

IoT Based Electrical Device Surveillance and Control System

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Abstract— With every enhancement in internet in terms of speed and bandwidth, IOT (Internet of things) is taking the market on a new node and knocking the door with new opportunities of inventions. This paper talk about an energy saving electrical device surveillance and control system based on IOT. A large amount of energy is consumed by lighting appliances, so making improved efficiency and quick fault detection is a significant challenge. In this work, two different model approaches is followed depending on the nature of application. For small areas or confined premises IEEE 802.11 wireless technology is used where all the appliances is connected to a common Wi-Fi network. In the second model like street lamp pole where number of appliances grows only in one direction wired configuration is used to avoid range issue.

Keywords: IoT, Electrical Device, Supervisory control and data acquisition (SCADA)

I. INTRODUCTION

IOT is system of related sensors, computing and digital devices spread across the globe over the internet which can communicate amongst them to share and transfer information using unique id which is assigned to each and every device, as UIDs (Unique Identifiers). With the growing of different commercial premises and societies, the focus to automate these premises have increased drastically. Also the growing traffic mess in the cities has pushed everyone towards a better and more reliable electrical control system. A user friendly web application and mobile based surveillance & control system connected to IOT cloud server is used here formore energy conservationand early resolutionin case of any fault detection. In this new growing era where smart cities are taking into shape, the effort for optimal energy based traffic signal and light control system has gained pace. So effort has been taken to provide a reliable and user friendly application for easy to use and monitor the electrical devices.

II. LITERATURE SURVEY

- 1) ESP module and Wi-Fi based remote control automatic surveillance system is intelligent and provides a safe, secure and economical way for indoor and outdoor electrical device control and monitoring.
- 2) Many systems have been developed based technologies like GSM and Zig bee. GSM modem which needs an active SIM to send/receive SMS through microcontroller. Here the street controller 89C51 is connected to GSM modem through its UART port (Serial Ports). Sim card used in the GSM module may be compromised with certain risk and also the cost of developing such system is quite high. Security algorithm adopted in GSM (e.g. A3, A5) is all not disclosed algorithms. The researchers have proved that these algorithms cannot prove 100% security. Lastly, every

time, the GSM module sends a signal through SMS a minimum balance has to be maintained in each individual GSM module of the connected network. So there is an overhead maintenance cost included. Zig bee module is costlier in nature as compared to Node MCU which is very lesser as compared.

- 3) The Raspberry pi has several input/output pins which are connected to devices. Further pi is connected to Cloud server to process the data and send information to end user in mobile or web application. On premise uses NodeMCU module to communicate to Master controller over the HTTP protocol through internet to detect the faulty devices in the system.
- 4) Raspberry Pi as a Master controller for its slave (electrical device). Raspberry Pi Model B specification are ATmega328 microcontroller, input voltage 7 to 12v,DC current 40mA, operating voltage at 5v, 20v limit of input supply voltage, 40 GPIO pins, 32Kb flash memory. Raspberry Pi can be powered through USB connection or external power supply, with the range 7 to 12 volts. Raspberry Pi has input and output pins which may be used as power source for various device. A Software Serial library allows for serial communication on any of the input/output digital pins. The Arduino provides an IDE for programming the Raspberry Pi board, This Arduino IDE can be downloaded from the Arduino official website which is license free. This IDE is supported for every product of Arduino components.
- 5) Smart Exam based on IOT to access student difficulty and disability to attempt exam questions.
- 6) IOT has also given opportunity for criticsizers for an open debate on security on using IOT, as it transfer data into an open cloud system. Proper care and precaution needs to be taken in order to implement IOT.
- 7) Patient health monitoring application from remote place based on IOT.
- 8) Now days, vehicle monitoring system is developed to get the live feedback of vehicle movement and track its performance.

III. RELATED WORK

Here the existing system uses PLC scada (Programmable Logic controller) and SCADA (Supervisory Control an Data Acquisition).A PLC is a piece of physical hardware. On the other hand, scada is a software. To operate the electrical devices, it uses ladder logic programs. The PLC scada works based on the ladder logic programme input in to the plc scada controller. Here no internet is required.

A. Programmable Logic Controller

A programmable logic controller (PLC) or programmable controller is an industrial computer that has been ruggedized and adapted for the control of manufacturing processes, machines robotic devices, or any activity that requires high

reliability, ease of programming and process fault diagnosis. Dick Morley is considered as the father of PLC as he had invented the first PLC, the Modicon 084, for General Motors in 1968. PLCs can range from small modular devices with tens of inputs and outputs (I/O) extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery backed up or non-volatile memory. PLCs were first developed in the automobile manufacturing industry to provide flexible, rugged and easily programmable controllers to replace hard wired relay logic systems. Since then, they have been widely adopted as high reliability automation controllers suitable for harsh environments.

A PLC is an example of a hard real time system since output results must be produced in response conditions within a limited time, otherwise unintended operation will result. .

B. SCADA

Supervisory control and data acquisition (SCADA) is a control system architecture comprising computers, networked data communications and graphical user interfaces (GUI) for high level process supervisory management, while also comprising other peripheral devices like programmable logic controllers (PLC) and discrete proportional integral derivative (PID) controllers to interface with process plant or machinery. The use of SCADA has been considered also for management and operations of project driven process in construction.

The operator interfaces which enable monitoring and the issuing of process commands like controller set point changes, are handled through the SCADA computer system. The subordinated operations, e.g: the real time control logic or controller calculations, are performed by networked modules connected to the field sensors and actuators. The SCADA concept was developed to be a universal means of remote access to a variety of local control modules, which could be from different manufactures and allowing access through standard automation protocols. In practice, large SCADA systems have grown to become very similar to distributed control systems in function, while using multiple means of interfacing with the plant. They can control large scale processes that can include multiple sites, and work over large distances as well as small distance. It is one of the most commonly used types of industrial control systems, in spite of concerns about SCADA systems being vulnerable to cyberwarfare / cyberterrorism attacks. The key attribute of a SCADA system is its ability to perform a supervisory operation over a variety of other proprietary devices. Both large and small systems can built using the SCADA concept. These systems can range from just tens to thousands of control loops, depending on the application. However SCADA systems may have security vulnerabilities, so the systems should be evaluated to identify risks and solutions implemented to mitigate those risks. Supervisory computers are the core of SCADA system, gathering data on the process and sending control commands to the field connected devices.

C. Remote Terminal Units

Remote terminal units, also known as (RTUs), connect to sensors and actuators in the process, and are networked to the

supervisory computer system. RTUs have embedded control capabilities and often conform to the IEC 61131-3 standard for programming and support automation via ladder logic, a function block diagram or a variety of other languages. Remote locations often have little or no local infrastructure so it is not uncommon to find RTUs running off a small solar power system, using radio, GSM or satellite for communications, and being ruggedized to survive from -20C to +70C or even -40 to 85C without external heating or cooling equipment.

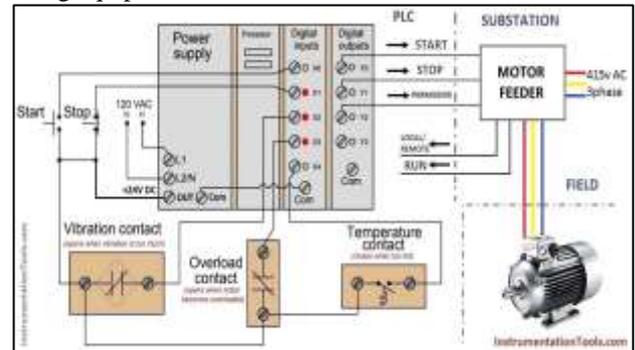


Fig. 1: Existing System

IV. PROPOSED SYSTEM

In this proposed system IOT technology is used which is the powerful tool for industrial and domestic automation. Here any electrical load can be remotely and it has the ability to transfer data over a network without requiring human to human or human to computer interaction. The electrical load can be monitored and there is a real-time feedback to analyze system in real time. The supply voltage can be varied with the help of a microcontroller. We will send command to microcontroller to control speed. Microcontroller will receive commands from android phone by Bluetooth. It will send command to a motor driver IC and this IC will control the speed of the motor. As long as device is able to connect to the internet and has sensors that transmit data, it can be considered an IOT device. Although smartphone can do both, it's not an IOT device. The DC motor control is designed based on IOT, so the smartphone becomes the control device. IOT nodes need routers to connect to the internet so that nodes can connect with users. The last part is data communication per node. But this paper only discusses one node, which tests the DC motor control based on IOT. Make sure smartphone has a strong and fast internet connection. Download the Android auto app from Google play or plug into the car with a USB cable and download when prompted. Turn on car and make sure it's in park. Unlock your phones screen and connect using a USB cable. The Android platform provides several that let monitor the motion of a device. The gravity, linear acceleration, rotation vector, significant motion, step counter, and step detector sensors are either hardware based or software based. The accelerometer and gyroscope sensors are always hardware based. The IOT evolved due to the convergence of multiple, machine learning and commodity sensors. In the consumer market, IOT technology is the most synonymous with products pertaining to the concept of the —Smart home covering devices and appliances. IOT devices are part of the concept of home.

automation which can include lightening and air conditioning. This IOT based devices can be used to enable remote health monitoring and emergency notification system. The IOT can assist in the integration of communication, control and information processing across various transportation systems. Industrial IOT devices analyze data from connected equipment, operational technology, location and people. The IOT used for various manufacturing devices. It enable rapid manufacturing of new products and dynamic response to product demands. The IOT application in farming such as collecting data on temperature, rainfall, humidity, wind speed and soil content. This data can be used to automate farming technique and take informed to improve quality and quantity. The IOT major significant trend in recent years is the growth of devices connected and controlled by the internet. The IOT creates opportunities for more direct integration of the physical world into computer-based system, resulting in efficiency improvements, economic benefits and reduced human exertion.

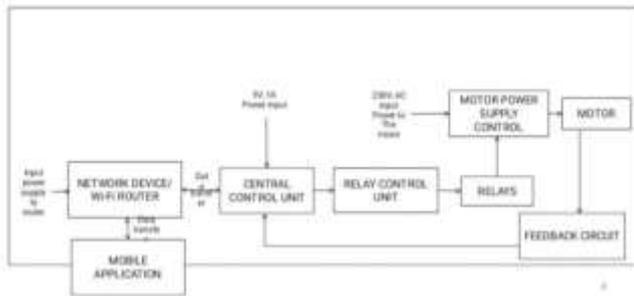


Fig. 2: Block diagram of proposed system

V. CONCLUSION

This IOT based device surveillance and control system is exclusively used to keep surveillance on the electrical devices working condition and also to control the on/off functionality from a central remote location. The designed system works efficiently for both indoor and outdoor lighting. On the one hand it improves efficiency of the system by sending alert signal in case of any defect and on the other hand it drastically reduces the electric energy consumption by providing central control over the appliances. The graphical App based mobile controlling gives a user friendly and easily accessible platform to the user. This system can be installed as energy efficient system to control street lamp that requires a lot of energy and needs manual intervene.

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