity and the electricity would be preserved for future use. These lights work over any temperature or in any seasons moreover they are beneficial over winter months. The LED lights produce more accurate color the rendering, making it easier for drivers and others to recognize objects. With the components explained above we have made a smart street light by using Arduino UNO, Ultrasonic sensor, Basic shield, jumper wires and LED. With this smart street light our intention is to save electricity in unnecessary areas such as roads near highways. There we will place the light which works with the help of the sensor about 100m of radius. It works when a vehicle or an object or any human enters the range then the light gets on. It analyzes the speed of that particular object and the light gets on. The light until the object stays in that radius and the light gets OFF. Hence, due to this we can save electricity and these LED's are eco-friendly. They will not emit any harmful radiations and the other advantage is they will lasts long for many years

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