IoT Based Multi-Room Music System

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Abstract— This project is design of Internet of Things (IoT) based multi-room sound system using Raspberry pi. This project is intended to construct a multi-room sound system that uses any mobile device to control the music system. This multi-room music system is based on IoT. Music system is very exciting field when it uses new technologies like Internet of Things(IoT).Raspberry pi is credit card size computer. Raspberry pi supports large number of peripherals. It allows to control number of music simultaneously. Here local server is created on Raspberry pi. User required to use different mobile devices like smart phones, Laptops, Tablets to operate the multi-room sound with the help of UI created on web page.
Keywords: Home Automation, Internet of Things, Raspberry Pi, Server, Mobile Devices

I. INTRODUCTION

Internet of thing 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 IOT. It having the potential to changes the lifestyle of peoples. The major element of IOT based multi-room sound system can be defined as a mechanism control the multiple music technically possible and feasible in various domestic processes and replacing them with programmed electronics system. Ultimately it is a system that aims to heighten quality of music as well as number of music that may be controlled over the internet.

This paper provides a simple introduction to the IoT, application of IoT and benefits to the society. IoT has received much attention from scientists, industry and government all over the world for changing modern day living. IoT is billions of sensors connected to the internet through wireless and other communication technologies. The sensors would generate large amount of data which needs to be analyzed, understood and utilized. Multi-Room Sound System uses the technology of Internet of Things for monitoring and controlling of the electrical and electronic appliances at anywhere from any remote location by simply using a Smartphone. Implementation of a low cost, flexible Multi-Room Sound System is presented. It improves the use of wireless communication which provided to the user

II. LITERATURE SURVEY

One of the most important application of Bluetooth technology is home automation. R. Piyare introduced design of low cost, flexible and wireless solution to home automation using the arduino[1].

Instead of Bluetooth technology the home electrical appliances can be control using internet and Raspberry Pi.

Nisarg Shroff has designed this project to reduces human efforts by using the IoT concept[2].

The home automation uses different sensor for controlling home appliances the sensor data need to be stored somewhere and used again for control. Ravi Kumar developed a mechanism where a sensor data is sent to a web service named ThingSpeak[3].

Rohit Kumar Gupta executed IoT based surveillance system and home automation which improves traditional security system in feasible control and access perspective[4].

III. METHODOLOGY

A. Hardware Implementation:

1) Raspberry Pi:

The Raspberry Pi is a credit card–sized single board computers and established by the Raspberry Pi Foundation in the United Kingdom with the aim of encouraging the teaching of basic computer science. Raspberry pi is low cost minicomputer. It is feasible to connect Monitor of PC as well as television to the Raspberry pi. Mouse and Keyboard are easy connect to the Raspberry pi. All models having a Broadcom system on a chip, it comprises an ARM compatible central processing unit (CPU) and an on-chip graphics processing unit. CPU has speed from 700 MHz to 1.2 GHz for the Pi 3. On board memory is from 256 MB to 1 GB RAM. Secure Digital (SD) cards are mainly used to store the operating system and program memory. Most of the Raspberry pi board contains USB ports, HDMI post, DSI port, Audio jack, 40 GPIO pins, In-built Bluetooth, WIFI and so on. Raspberry pi has its own operating system. Raspbian, Ubuntu mate, snappy Ubuntu, Pidora, Linutop, Arch Linux ARM and so on are the different operating systems used for the Raspberry pi. Raspberry pi supports different programming languages like C++, Python, SQL, and HTSQL. C++ uses for programming Arduino. HTSQL (Hyper Text Structured Query Language) to provide a web interface to database that is easy to query via the web browser. It also supports java, java script, php and so on.

Fig. 1: Raspberry pi board

2) Relay and Relay Driver Circuit

Relay is a electromagnetic switch which allows one circuit to switch another circuit while they are separated. Relay is mainly 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 Control 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 has two parts, one is input and other is output. Input side is t a coil which generate magnetic field when small input voltage is given to it.
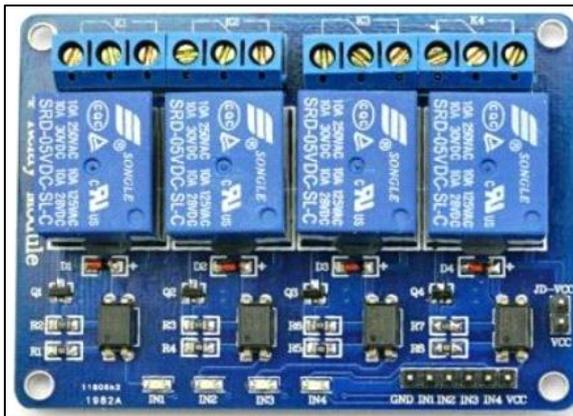

Fig. 2: Relay Board

3) Mobile Devices:

Mobile devices are noting but small computing devices. They are small enough which can be operated by holding them in hand. They are also having their own operating systems. Mobile device are portable i.e. can be moved from one location to other. Examples of mobile devices are: Smart phones, Laptops, Tablets and so on.

Fig. 3: Mobile Device

4) Speakers

The Speaker can be used for the Raspberry Pi robot to gives your Raspberry Pi robot a voice and sound. This speaker connected to the aux jack on the Raspberry Pi can be used to play music, voice, and alerts. The Raspberry Pi Speaker must have a good quality and loud sound. It doesn't require an external power supply.

Fig. 4: Speakers

B. Software Implementation:

1) Thingspeak Cloud:

The system uses the Thingspeak cloud. Data can be sent and retrieved from the cloud by android application, Raspberry Pi, and various devices. By use of android application data '1' and '0' are directed to the Thingspeak cloud and another side Raspberry Pi is used to retrieve the data from the Thingspeak cloud for turning On and Off the speaker. The cloud has a specific channel id and read, write API key by which the data is sent and retrieved from the cloud within few seconds.
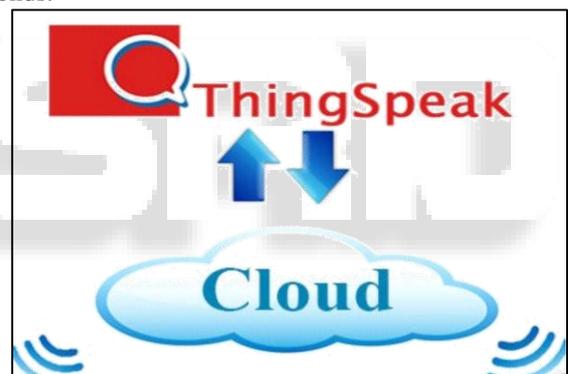

Fig. 5: Thingspeak Cloud

2) Android Application Design: MIT App inventor 2

MIT App Inventor -2 for Android is open-source web application released by Google. It is now maintained by the Massachusetts Institute of Technology. It allows newcomers to create software applications for the Android operating system. We have created the app which contains eight buttons for various relays

IV. PROPOSED SYSTEM

Fig. 6: Implementation

Multi-room sound system is IOT based project. It allows users to wirelessly play music anywhere in a house as well as from remote location. The speakers can operate by the android application. Relay Board decides which speaker has to turn ON/OFF. The data of Android Device is send to Raspberry pi via ThingSpeak cloud.

To play a music on a particular speaker, first we should turn ON the respective button in android application. This data is send to ThigSpeak server. The ThingSpeak server directs this data to raspberry pi using channel and API keys, according to commands from ThingSpeak server, raspberry pi activates respective GPIO pins. Due to this Relay gets latched to ON state and this turns ON the speaker

V. CONCLUSION

Multi-room music can be defined as a mechanism control the multiple speakers over the internet. The major elements of IoT based multi-room music system are Raspberry pi and the Relay along with their driving circuitry. This system allows users to wirelessly play music anywhere in a house as well as from remote location.
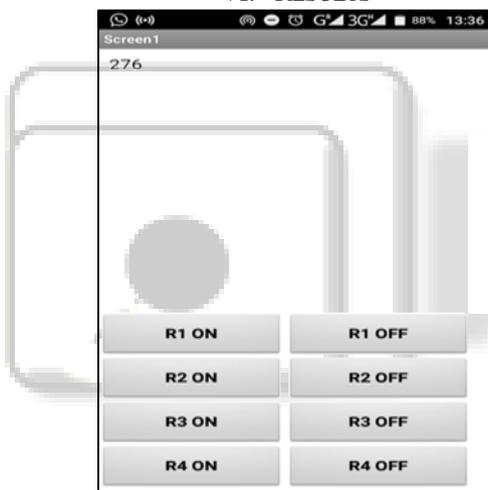
VI. RESULTS
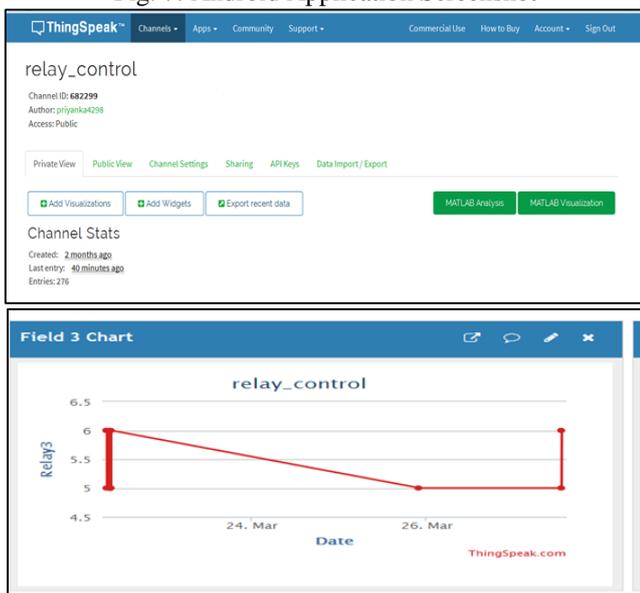

Fig. 7: Android Application Screenshot
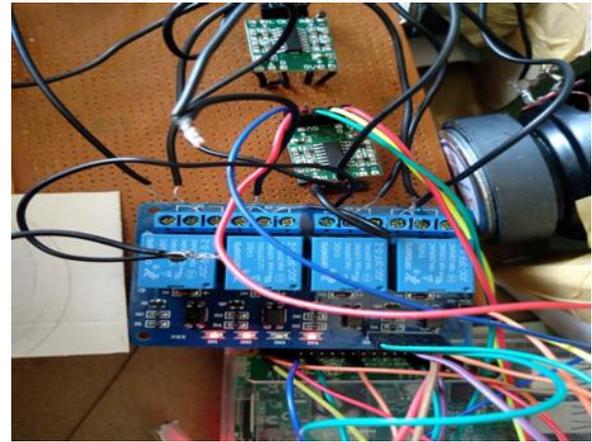

Fig. 8: Thingspeak Cloud GUI

Fig. 9: Relay 3 Turned ON

A. Result Description

The android application has 8 buttons and the number of data upload entries at top-left corner. The Figure 8. Shows Thingspeak GUI, it consist of channel information and field status. Here we have turned ON relay 3, So Field 3 data is updated.

The Figure 9 Shows relay 3 is turned ON So the LED with respect to relay 3 is turned OFF.

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