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Street Light Controlling and Monitoring of Fault Detection using LoRa

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ABSTRACT

IoT (Internet of Things) is taking the market on a new node and knocking on the door with new invention prospects with every improvement in Internet speed and bandwidth. This project is about an IoT-based energy-saving street light monitoring and control system. Lighting appliances consume a substantial amount of energy, therefore improving efficiency and detecting faults quickly is a key task. Depending on the nature of the application, two distinct model techniques are used in this study. IEEE 802.11 wireless technology is utilized in limited regions or confined premises where all appliances are connected to a cloud. The second variant, which is similar to the street lamp pole, Wired setup is used to eliminate range issues when the number of appliances develops solely in one direction. When a problem is found, that specific pole number problem is immediately uploaded to a web page.

KEYWORDS: Streetlight, IoT, LoRa, Things speak.

INTRODUCTION

The Internet of Things (IoT) refers to the transmission of data from devices to a master controller using gateways and current network procedures. Unlicensed and licensed spectrums are vital in the IoT market, according to market developments and studies. IoT systems use field sensors and data analysis to communicate with one other through the internet, allowing them to share and transmit information using a unique identifier provided to each item. In today's world, automation plays a key role, and IoT and LoRa can help to meet those needs. There is a considerable loss of electrical power in the street lighting and electrical systems due to the traditional on/off system, and studies are being conducted in the area to decrease the power loss using various technologies. IoT cloud server is utilized here for improved energy conservation and early resolution in case of any defect detection in mobile based surveillance with web. At this subject, a lot of research is being done to reduce energy loss in remote sites by introducing user-friendly applications. The major goal of this study is to create an automated and regulated street light that meets the needs of roadways, pedestrians, and vehicles. Utilizing existing networks and unlicensed radio frequencies, a user-friendly control system to monitor and manage lighting systems from remote places using IoT and LoRa can meet the needs with low infrastructure expense. Field sensor data can be communicated to master control stations from remote places using LoRa

gateways; once at the gateways, signals are routed to the User end via an existing network server, and vice versa. Every gateway routes the received packet from the end-node to the cloud-based network server through cellular, Ethernet, satellite, or Wi-Fi backhaul. As a result, when there is no need for lighting in a particular location, the power consumption can be reduced by turning off the circuit.

LITERATURE SURVEY:

B. K. Subramanyam1 et al. [1], worked on intelligent wireless street light control and monitoring system, which integrates new technologies, offering ease of maintenance and energy savings. Using solar panel at the lamp post by using LDR it is possible to save some more power and energy, and also we can monitored and controlled the street lights using GUI application, which shows the status of the lights in street or highway lighting systems.

P. Nithya et al. [2], in their work on Design of Wireless Framework for Energy Efficient Street Light Automation suggested an Intelligent management of the lamp posts by sending data to a central station by ZigBee wireless communication. With the suggested system, maintenance can be easily and efficiently planned from the central station, allowing additional savings.

Srikanth M et al. [3], in their work on ZigBee Based Remote Control Automatic Street Light System. This streetlight control system helps in energy savings, detection of faulty lights and maintenance time and increase in life span of system.

Anila Devi Y et al. [4], worked on GSM Based Remote Control System of High Efficiency Intelligent Street Lighting System Using a Zigbee Network of Devices and Sensor. New intelligent and smart street light system is designed with wireless technology for maintenance and network of sensors for controlling. In which, they used high efficiency LED lamp which consumes less energy with high life time and which are supplied with renewable energy of solar panels.

Soyoung Hwang et al. [5], remote monitoring and controlling system based on ZigBee networks. Real-time remote monitoring is implemented with JMF which is a multimedia extension API of Java.

BLOCK DIAGRAM:

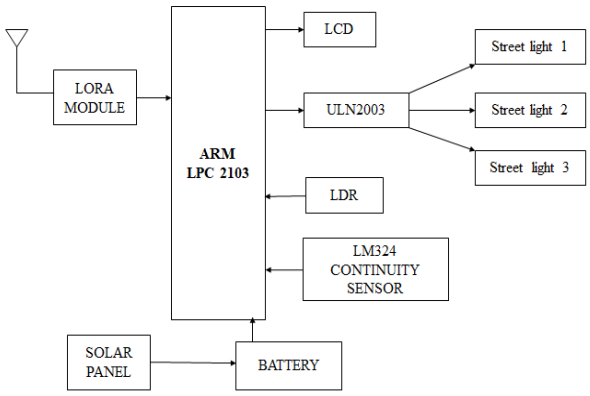
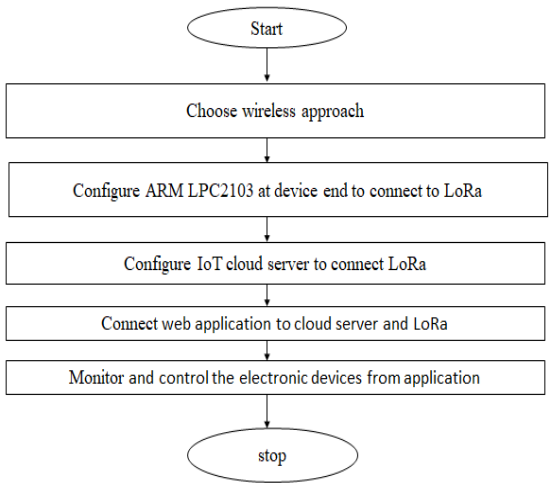


Fig.1 Block diagram of street lights controlling and monitoring

ARM Microcontroller periodically asks the sensor value from the current sensor located in the pole this sensor sends the response by sending the values. If the received value is less than the threshold value than it reports the failure of the application system to update the database. LDR senses the presence of night or day status. Continuity sensor will check the circuit if it is open or closed circuit. LoRa module is used to connect the web application and the cloud platform. Light functions can be controlled by sensors installed in each street light. The sensor uses LoRa technology to connect the street light to a LoRa-based gateway. The lora gateway collects data from all adjacent street lights and aggregates it. The same gateway connects sensors for various smart city applications. The information is sent to the cloud, where it is examined by an application server. The illumination is controlled by the application server. For burnt out bulbs and other issues, the server sends out maintenance warnings.

Flow chart:



Choosing the wireless approach to configure the microcontroller ARM LPC2103 at device end to connect to the LoRa. Next we have to configure IoT cloud server to connect LoRa. We should connect the web application to cloud server and LoRa. Now we can monitor and control the electronic devices from the application.

HARDWARE CONNECTION:

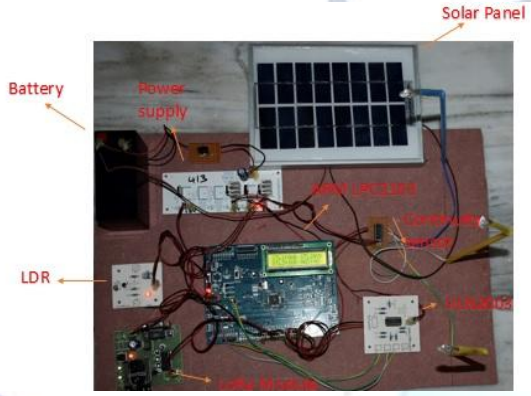


Fig.3 Hardware kit

LDR senses the presence of night status and day status and will communicate to controller to switch on or off the street light. Continuity test sensor will check the circuit/street lighting the system if any fault is observed by concept of open circuit and closed circuit. Microcontroller unit always gives the update of street lights to LoRa. LoRa will communicate to cloud platform.

RESULTS:

Fig.4 Things speak output

Things speak recorded and stored the data of the street lights when it is in good condition as well as when fault occurs in any of the street lights through graphical representation.

CONCLUSIONS:

Nowadays resources (water, power, air, etc.) are very precious. This work focused to protect one such resource i.e. energy. Electricity is one of the major losses of energy. Using IoT the street lights ON/OFF is automated based on the weather condition, the working status of the street light is observed. The LDR sensor senses the environmental changes, the ON/OFF of the street lights is made automatically. Whenever the street light got damaged or not on during night time, the LDR sensor senses it and sends the notification to the authorized person that the light is damaged and the location where the light is damaged. It reduces human efforts, delays in fixing the issues. The automatic control of street lights is used to find the exact location when the street light gets damaged. Further, this can be implemented for all the street lamps in rural lamps. Pre-identification of damaged street lights is done based on the expiry of lamps.

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