

A Survey on IoT Based Surveillance and Control System of Electrical Devices

Dipika Tidke¹, Madhuri Malode²

Assistant Professor, Department of Computer Engineering, MVPS's KBT COE, Nashik, Maharashtra, India¹

Assistant Professor, Department of Computer Engineering, MVPS's KBT COE, Nashik, Maharashtra, India²

ABSTRACT: IOT (Internet Of things) is taking the market on a brand new node and knocking the door with new opportunities of inventions with every enhancement in Internet in terms of speed and bandwidth,. This talks about the device which saves energy Surveillance and this system supported IOT. A large amount of energy is consumed by lighting appliances, so making improved efficiency and quick fault detection could be a significant challenge. In this work, two different model approaches is followed betting on the character of application. For small areas or confined premises IEEE 802.11 wireless technology is employed where all the appliances is connected to a standard Wi-Fi network. In another model where number of appliances grows only in one direction like streetlight pole, wired configuration is employed to avoid range issue.

KEYWORDS: Street light, Traffic Signal, Signal Control, Wireless Communication, IEEE 802.11, Node MCU, Energy efficiency, Node Red, Raspberry Pi 3.

I. INTRODUCTION

The billions of physical devices around the world that are now connected to the internet, all collecting and sharing data can be refer as IOT[4]. This system is made up of related sensors, computing and digital devices spread across the world over the net which may communicate among them to share and transfer information using unique id which is assigned to every and every device, as Unique Identifiers^[10]. The main focus to automate these premises has increased drastically with the growing of different commercial premises and societies. Also the growing traffic mess within the cities has pushed everyone towards a much better and more reliable electrical system.

A user friendly web application and mobile based surveillance & system connected to IOT cloud server is used here for more energy conservation and early resolution in case of any fault detection. During this new growing era where smart cities are taking into shape, the hassle for optimal energy based light and lightweight system has gained pace[8]. So effort has been taken to supply a reliable and user friendly application for straightforward to use and monitor the electrical devices.

Applications of IOT

IOT has different applications in many of the fields, for example:

- 1) Smart Exam supported IOT to access student difficulty and disability to try exam questions [1]. This technique allows analyzing the power of student to know a given topic or field of study
- 2) IOT based health monitoring application from remote place for Patient [12].
- 3) Now days, vehicle monitoring system is developed to urge the live feedback of auto movement and track its performance [2].
- 4) an open debate on security on using IOT opportunity has given by IOT for criticizers, because it transfer data into an open cloud system. Proper care and precaution has to be taken so as to implement IOT [3].

II. RELATED WORK

Wi-Fi based automatic surveillance system with remote control is smart and provides a safe, secure and economical way for indoor and outdoor electrical device control and monitoring. Most of the street lamps have used control system based on LDR which turns on the street lights in night and turns off the street lights in day. Street lamp or the on previous light system still consumes lot of electricity when there are few vehicles around and no people in the office. New designed system is better in providing the option of manually monitor and control through web based portal or mobile. Simultaneously, it also provides feedback of the faulty devices through sensors to the concerned authority to quickly fix the issue may be convenient to the end user.

Many systems are developed using based technologies like GSM and Zig bee. GSM modem which send and receive SMS by using active SIM through microcontroller. Here the road controller unit is connected to GSM modem through its UART port i.e. Serial Ports. The price of developing such system is sort of high because SIM card employed in the GSM module is also compromised with certain risk [1]. Security algorithm adopted in GSM is all not disclosed algorithms. The researchers have proved that these algorithms cannot prove 100% security [12]. The minimum balance should be maintained in each individual GSM module of the connected network which sends a sign through SMS. So there's an overhead maintenance cost is included. As compare to Node MCU which is extremely lesser in cost the Zig bee module is costlier in nature. Several architectures are developed to implement wireless system.

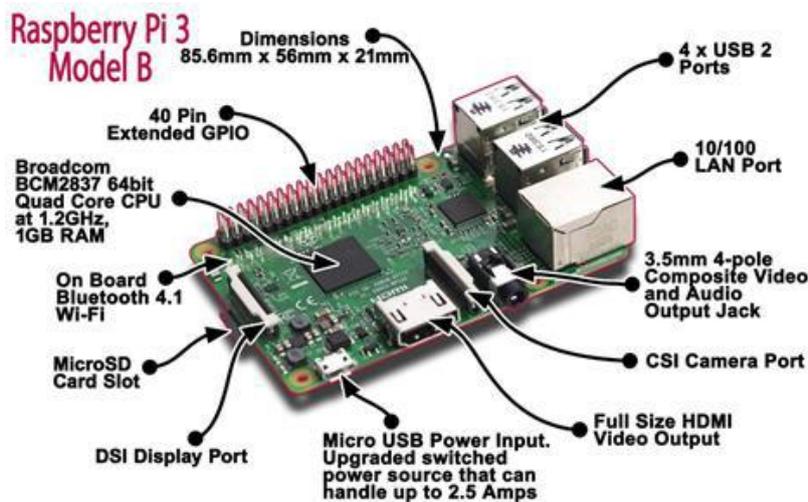


Fig 1: Raspberry Pi 3. [4]

As compared to other contemporary chips NodeMCU Wi-Fi chips are a quite lesser in cost. This chip is manufactured by Chinese company which has in built MCU and TCP/IP layer. The key focus area of this is often cheap cost, lesser power consumption than other controllers and reliable performance [4]. There are various application of NodeMCU like electronic product, medical equipment and home automation.

III. SYSTEM OVERVIEW

The proposed Surveillance and control system is splits into two categories

- 1) Previous System
- 2) Proposed System (One Directional)

Both the categories have same purpose but different within the system design. Proposed system focuses on traffic signals which work on wired communication through its Controller Raspberry Pi. This has different input/output pins which are connected to devices. This Master controller is connected to Cloud server which processes the information and send information to finish user in web application or mobile.

The Previous system uses NodeMCU module which communicate using the web to detect the faulty devices within the system to Master controller over the HTTP protocol [1]. Using the internet to detect the faulty devices in the system.

On Previous System

The diagram of proposed ESP module based surveillance and system is shown in Fig 2. It contains street lamps, , relay to regulate the on/off of the device, sensors to detect flow of current and a 5v power supply converter and node MCU at the slave end i.e. device. Sensors are accustomed send the analog signal of the environment to the system and perform the related task and control electrical appliance.

Master end contains Raspberry Pi 3 controller which is connected to Internet connection. The aim of microcontroller is to gather the information from all the road lamps by using Wi-fi connection and convert them into serial communication. The signal is send to NodeMCU module from the sensors which again send the signal wirelessly

to master control terminal. Master controller detects the signal and perform appropriate task just in case there's detection of failure of street lamps [1]. The transmission consist of NodeMCU at device end which receives information though sensors attached to the device. At the opposite end, master controller sends the wirelessly received information to a central monitoring system. Web application presents the graphical representation of the received data from the electrical devices.

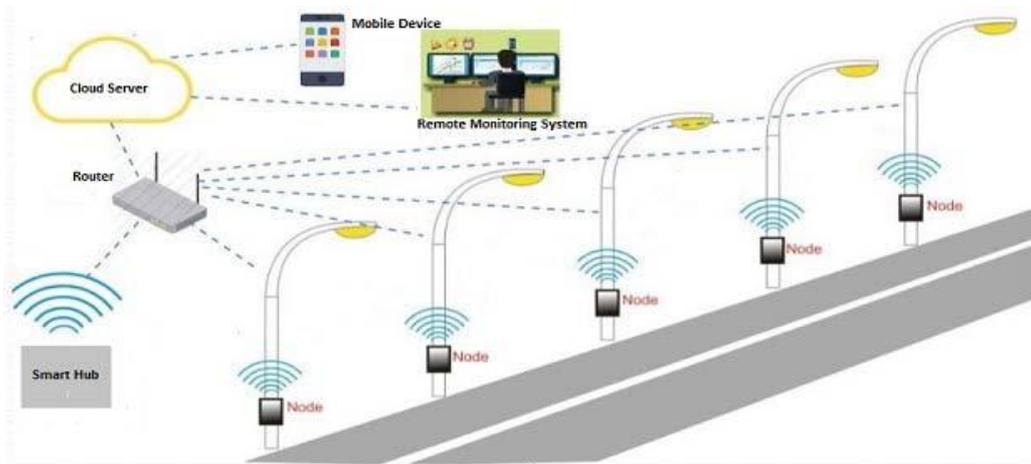


Fig. 2. Block diagram of Wi-Fi based surveillance and control system (OnPremise)

Proposed System

This is often the case of traffic street lamps which grow in number in one direction. Here we've challenge of communication range so this is often different from the on premise. As wireless connection range (router or Node MCU) is in meters, so it's unattainable to use in cases where Wi Fi connection is require in Kilometers. Moreover, to create the system reliable wired connection is employed to attach Master Controller Raspberry Pi to the road lamp device[1]. This Raspberry Pi is connected to Cloud server and web application. Fig. 3 shows the diagram of proposed surveillance and system for one directional system.

A. Master Controller: It acts like brain of the entire device control and monitoring system. Raspberry Pi receives and transmits signals to slave nodes and from slave nodes over wired connection. At the identical time it sends the feedback to a central monitoring application for visual display of the status of various electrical devices.

B. Slave Node: To send and receive information about the status of the device, each lamp controller is connected to master controller. supported the present sensor detector which is connected to device, signal is send to the

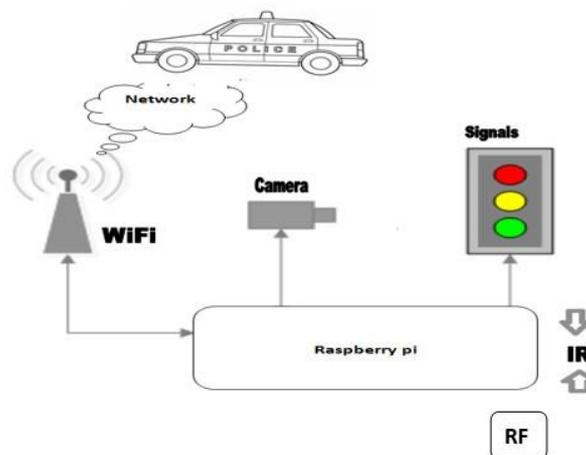


Fig 3: Block diagram of proposed system

Master controller about the working status of the device. If any signal is send from the master to the slave then the relevant action is performed supported the information received.

C. Web Application: Web application is employed to display the status of the device during a user friendly way. User can even send signal from this web application to the device so it are often controlled remotely. This application can communicate with the master controller by using HTTP protocol.

D. Software Used: Node Red and AVR studio are the two development tools that are employed in this project. Embedded level programming is finished through AVR studio and Node Redis used to develop web based application.

Algorithm 1: Electrical Device Control from Web application

Trigger: Switch on the lamp by the web application

1. The message is received by the Server on Raspberry Pi controller from web application through Subscriber (Sub) message.
2. Raspberry Pi reads the message of the target electrical device for the client id.
3. Node Red (pub) publishes the message to particular device over Wi Fi signal by finding the client id of the target device. [1]

Algorithm 2: Sending fault alert to web application from Device.

Trigger: Sending fault signal from the device

1. The fault is sensed by the Current sensor in electric current flow and it alerts the Node MCU for publishing the message to Subscriber for the fault.
2. This message is received by the Master Controller Raspberry Pi from device over HTTP protocol using MQTT message.
3. Then the fault signal is send by the Controller to other Subscriber over HTTP protocol.
4. Web application displayson the web portal by receiving this fault signal.[1]

IV. CONCLUSION

This IOT based device surveillance and system is exclusively accustomed keep surveillance on the electrical devices working condition and also to manage the on/off functionality from a central remote location. The designed system works efficiently for lighting both outdoor and indoor. On the one side it improves system efficiency by sending alert signal just in case of any defect and on the opposite hand it drastically reduces the electrical energy consumption by providing central control over the appliances. The graphical App based mobile controlling gives a user friendly and simply accessible platform to the user. This technique is installed as energy efficient system to manage streetlight that needs plenty of energy and wishes manual intervene.

V. FUTURE SCOPE

The system are often further accustomed enhance to observe the whole traffic system like: Reading Number plates of vehicles: - MATLAB or Open CV are often accustomed further enhance this technique for automatically read Number plates of Vehicles. Challan the vehicles for over speeding :- just in case of traffic violation or over speeding, challan are often automatically issued via camera monitoring and recording clips are often saved for future reference. Trespassers detection: - Trespassers are often traced if found guilty. Real time deployment of sensors to style and implement HMIS [HealthCare Management Information System]. Live video feedback to control center: - Live video streaming are often screened on to the appliance to a central monitoring team.

REFERENCES

- [1] Alok Kumar Gupta, Rahul Johari. " IOT Based Electrical Device Surveillance And Control System" IEEE 2019
- [2] Shulong , Wang, Yibin Hou, Fang Gao, and Xinrong Ji. "A novel IoT access architecture for vehicle monitoring system." In Internet of Things (WF-IoT), 2016 IEEE 3rd World Forum on, pp. 639-642. IEEE, 2016.
- [3] Abdur Rahim , Biswas, and Raffaele Giaffreda. "IoT and cloud convergence: Opportunities and challenges." In 2014 IEEE World Forum on Internet of Things (WF-IoT), pp. 375-376. IEEE, 2014
- [4] <https://www.raspberrypi.org/>
- [5] Sertan Deniz Saygili, Xheladini, Ferhat Dikbiyik, Azra. "An IoT based smart exam application." In Smart Technologies, IEEE, 2017.
- [6] <https://www.raspberrypi.org/magpi/raspberry-pi-3-specs-benchmarks/>



- [7] Heekwon Yang, Shahzad, Gul, Arbab Waheed Ahmad and Chankil Lee. "Energy-efficient intelligent street lighting system using traffic adaptive control." IEEE Sensors Journal 16, no. 13 (2016).
- [8] Ahuja S., Khokhar C., Johari R. "IoT: Internet of Things Application" In: Proceedings of the Second International Conference on Computer and Communication Technologies. Advances in Intelligent Systems and Computing, vol 381. Springer, 2016.
- [9] <https://www.raspberrypi.org/documentation/usage/camera/python/README.md>
- [10] <https://www.makeuseof.com/tag/raspberry-pi-camera-module>.
- [11] I. A. C. L. Zeeshan Kaleem, "Smart and Energy Efficient LED StreetLight Control," IEEE.
- [12] Minoli, Daniel, Kazem Sohraby, and Benedict Occhiogrosso. "IoT security (IoTsec) mechanisms for e-health and ambient assisted living applications." In Proceedings of the Second IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies, pp. 13-18. IEEE Press, 2017.