International Journal of Research and Development in Applied Science and Engineering (IJRDASE)
ISSN: 2454-6844

Smart City Electric Pole Monitoring System

Shruti Chauhan, Anjali Chauhan, Satyam Vishwakarma, Sushmita Shukla, Saksham Gupta
Department of Electrical Engineering,
Axis Institute of Technology and Management, India,
shrutiichauhan@gmail.com, anjalithakur788114@gmail.com,
satyamvishwa07@gmail.com, shuklasushmita111@gmail.com,
sk.saksham870@gmail.com

Abstract: The trending demand of alternative sources of the energy is required to the growing demand of the people. It can be done by two ways first one is to find alternative resource of energy and another one is by reducing the energy consumption of the present available resources. We can control the street light manually but it is time taken and also time lagging chances are there , the automatic fault detection scheme has the provision to detect the fault without the man power as well as controlling is easy without lapsing of time. Our project aims to reduce the chances of error and increase the feasibility of system.

Keywords: Electric Pole, GUI, LED, Smart Traffic.

1. Introduction

As our is about smart city, when we define smart city , it is an urban area that uses different type of electronic methods and sensors to collect data, insight gain from the data are used to manage resources and services efficiently .

According to data, 80% of currently produced electrical power is used to supply urban necessities and about 60% out of this is required for street lamps, due to their continuous operations at night time. As everyone knows street light becomes large energy consumer so we need to save our or conserve energy because most of the energy source we depends on, like coal and natural gas can't be replaced once we use them , they are gone forever. Saving power is very important, instead of using the power in unnecessary time. It should be switched off because most of the time we see street light are on even after sunrise thus wasting of lots of energy saving is key point in the context of smart cities, in this project we focus on the achievable energy saving by adopting smart lighting system in place of traditional incandescent/fluorescent lamps.

In this respect, smart lighting control system play a crucial role in energy consumption reduction .In fact the advances in wired and wireless network control technologies and embedded system have made it feasible to design. Modern lighting system endowed with smart technologies where the energy saving issue can be efficiently death with this project is all about to control the power consumptions at the streets and eliminating manpower. This includes the controlling a circuit of stret lights with specific sensor, LDR and microcontroller during day and night.

The aim of the project is designing and executing the advanced development in embedded system for energy saving of street lights and now a days human are too busy, and it's unable to find time even to switch off the lights wherever not necessary and monitor the status of light .

It is very hard job to collect information of electric light status , they are running or not. You have requires lots of men power and days to get information . Then you can know the current status of electric pole light status .

To remove the men power and get status of all electric poles information with in few minutes we have design this project.

2. Related Work:

A smart traffic management system that is partially deployed in Cambridge city where queue detectors are buried in the roads that detect the traffic queue and inform the central control unit which takes decision accordingly. Since the system is centralized that can slow down due to networking issues [9]. The researcher used surveillance cameras to detect traffic and OCR to identify the vehicles through number plate recognition which is a simple detection method but the system will fail in Pakistan as there are different kinds of traffic including cycles, donkey carts which have no number plate [10]. Osman et al. proposed a system in which they have used surveillance cameras to detect traffic density using MATLAB, a traffic controller and a wireless transmitter used to send images to the server after that server calculated traffic density by using those images of every section. This system used fixed (predefined) thresholds that depend on a number of vehicles on road. An algorithm was used to set a time span of red light for a particular lane of the intersection, which is determined by traffic density on road and forwarded to the microcontroller and then server [11].

Jadhav et al. used surveillance cameras, MATLAB and KEIL (Microcontroller coding) to control traffic congestion. This paper also discusses the priority-based traffic clearance and red signal broker (Number plate detection). Due to using heavy hardware, it is difficult to manage and become costly [8].

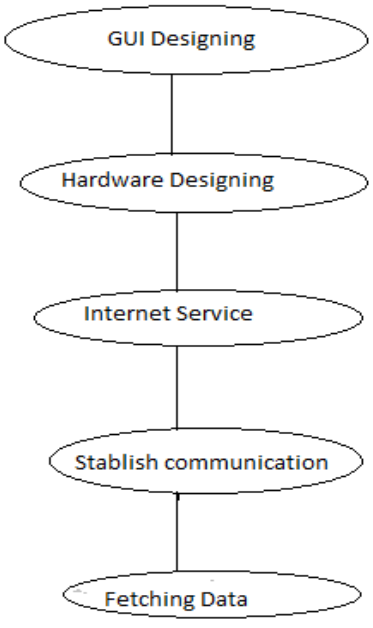
Bui et al. Analyzed a real-time process synchronization based system to manage the traffic flow dynamically. Sensors were used to detect the traffic, where vehicle to vehicle and vehicle to infrastructure communication was done by using wireless communication devices. Controller placed at the center of the intersection received vehicles' and pedestrians' information and requests and process using first come first serve method [12].

Swathi et al. proposed smart traffic routing system that chooses the shortest route having the least congestion. Sensors are used to collect data about traffic density, these sensors use solar energy and battery. Sensors kept transmitting infrared light and when an object came near, they detect traffic density by monitoring the reflected light from the vehicle. However, readings may change with the change in temperature and humidity [13].

Al-Sakran et al. proposed a system in which major goals were detecting vehicles and get their location by using sensors and RFIDs after getting data it sent to centralized controlling center by using a wireless connection for further processing. Researchers used cloud computing, RFIDs, GPS, wireless sensor network (WSN), agent and other modern tools and technologies to collect, store, manage and supervise traffic information [14].

3. Methodology:

We describe the basic components of the project here in simple terms. We designed the hardware, the software, and the GUI. After reading several research papers, we understand the summary, and now we realize what people are experiencing before in order to move ahead with idea. In other words, methodology refers to a very specific collection of data, methods, procedures, and practices for research work. In general, research strategy is a description of how the research will be undertaken and, ultimately, what the results will be. Also, understand existing methods and introduce new ones for improving.



There are four main functions that determine methodology:-

1. GUI Designing
2. Hardware Designing
3. Internet service
4. Establish communication (between hardware and software)
5. Fetching Data

GUI (Graphical User Interface):-

For this project, we used Python to create a GUI. Tkinter is the most commonly used GUI method in Python. It uses a standard Python interface to the Tk GUI toolkit included with Python, making it the most efficient and easiest way to develop GUI (Graphical User Interface). GUIs help individuals communicate with electronic devices like computers, mobile phones, and other devices through symbols, icons, menus, and other graphics. They demonstrate information visually.

Hardware Designing:-

Hardware we use is designed as two pole with a 12 volt battery, LDR sensor, LED, current transformer, node MCU and programming written in Node MCU. Hardware programming is arduino code written in C language.

The prototype system is designed for two poles, actually we will use two pairs of electric poles for our demonstration. By changing the csv file data we can add thousands of poles for online tracking, and on each pole we need to interface our device.

Internet Service:-

Having a network will provide connectivity, power, policy, compute, security, and manageability at scale for IOT deployments.IOT devices must be connected to the controllers that will control the devices. The connection may be wired or wireless. As our project is based on the IOT so internet connectivity plays a important role in the project. We need different hotspot or network connecting source for establish connectivity in hardware and software.

Establish communication:- In this project we establish the communication between hardware and software by the dweet.io API. Dweet is free and easy to use though we will mention an inexpensive enhanced version of the service. There are many messaging services (for instance MQTT) that can be

used by IOT application, but very few are simple along with being free. Dweet is an IOT platform where connected devices can send messages according to its creators. "It's like Tweeter for Social machines."

Fetching Data:-

We can understand the fetching of data by a example ie; The mobile application connect to the internet and send data to a server over the internet. The server retrieves that data, interest it, perform the necessary action and send it back to your phone. The application interprets the retrieved data and displays it on your phone, means to collect data from cloud storage that is fetching of data.

4. Result and Discussion:

This is our prototype system for demonstration, so we are designing for 2 pole. actually we will use 2 number of electric pole's for our demo. But only changing in our CSV files data we can add thousands of pole for on line tracking & on each pole we have to interface our device.

For easy understanding we have divide our project in 2 sections-

1. Hardware Part
2. Software part

Programming is involved in both part. In Software which will run on CPU , we will use Python & in hardware we are using c language for Arduino programming.

In real time, we will setup one hardware on each poll & will connected with internet via Wi-Fi or any other medium. Hardware will send data to server after every 60 minutes & software will collect that data from server & generate report of poll.

But in our case for demo purpose we have setup two button Hardware, one button for on or off one lamp & another button to send data to server. First we will turn on lamp by on/off switch, then we will collect data from server, it will shows lamp status with ok, next will turn off lamp & send data to again on server, next again collect data from server, now it shows fault in result.

The case diagram of the project completely define, what is actually happen in this project. As we can see in the above diagram, admin first manage the area and the street light selected in that particular area and then add csv.file for your convenient, how many pole you want to monitor the status of those pole. We design a GUI which contain boxes that is division list, pole Id, running status, time interval and button that starts the monitor. we design a excel list which is automatically update when we start monitoring and update the status of lamp on behalf of the sensor result.

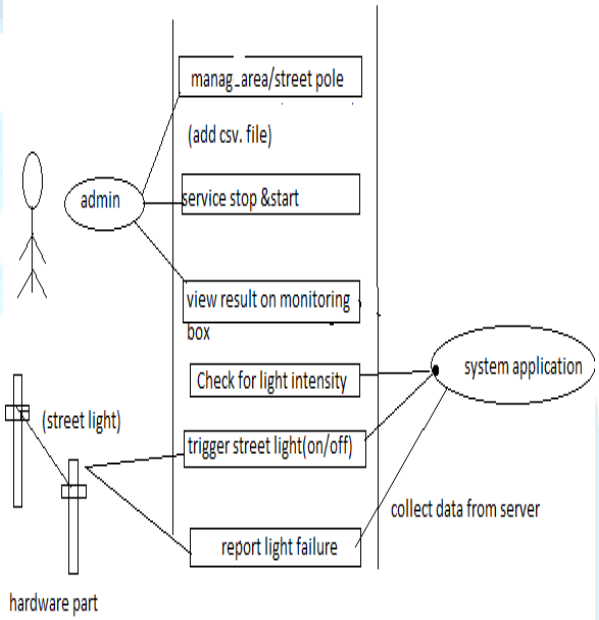


Fig. 3: Case Diagram

Fig. 4: Hardware Part.

The above image is the prototype model of street light system. The lamp represent the street light and all the other things is used for the modernization of street light. As part of the design, we installed light sensor within all the street light circuits, which are responsible for turning on and off

automatically. Once the light are on, the current sensor reports the status of the problem to a centralized system using LDR technology. Having the status available in a centralized system makes it easier for workman to locate the faulty light for repair, thus reducing the amount of time searching for it and repairing. It also collects the useful information from each street light at the end of each day. The information is stored in a database that generates information charts. These charts display information such as the area of the monitoring pole, the pole id, current status of the lamp, and the timing of the monitoring. The proposed system aim to achieve individual fault repaired within few working hour instead of taking days.

5. GUI Interface:

Graphical user interface is a form of user interface that allows users to interact with electronic devices through graphical icons and audio indicators as the main symbols, instead of typing command labels based on the user's text interface or text navigation.

In 1979, Xerox Palo Alto research center developed the first GUI prototype. A young man named Steve Jobs is looking for new ideas to develop the future version of Apple computer. He traded $1 million in stock options to Xerox to learn more about its current facilities and projects.

The GUI presents system resources, mainly data files and applications, in graphical objects called icons on the screen, and allows users to use the mouse as another input device to express their needs, such as selecting objects, and calling tasks.

Fig. 5: GUI Interface.

References:

[1] W. S. Associate, "Transportation and Economy Report," MDOT State LongRange Transportation Plan, Karachi, 2007.

[2] K. S. D. M. R. B. Patan Rizwan, "Real-Time Smart Traffic Management System for Smart Cities by Using Internet of Things and Big Data," in International Conference on Emerging Technological Trends [ICETT], Kollam, 2016.

[3] C. S. D. L. T. Authority, "Annual Vehicle Statistics," Annual Vehicle Statistics 2015, Karachi, 2015.

[4] M. P. a. B. B. Sivasankar, "IoT Based Traffic Monitoring using Raspberry Pi," Internation Journal of Research in Engineering, Science and Technology (IJRESTs), vol. 1, no. 7, pp. 2454-664x, 2016.

[5] A. Lone, "Karachi's crime malaise," Tribune.com.pk, 18 August 2011. [Online]. Available: https://blogs.tribune.com.pk/story/7540/karachiscrime-malaise/. [Accessed 20 September 2017].

[6] S. Sharief, "Road Accidents in Pakistan Reach Alarming High: Who's Responsible," Pakwheels.com, 2016. [Online]. Available: https://www.pakwheels.com/blog/alarming-increase-of-road-accidentsin- pakistan/. [Accessed 2017].

[7] B. k. Khan, "Traffic jams in Karachi result in losses worth of millions each day," PakWheels.com, 2013. [Online]. Available: https://www.pakwheels.com/blog/traffic-jams-karachi-result-lossesworth- millions-day/. [Accessed 2017].

[8] P. K. K. P. S. T. Prashant Jadhav, "Smart Traffic Control System Using Image Processing," International Research Journal of Engineering and Technology (IRJET), vol. 3, no. 3, pp. 2395-0056, 2016.

[9] E. Leigh, "Advancing integrated and sustainable transport for the Cambridge region," Smarter Cambridge Transport, 2017. [Online]. Available: http://www.smartertransport.uk/. [Accessed 2017].

[10] T. C. N. K. Kartikeya Jain, "Smart vehicle identification system using OCR," in 3rd International Conference on Computational Intelligence & Communication Technology (IEEE-CICT 2017), Ghaziabad, India, 2017.

[11] T. e. a. Osman, "Intelligent traffic management system for a cross section of roads using computer vision," in Computing and Communication Workshop and Conference (CCWC), 2017 IEEE 7th Annual, 2017.

[12] D. C. J. E. J. Khac-Hoai Nam Bui, "Real-Time Traffic Flow Management Based on Inter-Object Communication: a Case Study at Intersection," in 7th International Conference on Ambient Intelligence (ISAmI'2016), 2016.

[13] V. S. A. M. S. D. K. K. Swathi, "Traffic Density Control and Acciden Indicator Using WSN," International Journal for Modern Trends in Science and Technology, vol. 2, no. 4, pp. 2455-3778, 2016.

[14] H. O. Al-Sakran, "Intelligent traffic information system based on the integration of Internet of Things and Agent technology," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 6, no. 2, pp. 37-43, 2015.

[15] A. S. Nidhi D. Agrawal, "Intelligent Real Time Traffic Controller Using Image Processing – A Survey," International Journal of Science and Research (IJSR) ISSN (Online), vol. 4, no. 4, pp. 2319-7064, 2015.

[16] J. D. D. M. A. M. A. J. Vismay Pandit, "Smart Traffic Control System Using Image Processing," International

Journal of Emerging Trends & Technology in Computer Science (IJETTCS), vol. 3, no. 1, pp. 2278- 6856, 2014.
[17] D. S. P. S. Y. M. Pranav Maheshwari, "Smart Traffic Optimization," in 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE), IEEE, 2015.
[18] M. A. M. A. T. R. J. S. A.-M. A. B. Fozia Mehboob, "Automated Vehicle Density Estimation from Raw Surveillance Videos," in SAI Computing Conference 2016, London, 2016.
[19] K. B. M. R. M. B. Shubham N. Mahalank, Device to Device Interaction Analysis in IoT based Smart Traffic Management System: An Experimental Approach, Symposium on Colossal Data Analysis and Networking (CDAN), 2016.