Iot based advanced HOME AUTOMATION

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Abstract : Mobile devices are the part of our day-to-day life from last few years. SConsequently ,providing facilities and security are becoming increasingly prominent features on mobile devices. In this paper, we have to develop a home automation system that interfaces with Android mobile devices. The mobile device and system can communicate with each other via Wi-Fi. The mobile application can be loaded and interfaces with system from any compatible device. Commands to ON/OFF electrical equipment like lights, fans, air conditioners etc. and setting timer at home or any organization can be sent easily and quickly from the mobile devices via a simple and comfortable GUI application, which is easy to use for the any normal users. The system then acts and responds to these commands by taking actions per commands and gives the result to the user. The user can also see the result on Android mobile application within the range of Wi-Fi. Therefore, it's a good choice to design a home automation for luxurious life that aims at designing an advanced home automation system using Wi-Fi technology.

Index Terms – Node MCU, IOT, Wi-Fi, Relay etc.,

1. 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. Basically it started as the “Internet of Computers.” Research studies have forecast an explosive growthin the number of “things” or devices that will be connected to the Internet. The resulting network is called the “Internet of Things” (IoT) [1]. The recent developments in technology which permit the use of Bluetooth and Wi-Fi have enabled different devices to have capabilities of connecting with each other.

Using a WIFI shield to act as a Micro web server for the ARDUINO which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control of home appliances is designed.

Home automation is the residential extension of building of automation. It is automation of the home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, security locks of gates and doors and other systems, to

provide improved convenience, comfort, energy efficiency and security. Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise required in the specialized automated appliances.

In nowadays, development and changes of technologies is happening daily as well as continuous improvement of people's living standards are increasing. The mobile phones are the inspirable part of human lives today.

The project proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling home appliances via web browser using Wi-Fi as communication protocol and node MCU as server system.

Node MCU is an open source IoT platform. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan etc are remotely controlled through easy website. The server will be interfaced with relay hardware circuits that control the appliances running at home. The server communicates with the corresponding relays.

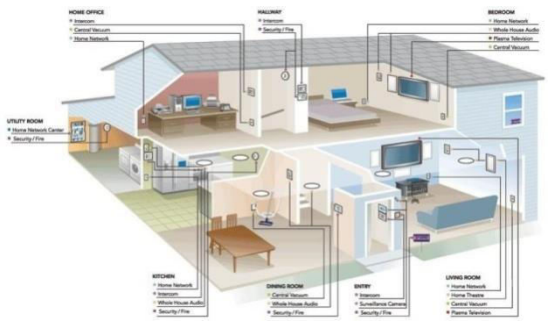

Fig 1: Concept of Home Automation

Overview and benefits

Home automation refers to the use of computer and information technology to control home appliances and features (such as windows or lighting). Systems can range from simple remote control of lighting through to complex computer.

In modern construction in industrialized nations, most homes have been wired for electrical power, telephones, TV outlets (cable or antenna), and a doorbell. Many household tasks were automated by the development of specialized automated appliances. For instance, automatic washing machines were developed to reduce the manual labor of cleaning clothes, and water heatersreduced the labor necessary for bathing. The use of gaseous or liquid fuels, and later the use of electricity enabled increased automation in heating, reducing the labor necessary to manually refuel heaters and stoves. Development of thermostats allowed more automated control of heating, and later cooling.

2.LITERATURE REVIEW

The system proposed in [1] uses stable communication plays an important role in autonomous applications mobile robots, especially in the environments without the communication infrastructures. There are high demands for quickly building wireless communication network for robots. To ensure stable wireless communication, the bottleneck of the data transmission is needed eliminating to make the communication ability best amongst base station, mobile robots and clients. Thepaper proposes an efficient approach to address the problem, by equipping WiFi routers on robots to enable and enhance communication ability.

The system proposed in [2] develops

home automation to improves the lifestyle of the control ofhome devices. Technology advancements have made the implementation of embedded systems within home appliances. The abilities and benefits are increased by the home automation. The value of our lives can be improved by automating various instruments or electrical appliances.

The system proposed in [3] makes every system to be automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control systems. Especially in the field of electronics automated systems are doing better performance. Nowadays, there are lots of good-quality motor speed controls on the market. However, their costs are relatively high. A speed control with both low cost and good performance will be highly marketable, especially for small mobility applications. On the other hand, the wireless connectivity has a nature of low cost and less environmental limitations.

The system proposed in [4] incorporates with today's world has seen rapid and lucent spread of Android Devices. Any system, thus, developed which has support of the ubiquitous Android – enabled devices will be much appreciated. Our project is based on thisidea along with the much- needed Automation System interfaced with the Android Systems.

3.SOFTWARE REQUIREMENT

IOT(Internet of Things)

IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system.

IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.

IoT−KeyFeatures

The most important features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below

AI − IoT essentially makes virtually anything "smart", meaning it enhances every aspect of life with the power of data collection, artificial.

intelligence algorithms, and networks. This canmean something as simple as enhancing your refrigerator and cabinets to detect when milk andyour favorite cereal run low, and to then place an order with your preferred grocer.

Connectivity − New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT createsthese small networks between its system devices.

Sensors − IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.

Active Engagement − Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.

Small Devices − Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.

IoT−Advantages

The advantages of IoT span across every area of lifestyle and business. Here is a list of some of the advantages that IoT has to offer

Improved Customer Engagement – Current analytics suffer from blind-spots and significant flaws in accuracy; and as noted, engagement remains passive. IoT completely transforms this to achieve richer and more effective engagement with audiences.

Technology Optimization − The same technologies and data which improve the customerexperience also improve device use, and aid in more potent improvements to technology. IoTunlocks a world of critical functional

Fig 2 Connection of devices

Node MCU is an open source IOT an platform It includes firmware runs on which the ESP8266 andthe hardware which based on NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDKfor ESP8266. It uses many open source projects, such as lua-cjson.

Fig.3NODE MCU Development board

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shaghai based C. This is the module provides access to the GPIO (General Purpose Input/Output) subsystem. All access is based on the I/O index number on the NodeMCU dev kits, not the internal GPIO pin. For example, the D0 pin on the dev kit is mapped to the internal GPIO pin 16.

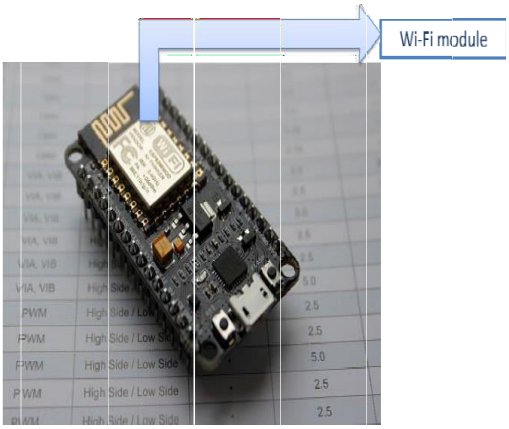

Fig 4: Pin Configuration of Node MCU Development Board

Interfacing a node MCU with AURDINO IDE

The aREST framework is a complete solution to build powerful RESTful applications based onthe Arduino, Raspberry Pi and node mcu platforms. It

can handle all kind of communications via Serial, WiFi, Ethernet, and much more. It includes libraries for boards themselves. Arduino boards, and also server-side code to handle the communications between a server and remote devices. The a REST framework is of course completely open-source and free to use. Raspberry Pi and node mcu platforms. It can handle all kind of communications via Serial, WiFi, Ethernet, and much more.

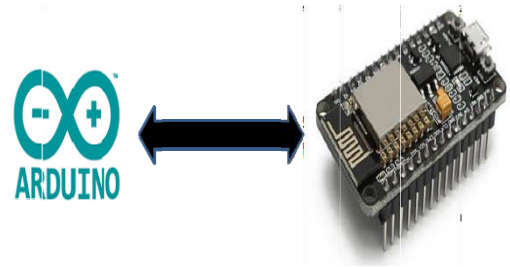

Fig 5 : NODE MCU interfacing with ARDUINO

4. LOGIC AND OPERATION

After assembling the system, what remains is to observe its operation and efficiency of the system. The total system is divided in several sub systems, like Node MCU, Relay and Board Relay.

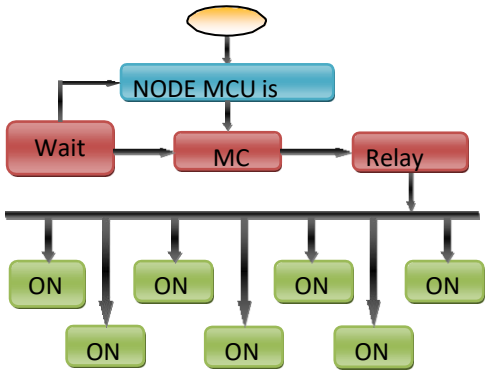

Fig 6: Flow chart of the program

4.1 Principle & Operations

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non- OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs The a REST framework is a complete solution to build powerful REST ful applications based on the ARDUINO, Raspberry Pi and node MCU platforms. It can handle all kind of communications via Serial, WiFi, Ethernet, and much more. At first we have to create an account in dashboard.arest.in website. It is giving us a platform to control the load through relays globally. After that an API Key is generated for that particular account. It is given to our main program and the device ID is attached with it.On the other hand, Node MCU is to be connected with host device. When a Signal is given to Node.

5. CONCLUSION & FUTUTRE SCOPE

Here we have used NODEMCU which has inbuilt Wifi module to control relays locally as well as globally. It is one of the easiest and most pocket friendly home automation control system based on IOT. The project will proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wifi etc. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan etc are remotely controlled through easy website. The server will be interfaced with relay hardware circuits that control the appliances running at the home. The server communicates with the

corresponding relays. If the web affiliation is down or the server isn't up, the embedded system board still will manage and operate the appliances domestically. By this we provide a climbable and price effective Home Automation system.

As we have already mentioned in the disadvantage of the proto type that the working of the circuit is depend on a third party server “aRest”. if the server will not work then the prototype is also not work. So our future plans is to build our own. server so that we ensure that the working of the prototype will continues all the time.

6.REFERENCES

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