Design and Implementation of an Embedded Home Surveillance System Using Arduino and Node MCU

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Abstract- This paper proposes the design of Internet of Things (IOT) based home automation system using Node MCU. Currently in day today's life we can hardly find a house without a home automation system This project is intended toconstruct a home automation system that uses any Smart Phone to control the home appliances. This home automation system is based on IOT. Home automation is very exciting field when it uses technologies like Internet of Things (IOT). Node MCU is credit card size computer. Node MCU supports large number of peripherals.User required to use different mobile devices like smart phones, Laptops, Tablets to operate the home appliances.

Keywords- Home automation, Internet of Things(IOT),Arduino, Node MCU, Current sensor Relay, Mobile**.**

I. INTRODUCTION

Internet of Things is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The Internet is an evolving entity. It started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet ofThings" (IOT) . IOT is having the potential to change the lifestyle of peoples. In day today's life, people prefer more of automation systems

II. LITERATURE SURVEY

This paper provides a simple introduction to the IOT, its application and potential benefits to the society.[2] IOT has received much attention from scientists, industry and government all over the world for its potential in changing modern day living.[3] IOT is envisioned as billions of sensors connected to the internet through wireless communication technologies. [4]The sensors would generate large amount of data analysed, interpreted and utilized. [5]Home Automation System uses the technology of Internet of Things for monitoring and controlling of the electrical and electronic appliances at home from any remote location by simply using a Smartphone.[6] Implementation of a low cost, flexible home automation system is presented.[7] It enhances the use of wireless communication which provides the user with remote control of various electronic and electrical appliances.

rather than any manual systems. The major elements of IOT based home automation system are Node MCU and the Relay along with their driving circuitry. Home automation can be defined as a mechanism removing as much human interaction as technically possible and desirable in various domestic processes and replacing them with programmed electronic systems.

Fig.1: Home Automation

III. HOME AUTOMATION & HISTORY

In 19th century, concept of home automation came into the picture. The Electronic Computing Home Operator was developed in the April 1968 and has been enhanced from a set of spare electronics. Further X10 standard was developed to allow transmitters and receivers to broadcasting messages such as "turn ON" and "turn OFF" via radio frequency. X10 system has number of disadvantages. With the invention of the Raspberry pi which is small credit card size computer having large number of peripherals along with communication ports like Ethernet, USB ports, HDMI port, now a day's home automation is become very easy and interesting. Home automation includes all that a building automation provides like door and window controls, climate controls, control of multimedia home theatres, pet feeding, plant watering and so on. Home automation is nothing but 'Smart home' or 'Intelligent home'. Such smart homes or intelligent homes are controlled with the help of various technologies. GSM, WIFI, Bluetooth, Zig bee and so on are used for the purpose of home automation.

IV. SYSTEM DESIGN

A. Arduino UNO

A microcontroller board, contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip. It simplify the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation. It is an open source hardware, any one can get the details of its design and modify it or make his own one himself.
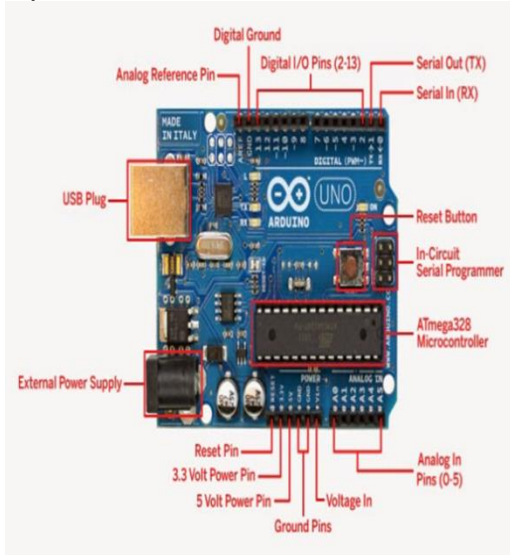

Fig.2: A:Arduino UNO

B. Relay

Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relays are available in various configurations of operating voltages like 6V, 9V, 12V, 24V and so on. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF.
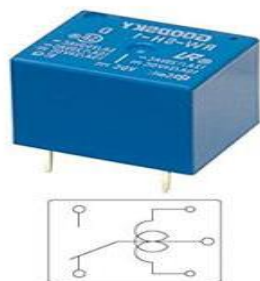

Fig.3: B: Relay Module

C. Node MCU

Node MCU was created shortly after the ESP8266 came out. On December 30 2013, Espressi system production of the ESP8266. The ESP8266 is a Wi-Fi SOC integrated with a Tensilika Xtensa LX106 core, widely used in IOT applications. Node MCU started on 13 Oct 2014, when Hong committed the first file of node MCU-firmware to Git Hub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTTclient library from Contikato the ESP8266 SOC platform, and committed to Node MCU project, then Node MCU was able to support the MQTT IOT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to Node MCU project, enabling Node MCU to easily drive LCD, Screen, OLED, even VGA displays

Fig.4: C: Node MCU

V. BLOCK DIAGRAM

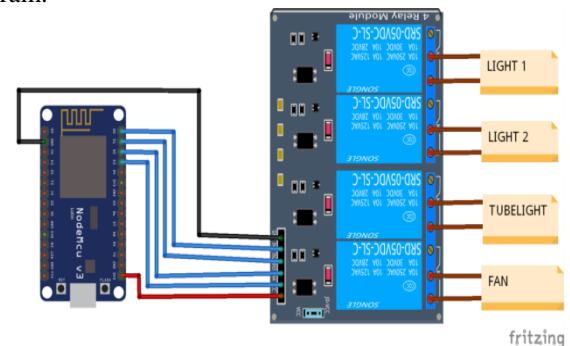To make the system hardware we gone through below block diagram.

Fig.5: block diagram

VI. METHODOLOGY

A. Hardware Implementation

Once the user connects mobile device in network and after putting the IP address of the Node MCU in the browser of Mobile device will be able to see the web page which contains UI to control home appliances in each room. UI simply shows the number of rooms and home appliances present in each room. It also contains buttons to toggle the status of home appliances of each room.

Fig.5: A: Hardware Connections

B. Software Implementation

It usually takes years and years of studying to get even the most basic concepts down and it's especially difficult to apply these codes to real work devices. Nowadays, however, knowing how to code and program is a very useful skill to have. Arduino IDE is a coding software that makes the programming world more accessible to beginners with its simple interface and community-driven system.

Mobile devices are noting but small computing devices. They are small enough so that we can operate and hold in hand. They are also having their own operating systems. Mobile device can be move from one location to other. Example of mobile devices are: Smart phones, Laptops, Tablets and so on.
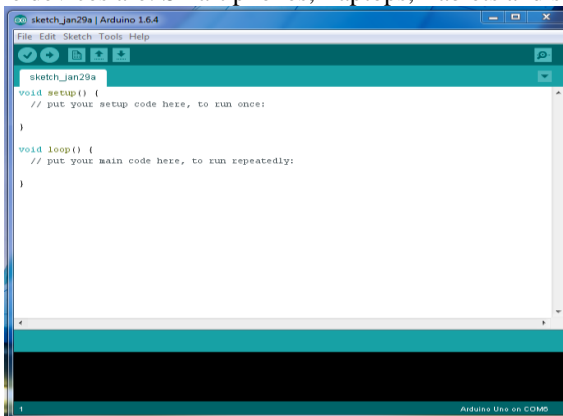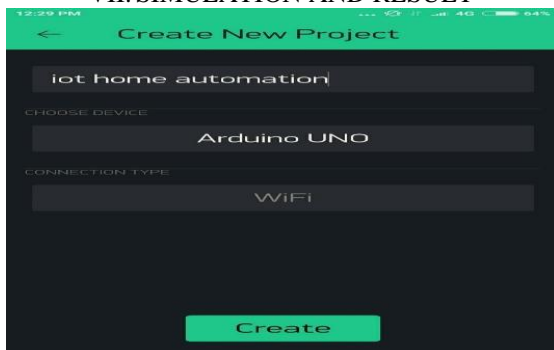

VII. SIMULATION AND RESULT

Fig.6: Creating a project in blynk app

A .Turn On Home Appliances

Fig.7: A: Bulb ON

B. Turn OFF Home Appliances

Fig.8: B: Bulb OFF

VIII. CONCLUSION

The work for IOT based home automation is completed successfully using internet source and Node MCU. It is reliable and scalable home automation system with low cost and easy to implement. It makes human life easy and comfortable. It is possible to operate home appliances from any part of the globe.

IX. FUTURE SCOPE

The future of home automation is very vast. We can add many more new features in it, in future to make it more efficient to fulfill users requirement. Some features are given below:

1. Home security system.
2. It can be operated through voice command.
3. User can add new appliances by their own in a given interface without any external support.

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