

IOT BASED SMART ELECTRIC LOAD CURB AND SUPERINTENDENCE SYSTEM

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Abstract- *Smart automation system has wide potential for implementation in future technologies. Various automation systems are being developed by various researchers worldwide. But most of them has certain limitations in terms of high cost, low efficiency and robustness. Comparing to multiple system, our system is suitable for future generation. This system is to mainly develop hardware and software, able to monitor and manage the various loads and applications through android mobile device in an efficient and safe way. The communication takes place between the Arduino and smartphone through web server. Meanwhile, the current sensor is used to upload the current status of the load at every second. The system also makes use of Android app titled “ELCS (Electric Load Control System ” which provides flexible and easy to use GUI for interface. The system is currently the most cost effective and work-efficient as compared to other systems.*

Keywords – Arduino , Mobile app, WIFI ESP8266, Sensor, Relay.

I.INTRODUCTION

The concept of “Smart Automation” was developed in 1984 by American Association of builders. The main idea behind the development of smart automation system is to fully automate the control of various devices and appliances and to make the day to day life of people more technology driven, easy and well managed. The implementation of smart automation includes the introduction of various technologies. Smart automation is regarded as very flexible technology as it can be created on basis of analysis of client’s requirements and budgets. With more advancements in micro-controller technology, Wi-Fi technology and smart phone App technology which is progressing rigorously, smart automation can be efficiently implemented.

According to CISCO, it is estimated that 50 billion devices would be connected to the internet by 2020. Recent advancement in cloud computing and data analytics allows intelligent systems to process and analyze the data in a more efficient manner .Therefore the system can overcome the issues of human error and power loss in terms of controlling and management. In addition, it can also solve the manual control and a unit recording operation without human error. To achieve this sophisticated system, the communication and networking are the major role to track al kind of connectivity among the individual devices. The challenge is to build the network system with robust, at the same time low power consumption. It is basically controlling all sorts of electronics and electrical devices via smart phone Apps without going near to switches. Smart automation technology in recent years has shown a dramatic jump in development and now not only appliances with simple ON and OFF and it can be used to control and protect the devices

from fault conditions with the help of relay and circuit breakers. And in this technique the current status of the load can be displayed in the continuously and faulty operation can be notified in the app.

II. LITERATURE SURVEY AND RELATED WORKS

The automation is new in India, considerable amount of work has been carried out in other countries, where automation is already in place. Anand nayyar [1] discusses about PIC microcontroller, Bluetooth and android app used in his paper. It proposed an architecture for smart home automation by using GSM technology. Chaiyod pira [2] discusses about effective power utilization and conversion in smart homes in IoT. Kumar mandala [3] explain about IoT technology and how it can be used for realizing smart automation using a Microcontroller based Arduino board and android mobile app. And he describes that Bluetooth in an indoor environment and Ethernet in an outdoor environment. Avila [4] proposed a system with a remote system for controlling automation through Transmission Control Protocol and Internet Protocol (TCP/IP) with lower hardware cost. And they are using GSM network for Short Message Service system. However, the design ZigBee/Ethernet gateway did not support the functionalities of traditional access point. The gateway can only exchange sensing data and commands between two devices via Internet or Intranet. In addition of integration of personal wireless local area network and Internet home automation system Boulmalf [5]. P.Gaikwad [6] discusses about challenges and problems arise in smart home automation systems using IoT and proposed possible solutions. Though similar works are carried out elsewhere, authors proposed a unique architecture for IoT based home automation using low cost android phones in Indian context. Abou-Elnour[7] describes that according to ABI marketing research company 7 million automation systems are being deployed worldwide by year 2015 and the number could reach 30 million by year 2020. Various commercial research oriented smart home automation systems are already being introduced in market and various researchers around the corner of this world are working to make it more cost effective, efficient, secure and more portable and flexible.

III. SYSTEM ARCHITECTURE AND COMPONENTS

In our system there is requirement of various components. In this section we will discuss the components being used for development of smart automation system.

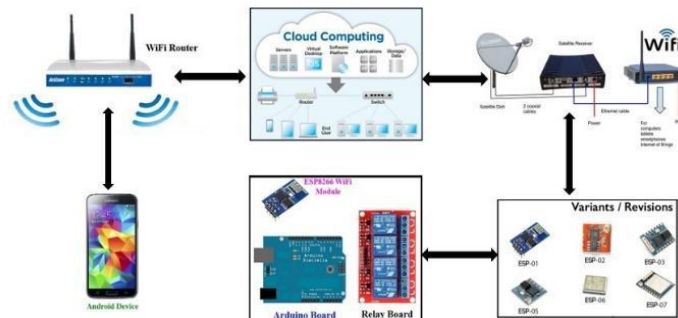


Fig1: System architecture of the proposed model.

1. ARDUINO UNO (ATmega328p)

Arduino Uno is a single-chip microcontroller created by the Atmel in the mega AVR family. It has 14 digital input/output pins (of which can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 32 kb ISP flash memory with read and write capabilities, 1 kb EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose registers. The device will operate between 1.8-5.5 volts. As of 2013 the ATmega328 is commonly used in many projects and automation systems where a simple, low cost and powered.

2. ESP8266 WIFI MODULE

The ESP8266 is a low cost Wi-Fi microchip with full TCP/IP protocol stack that can give any microcontroller access to a Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. It has 8 pins (Gnd, GPIO 2&0, RX, TX, CH-PD (chip power-down) and reset). This device works with 3.3V.

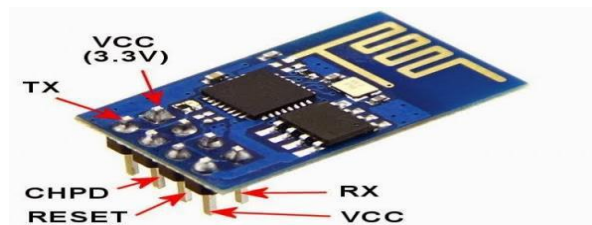


Fig3: ESP8266 WiFi module

3. ACS712 (current sensor)

The ACS712 provides economical and precise solutions for AC and DC current sensing. It consists of a precise, low-offset, linear hall sensor circuit with a copper conduction path. Applied current flowing through this copper conduction path, generates a magnetic field that is sensed by the integrated Hall IC and converted into a proportional voltage. These current sensors are offered with full scale values of 5A, 20A, 30A.

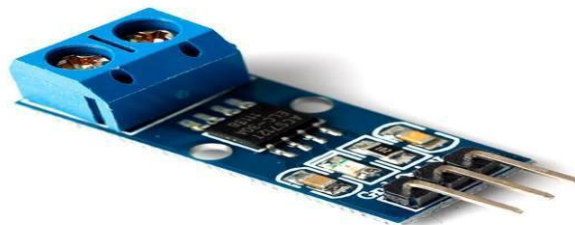


Fig 4: ACS712 (current sensor)

4. MCB (Miniature Circuit Breaker)

A MCB is an electromagnetic device (instead of a fuse). The main function of an MCB is to switch the circuit, i.e., to open the circuit automatically when the current passing through

it(MCB) exceeds the value for which is set. It can be manually switched ON and OFF as similar to normal switch. It automatically switches off the current during abnormal and fault conditions.

5.SOLID STATE REALY

SSR is an elctronic switching device that switches on or off when a small external voltage is applied across its control terminals. It not having any moving part ,in this relay by using the semiconductor switches such as, thyristor, triac, etc., the input control voltage is 5v dc supply(40mA). Input voltage is between 0-2.5v state (low level),when the relay is OFF, voltage is 3.3-5v state (high level),when the relay is ON.



Fig 6:Solid State Relay

6.ROUTER

Router is a networking device that forwards data packets between computer networks. A router is connected to two or more data lines from different network. It reads the network address information in the packet to determine the ultimate destination. it has two types of network element components organized into separate planes, they are the control plane and forwarding plane.

7.ANDRIOD APPLICATION

The user will enable the app on android based smartphone. The Wi-Fi module (ESP8266) will embedded on system board will start communicating with the web server.

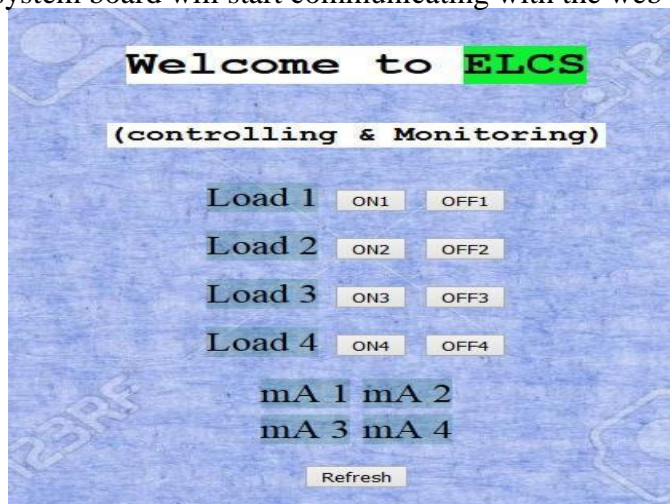


Fig8: Android app developed for controlling and monitoring the automation system.

The main features of our application is to communicate between mobile phone and various loads. The app will be created by using MIT App Inventor. Without using the programming code, the app will be easily created by using the GUI (Graphical User Interface) for user freeness and friendliness. Above the app fig will displays the app front page and list of the loads and its status, whether it is in ON condition or in OFF condition. By getting back the signals the load will operates.

IV. SYSTEM IMPLEMENTATION

In our system, the ESP8266 module is the center processing unit of the system and responsible for communication between the android app and the web server in order to send and receive the signals. There are two important modules in our smart system.

- 1)Display unit
- 2)Protection unit.

In this smart device, the Arduino is the main component for controlling and processing the commands. For its supply the three phase voltage can be converted into DC by using the Bridge rectifier. On the displaying units the current sensors are connected. The current sensor (ACS712) of the system is able to operate with 10 Ampere, and it is designed to be easily used with the micro controllers, like the Arduino. This current sensor device can provide very low cost solutions for AC current sensing for communication systems.

Protection unit of this system is used to protect the system from various faults such as over current fault, transient fault etc., for that purpose we are using Relays and Circuit Breakers in front of the load. The over current fault cannot affect the system because the protecting devices can trip the supply to the load when over supply flow on live line of the system.

As the application will be installed in our phone, it displays like fig 8. When the user press the icon in the application, the concern code will be sent to the server. This command will send to the Arduino (ATmega 328p) through the app, which transfers the data via Wi-Fi module.

V.EXPERIMENTAL RESULTS

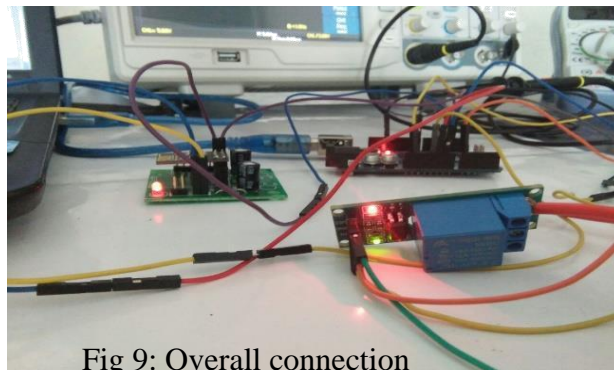


Fig 9: Overall connection

In this section we are going to demonstrate the system experimental results of different units. This paper shows the smart automation system concept using Arduino board for controlling and monitoring various electrical appliances using an Android smart phone. Since IoT's is one of the future technologies that can be used for automation, there are many challenges that are associated with it. One of the major challenges in the lack of standards for integrating sensors, relays, circuit breakers, applications and other existing devices. Providing unique IP address for connected devices and privacy and security in a smart environment is an another big challenge. As IoT deals with huge amount of data collected from various devices deployed in an environment, proper care should be taken in handling, storing and securing the data. In future, data analytics and visualization can be used for effective monitoring and controlling of IoT devices in a smart environment.

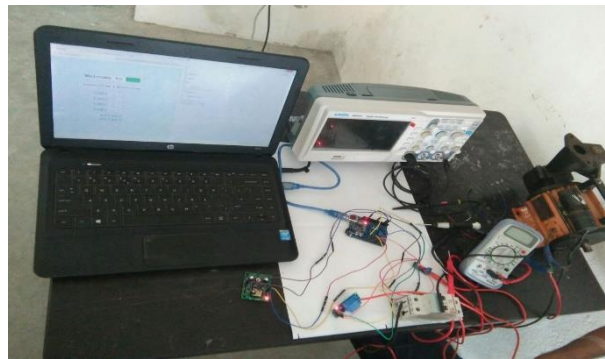


Fig 10 : Relay ON , when load is in ON condition

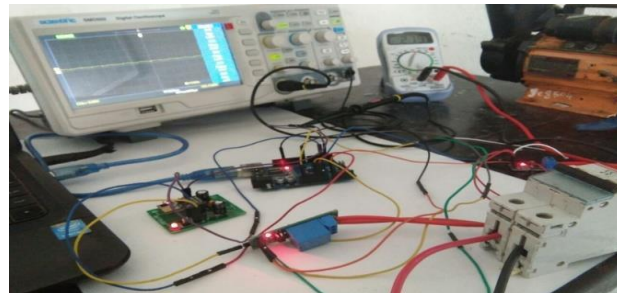


Fig 11: Relay OFF, when load is in OFF condition

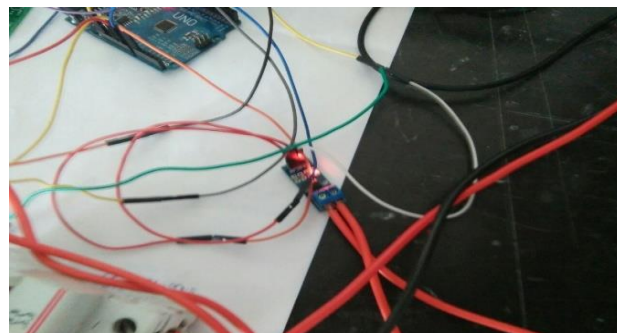


Fig 12 : Current sensor

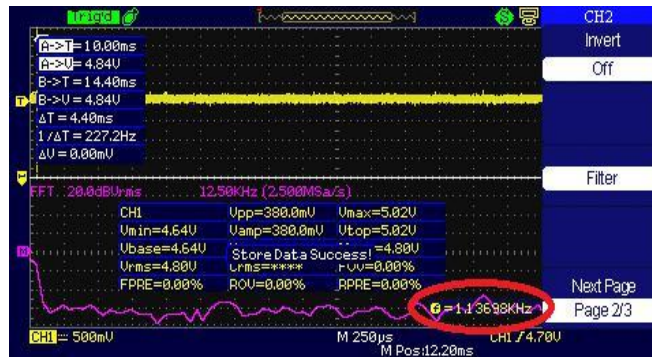


Fig 13: frequency range of wi-fi

VI. CONCLUSION

In this paper, we have developed the automation system to control and monitor the multiple loads simultaneously. Our system can overcome and improve the challenges of current trends. The parameter of our system can update the status of the load reliably. For an IoT implementation aspect, we have used Wi-Fi module ESP 8266 for transmitting and receiving the signals. And it can be used to display the information on the website through the server. By this we can achieve high reliability and it will be applied in various industrial sectors and also it can manage both 1 phase and 3 phase loads simultaneously with a single system. Meanwhile, it will protect our system equipment's by using protecting devices in all situations and our major advantage is low cost and maintenance free. The future enhancement of our system will include the performance improvement and dynamic data's will be uploaded in the web-server and we can extract those details whenever we want at anywhere at any time.

VII. REFERENCES

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