

Cost Effective Voice Controlled Home Automation Using IoT

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Abstract— *The Internet of Things is emerging technology as the third wave in the development of the internet. Internet of Things (IoT) is expected to have massive impact on consumer products, business, wider culture, but these are still early days. It has potential for very wide applicability to almost all verticals and aspects of business, industries, manufacturing, consumer goods, supply chains, etc. IoT as a whole is very broad area. This paper focuses specifically to design a voice controlled home automation system which makes operating electrical appliances in home through android application and set up the controlling actions in the mobile. The Bluetooth technology devices are used for home automation in a cost effective manner.*

Index Terms—Android application, Arduino UNO, Bluetooth Module, IoT.

I. INTRODUCTION

A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data. Internet of Things (IoT) heralds a vision of the future Internet through a network where connecting physical things, will let them take an active part in the Internet, exchanging information about themselves and their surroundings. This will give immediate access to information about the objects and the physical world in it leading to innovative services and increase in efficiency and productivity.

[1] Home automation is housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, 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 require institutional care. The concept of home automation has been around for a long time and products have been on the market for decades, though no one solution has broken through to the mainstream yet It can also provide a voice based interface to home appliances or the automation system itself to provide control and monitoring via android application and Bluetooth device. This paper will describe the approach which we are implementing to control various home appliances with Android smart phone.

[11] As the technology is advancing the automation in various fields can easily be seen. Day by day the effort for doing the daily routine work is decreasing, and it's necessary for the busy schedules the people are having as well as for the cost effectiveness. For example washing machines, autonomous vacuum cleaner, dishwashers, etc. have reduced

the manual efforts, and it's quite affordable. Similarly, for the physically challenged or elder persons the mobility is quite a difficult task and they always need some assistance for doing various tasks. Even when someone returns home tired, they feel quite difficult to do the simple activities like approaching the switch board for switching various appliances, switching of fans and lights, etc. In this paper, we are going to resolve such problems. By introducing automatic voice command based home automation that can control various household appliances as well as some other tasks that constitute the home automation system .

II. LITERATURE SURVEY

As per our survey currently there exists no system at cheaper rates. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary and closed, not very customizable by the end user.

N. Sriskanthan [5] explained the model for home automation using bluetooth via PC. But unfortunately the system lacks to support mobile technology.

Muhammad Izhar Ramli [6] designed a prototype electrical device control system using Web. They also set the server with auto restart if the server condition is currently down.

Hasan [9] has developed a telephone and PIC remote controlled device for controlling the devices pin check algorithm has been introduced where it was with cable network but not wireless communication.

Pradeep G [8] proposed home automation system by using bluetooth which saves lot of power and time using mechanism to save the preloaded list by not making it to setup connection all the time when required.

Al-Ali and Al-Rousan [7] presented a design and implementation of a Java-based automation system through World Wide Web. It had a standalone embedded system board integrated into a PC-based server at home.

Amul Jadhav [10] developed an application in a universal XML format which can be easily ported to any other mobile devices rather than targeting a single platform.

The applications which are developed in terms of some electronic and individual existing components will be independently executed even though there are some drawbacks and disadvantages for its existing criteria of requirements. More precisely the extent in these sort of standalone applications were formed together to state them as Embedded System applications. Embedded system is a computerized or automated system with a dedicated functionality in which large electrical, electronic and mechanical systems are inserted along with their constraints of execution.

An application in embedded system acquires specific characteristics of the system which are not functional. These characteristics are listed as per its importance.

Throughput – Our system may need to handle a lot of data in a short period of time.

Response–Our system may need to react to events quickly.

Testability–Setting up equipment to test embedded software can be difficult.

Debugability–Without a screen or a keyboard, finding out what the software is doing wrong (other than not working) is a troublesome problem.

Reliability – embedded systems must be able to handle any situation without human intervention.

Memory space – Memory is limited on embedded systems, and you must make the software and the data fit into whatever memory exists.

Program installation – you will need special tools to get your software into embedded systems.

Power consumption – Portable systems must run on battery power, and the software in these systems must conserve power.

Cost – Reducing the cost of the hardware is a concern in many embedded system projects; software often operates on hardware that is barely adequate for the job.

An application could be developed in embedded system by observing the life cycle “How a system runs through specification of the requirements.” Similarly here also the individual prototypes and its bugs are identified as well as resolved accordingly the combination of other prototypes to make it an complete system.

III. PROCEDURE

Safety is the most important requirement of home for people. With the development of IT technology, network and automatic control technology, a voice controlled home

automation system becomes more and more practicable today. By combining wireless sensor network (WSN) and

GSM technology, this paper designs a cost effective voice controlled home automation and buzzer system that can detect the leaking of gas and fire, and send alert message to the house owner’s mobile phone[3].

ARDUINO

[13] Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

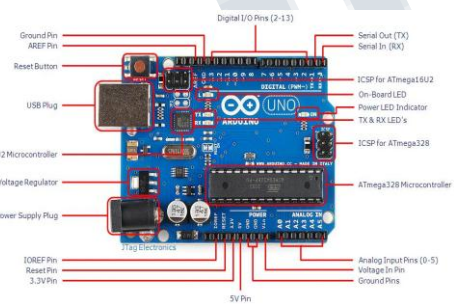


Fig. 1. Arduino UNO

Arduino UNO is a microcontroller board it has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

BLUETOOTH MODULE

[12] Bluetooth wireless technology is a short-range radio technology that uses radio frequency fields to transmit signals over short distances between telephones, computers and other devices. The technology offers simplified communication and synchronization between devices without the need for cables.

HC-05 FC-114

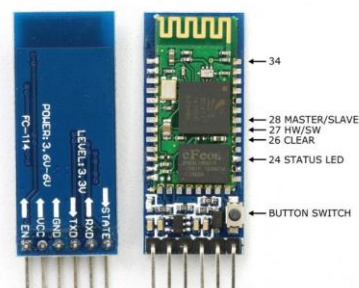


Fig -2: HC-05 Bluetooth Module

The Bluetooth technology devices used for home automation in a case effective manner. Universally available frequency of 2.4 GHz with in a range of 10m (Expandable to 100m) by increasing the transmitted power) at the speed of 1Mbps. A Bluetooth module is an intentionally clearly visible device designed to attract attention to a specific location.

WORKING DESCRIPTION

[3] [4] Bluetooth module HC-05 transmits and also receives data serially via Arduino board that can be read by the microcontroller. A relay is used here to control only one appliance, though you can use a multiple relays to control multiple appliances. Used Arduino UNO R3 which can be used to control an electrical devices.

The following steps have to be followed to run the project properly:

- Arduino UNO is the main component of this project. It performs the main function of the project.
- Arduino programming language is used to operate the Arduino UNO.
- Bluetooth module is used to receive and transfer the data through android mobile phone. It is connected to the Arduino UNO.
- A PCB board is also working in this project where different kinds of electrical equipments are assembled which is connected to the Arduino and Bluetooth device.
- AMR voice recognition android application is used to act as a voice source which is installed on the mobile phone.
- Different kinds of relays, connecting wires and voltage Regulator, Driver IC's are properly connected.
- People can control their home appliances via home automation devices and set up the controlling actions in their mobile.
- Used voice commands

Voice commands	
1. Light on	4. Fan off
2. Light off	5. All on
3. Fan on	6. All off

- By using the above commands can control the home appliances
- Using Temp LM35 and Smoke/Gas MQ2 sensors can detect gas and fire accidents and get alert message to the mobile.

The flow of the overall working procedure is given below in the form of block diagram Fig 3 which will give the clear realization of the working procedure of the project.

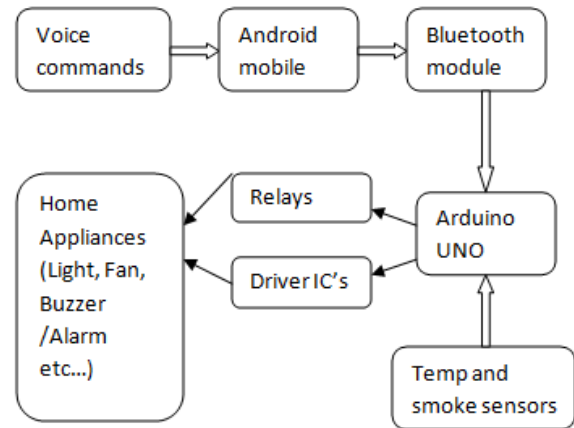


Fig 3: Block Diagram for Voice Controlled Home Automation System Using Bluetooth module

The picture view Fig 4 of the block diagram Fig 3, is to clearly and properly understand the overall working procedure which will be helpful to operate the project

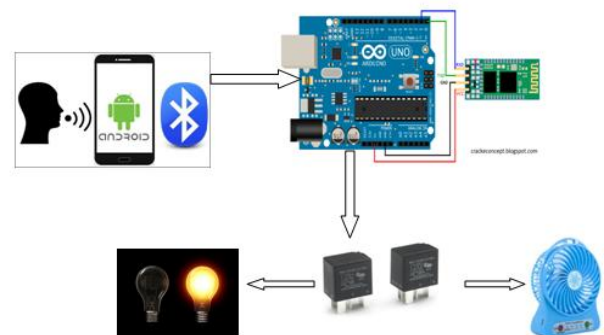


Fig 4: Picture View of Working Procedure[7]

The complete picture of the project Fig 5 named voice controlled home appliances using android phone is given below.

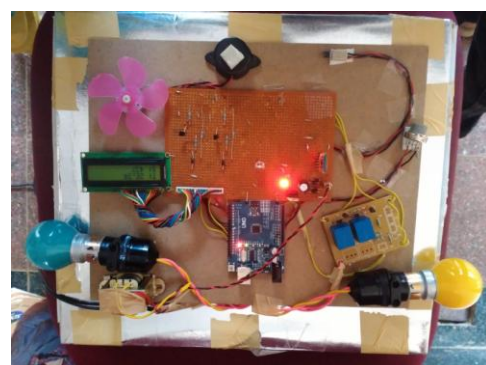


Fig 5: Complete Picture of The Project

ADVANTAGES

1. Flexibility
2. Wireless smart home
3. Cost effective
4. Voice control
5. Time saving

IV. APPLICATIONS

Following are the applications of Voice Controlled Home Automation

- Detection of fire, gas leaks and water leaks.
- Safe blind and deaf control: Blind people can get alert with the buzzer/alarm and deaf people can alert by seeing the LCD display view.
- Smoke detector can detect a fire or smoke condition, causing all lights in the house to blink to alert any person of the house to the possible emergency.
- The system can send message alert to the home owner on their mobile phone to alert them.

In terms of lighting control, it is possible to save energy when hours of wasted energy in both residential and commercial applications by voice command light on/light off at night time in home and all major city office buildings, say after 10pm.

V. FUTURE DIRECTION

Present prototype is proposed to be implemented using Arduino UNO where Arduino programming language used. We can also propose to implement using Raspberry pi where c programming language implements. In this way, the system

will gradually learn to understand the needs of different users and will also understand the most common actions a particular user performs after entering the home or while leaving, so that it can offer to do the same automatically. Also mobile phone based inputs can be implemented in future. In future, the system could use more concepts of Artificial Intelligence so as make it more user friendly and increase the automation.

Performance indicators will be identified based on experiments done on this test system, which will be used to optimize its performance in various conditions. Implementation of voice commands in variety of languages is also set for future implementations.

CONCLUSION

Voice controlled home automation is an ongoing project and the main objective is to assist physically challenged people/old aged people. Cost effective and time saving open source voice controlled home automation system is presented

in this paper. Various devices like fan, TV, refrigerator, lights etc are controlled using voice commands. The system can be

implemented within an extremely low budget (3000 INR for implementing the prototype) owing to open source hardware and software. The cost is more than 100 times lower than its commercial counterparts. Up scaling the system demonstrated on a small model will not add to the implementation beyond few thousand INR. The system is designed to be expandable. An experiment with different personnel's speaking same commands results in good accuracy (100% for silent background and above 90% for noisy background) of performance, which proves that the system is equally competent as its commercial counterparts

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