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IoT Based Street Light Controlling System

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Abstract : — Internet of things has brought a revolution to the world of connectivity and wireless technology. The main idea is to connect everything by wireless technology. Through the Internet of things, everything can be linked using different types of sensors designed for different purposes. The main focus of the paper into propose a system in which the street light can be automated and the data from the street light can be transferred through the internet. This smart street light system the lights can be automatically turned on and off according to the environmental situation. In this a light dependent sensor and humidity & temperature sensor are used to sense the environmental conditions. The street light system would automatically turn on and off if the light intensity in the environment falls or rises above a specified temperature. The humidity and the temperature sensor are used to detect the temperature and humidity of the surroundings so that the colour of the street can be changed to provide a better visibility under some specified weather conditions. The whole system can be powered by an artificial power source, such as solar panels.

IndexTerms **- Internet of Things (IOT), Arduino Nano; LDR; DHT11; Relay; Wi-Fi module; LED;**

I.INTRODUCTION

IOT is the network of physical devices that allows the devices to communicate with each other. IOT allows remote sensing and control over the devices. It is an advanced automation and analytics system which uses artificial intelligence technology to deliver advanced and automated products and services. These systems allow greater transparency, control, and good performance [2]. IOT has several automation streetlight system has several problems like maintenance applications like smart home, smart parking, smart roads, smart lighting etc. The current manual issues, timing problem, and connectivity issues These problems can be resolved by IOT technology [5]. The system is based on smart and weather adaptive automatic street lighting and management [6]. Automation simplifies various problems in the world economy as well as in daily life [8]. It uses the latest technology in LED as the light source to restore conventional street lamps such as HID lamps or HighPressure Sodium Lamps etc…The LED lights are adopted because of its various advantages over existing technologies like power saving due to increased current luminous efficiency, reduced maintenance cost, high colour rendering index, accelerated start-up, and durability [10]. Nowadays flexibility of streetlight system is being highly challenged. Majority of the control runs in a manual setup whereas some are automated based on their surrounding parameters. Handling remote area location is the greatest dilemma. Manual mistakes can lead to energy wastage and lower the performance of the system [1]. The aim of this paper is to automate the streetlights to increase the productivity and accuracy of the system in a cost-effective manner and also permits wireless accessibility and control over the system [3]. The main motive of the system is the energy conservation because the resources like hydro, thermal, coal that we rely upon are not easily replenished, so introducing power saving elements like LDR Relays and LEDs can light up a large area with high-intensity light whenever needed [4]. The relay is used as an automatic switch and reduces almost 100 percent of the manual work [11]. The main issue of existing electric system is the connectivity problem as most of the connections handled by different contractors are done manually. Timer settings are performed manually. Timer often requires twelve hours continuous power supply and the further timer settings may be disrupted in the absence of continuous power supply [5]. It supports clientserver mechanism where a single user can control the overall system [1]. It reduces heat and carbon dioxide emissions [2]. IOT based street light automation is a cost-effective and eco-friendly method which also eliminate the problems In disposal of incandescent lamps and power saving

II.RELATED WORKS

In the recent years, many efforts have been taken to automate the existing streetlight system. For any intelligent streetlight system, it should operate in a systematic way to maximize the quality and productivity. So by implementing a more reliable system can cut

off a major street lighting expenses and reduce human effort as well. But many methods are still operating with traditional light sources, therefore, it may reduce the human effort but the energy wastage and light pollution still exist.

Manish Kumar at el [12] in the year 2016 published their paper regarding streetlight controlling using Zigbee wireless module. They included LDR, microcontroller, and a transmission module. Zigbee allows wireless communication with the lamp module. The system consists of two LDR sensors to examine the day-night variations and lamp health conditions. The results from the LDR is transferred to the microcontroller after processing the data and further into the transmission module. The wireless Zigbee sends the data to the control centre to monitor and operate each streetlight. The system uses Zigbee network and the range of Zigbee is very short [7].

Prof. K.Y Rajput and three others from TSEC Mumbai also proposed an automated streetlight monitoring system using GSM technology. The system consists of a server microcontroller, and sensors like smoke sensor, noise sensor, light sensor etc…to measure various parameters. This system can detect surrounding temperatures, noise intensities and alert the system for corrective measures. The problem is that the GSM modem has to be implemented in each streetlight which makes the system very costly. It also has some connectivity issues. This model uses a lot of hardware to control and monitor the system so it is costlier [13].

M.Abhishek et al [14] implemented a traffic flow based streetlight control system powered by solar panels. They used an 8052 series microcontroller and replaced normal bulbs with LED light and energy consumption was decreased by three times. Sensors are provided at either side of the roads to detect the vehicle movements and to instruct the microcontroller to switch on and off the lights accordingly. Here the lights are turned on only in the presence or motion of vehicles. Otherwise, all the lights are turned off even it is night time or dark weather conditions.

III.PROPOSED SYSTEM

This project provides a better solution for streetlight control and automation. The system consists of LDR, relays, microcontroller, temperature & humidity sensor, and some electronic components. A single system is capable of controlling four to eight lights and it can also monitor the temperature and humidity of that particular area. Here we use a cost-effective ESP-12 Wi-Fi module. Arduino microcontroller is used to control the relays and to fetch the data from the sensors to the database through Wi-Fi module. The entire system can be monitored and controlled by a central system through a web interface. A central database is created to fetch data from all individual systems which can simultaneously control up to eight lights. The conventional lamp is replaced by smart LED light technology which consumes low power and provides high-intensity light and effectively illuminates the surrounding. The Light Dependent Resistor (LDR) helps in controlling the intensity of LED lights. The resistance of LDR varies according to the amount of light falling on its surface. When the LDR detects light its resistance will get decreased, thus if it detects darkness its resistance will increase, Therefore high-intensity light can be provided during the needful conditions. Rest of the times the light intensity can be set to a low state which boosts up the power saving and energy wastage. DHT11 TemperatureHumidity sensor is used to sense the surrounding accurately and gives a fast response. The whole system is implemented with a Wi-Fi module, Arduino Nano Microcontroller, relays, an HTML web page to control and obtain the status of the system and few other electronic components.

Fig.1 explains the architecture of the system. All the LEDs (Street lights) are used to connect with the relays which enables the LEDs for their switching ON/OFF according to the instructions given to it. And the instructions are carried out through ULN2003 relay driver from Arduino by sensing the data from LDR connected to it. Using the DHT11 temperature and humidity sensor, the data of the specific area is sensed and sent to the server using the ESP8266 Wi-Fi module which is connected to internet. And sends the weather and status of the street lights to the server which is controlled by a central control and monitoring system.

A. LDR

Light Dependent Resistors are light-sensitive devices. They are made up of semiconducting materials with high resistance. LDR works under the principle of photoconductivity in which the conductivity of the material gets reduced by the absorption of light. The theoretical concept of the light detector resistance lies behind, which is used in this circuit as a darkness detector.

B. ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove but in a different package. It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech. Arduino is an open-source prototyping platform. We can perform various operations with the knowledge of the Arduino programming language. It is an easy to use hardware and software. It is easy to code and upload it to the board.

C. RELAY

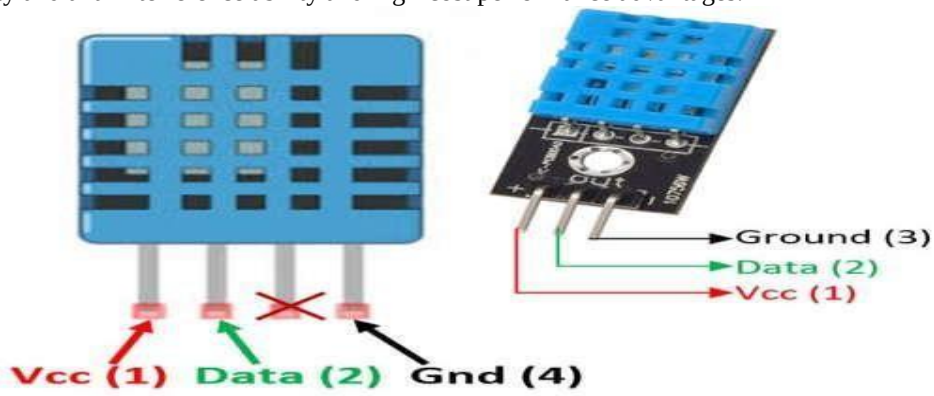
Relays are like remote control switches. It is highly used due to its simplicity, long life, and reliability. Relays can take electrical inputs and gives mechanical output or vice versa. It is normally an electromechanical device that is actuated by an electric current.

D. ESP8266EX Wi-Fi Module

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system. It serves as a Wi-Fi adapter; wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface.

E. DHT11 Sensor

It is a Temperature-Humidity sensor with extremely accurate humidity and temperature calibration. It is a singlewire serial interface system integrated to become quick and easy. It has a variety of applications due to its small size, low power, and signal transmission distance up to 20 meters. The product is 4-pin single row pin package. Special packages can be provided according to users need. It has excellent quality and anti-interference ability and high-cost performance advantages.



F. System Prototype

The whole system implementation is explained in Fig. 2, each smart system is connected to a group of 4 LED street lights. It can also be connected up to 8 LEDs per system. And all the systems are connected to the internet and used to send and receive all the data the server and provides a central control to the managing board through web application and mobile apps.

IV. RESULT & DISCUSSION

This IOT based automated streetlight system is very cost effective. The project aim is the conservation of energy. It can also eliminate the CO2 emissions and light pollution. The system does not require manpower and periodic check instead the system status is continuously updated. It is also helpful in getting the accurate temperature and humidity condition of a specific area.

Fig. 3 and Fig. 4 explains the result obtained from the smart system. Which shows the status of the LEDs, power usage, intensity of sun light, sensor threshold, Temperature and humidity. It has advantages such as user-friendly, all data access in a single window interface.

V. CONCLUSION

An enormous amount of energy can be saved by replacing sodium vapour lamps by LED and adding an additional feature for security purposes. It prevents unnecessary wastage of electricity, due to manual switching of streetlights. It provides an efficient and smart automatic street light control system with the help of LDR. It can reduce the energy consumption and maintenance the cost. It can be applied in urban as well as rural areas. The system is extendable and totally adjustable to the needs of the user. It creates a safe environment with maximum intensity light whenever required. The need of the system is to reduce the maintenance cost and to increase the lifespan of the system. Initial cost and maintenance are some disadvantages of this system.

REFERENCES

[1] Vaishali Gupta, Krutika Thakur, Ritesh Thakur, "Based Smart Street Lights" International Journal of Research (IJR), Volume 2, Issue 10, October.

[2] J.Arthi, W.Lydiapreethi, B. Gunasundari," IOT BASED SMART LED STREET LIGHTING SYSTEM" IJRTI | Volume 2, Issue 4 | ISSN: 2456-3315.

[3] Snehal Bhosale, Komal, Dipali, Pallavi, "IOT BASED DYNAMIC CONTROL OF STREET LIGHTS FOR SMART CITY" International Research Journal of Engineering and Technology (IRJET),Volume: 04 Issue: 05 May.

[4] Shreesh Mishra, Shivakant Gupta, Santosh Singh, Tripuresh Tiwari, Anand Mohan, "ARDUINO BASED LED STREET LIGHT AUTO INTENSITY CONTROL SYSTEM" International Journal of Advanced Research in Engineering, April2016 Volume 3, Issue-4.

[5] Sayali Arkade, Akshada Mohite, Rutuj, Vikas, "IoT Based Street Lights For Smart City" International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 4 Issue XII, December 2016.

[6] B.Abinaya, S.Guru Priya, "IOT BASED SMART AND ADAPTIVE LIGHTING IN STREET LIGHTING" Department of Information Technology Sri Sairam Engineering College. [7] Fabio Leccese, Marco Cagnetti and Daniele Trinca, Article on "A Smart City Application: A Fully Controlled Street Lighting Isle Based on Raspberry-Pi Card, a ZigBee Sensor Network and WiMAX" Sensors Journal 2014.

[8] Sindhu.A.M, Jerin George, Sumit Roy, Chandra J, "Smart Streetlight Using IR Sensors" IOSR Journal of Mobile Computing & Application (IOSR-JMCA) e-ISSN: 23940050, P-ISSN: 23940042.Volume 3, Issue 2.

[9] Parkash, Prabu V, Dandu Rajendra, "Internet of Things Based Intelligent Street Lighting System for Smart City" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 5, May 2016.

[10][10] Ritisha Salvi, Shraddha Margay, Kavita Mate1, Bhakti Aher, Smart Street Light Using Arduino Uno Microcontroller" International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, Issue 3, March 2017.

[11] Monika H R et al. "INTERNET OF THINGS BASED INTELLIGENT STREET LIGHTING SYSTEM FOR SMART CITY" International Journal of Engineering, Basic sciences, Management & Social studies Volume 1, Issue 1, May 2017. [12] Manish Kumar, Ravinder, Ritula, "Zigbee Based Smart Street Light Control System Using Lab VIEW" International Journal of Innovative Research in Science, Engineering and Technology Vol. 5, Issue 4, April 2016.