Voice Controlled Home Automation Based on MediaTek LinkIt

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Abstract— *Home automation is the residential extension of building automation and involves the control and automation of lighting, heating and appliances .The system discussed in this paper can be used to control lighting and as well as makes of sensors to detect various changes in the home environment such as the dust ,noise and temperature and pressure. It also has the feature of GPS tracking using the Linkit one. These features can be controlled via and android application. This paper details the overall design of a wireless home automation system which has been built and implemented. MediaTek LinkIt™ is a collection of development platforms designed for the development of Wearable and Internet of Things(IoT) devices [1]. The platform provides us with the necessary hardware and software resources required to prototype our ideas. The system discussed in this paper makes use MediaTek LinkIt one and LinkIt Smart 7688 duo boards.*

Keywords—*Voice Controlled Home automation, LinkIt Smart 7688 Duo MediaTek Linkit One, Server.*

I. INTRODUCTION

Home automation is not a new concept in today ‘s world, it is used to provide convenience for user to remotely control and monitor the home environment. A lot of research has been done in this field and many systems have been prototyped and implemented to remotely control and monitor various appliances and devices. Some of them used internet, wireless technology to communicate and control home appliances, others used Bluetooth and GSM technology for controlling the home appliances. The system which is going to be discussed in this paper uses Wi-Fi technology.

Automation lowers the human judgment to the lowest degree possible but does not completely eliminate it. As the result of continuous research in this field the concept of monitoring and controlling devices remotely has now become a reality. Consider a system where from any location at any given time the user could view and control the status of the device which he chose.For example, the user could measure the current room temperature and pressure and make changes to air conditioner cooling, and switches on or off some of the lights. This user could walk back home and only finds a very comfortable, pleasant home. The above example is one of the many features of home automation system. The possibilities and functionalities of smart home or office are endless.

The current systems generally consist of switches and sensors connected to a central hub from which the system is controlled with a user interface which can be interacted via a wall mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via internet cloud services.

The Voice Controlled Home Automation System discussed in this paper with easy to use libraries makes of use of any android device and a Linkit Smart 7688 Duo, which uses a command library that get sent back to the Androidapplication. MediaTek LinkIt Smart 7688 development platform consists of a Linux Wi-Fi SOC based development board designed to enable the prototyping of IoT devices. These devices include features such as Wi-Fi,GPS,Bluetooth and power processors for computation as well as cloud-based applications

II. LITERATURE REVIEW

The following section describes some of the related systems which were designed by some of the other researchers.

Thoraya Obaid [2]” Zigbee Based Voice Controlled Wireless Smart Home”. In this paper the home automation system was built which was based on voice recognition for the commands given. The main aim of this was to help the elderly and disabled people. The prototype developed could control most of the electrical devices in any home or office.This system implements voice recognition unit using HM 2007. The system implements the wireless network using ZigBee RF modules since they are efficient and consume less power. The preliminary test results were promising.

In “Home Automation Using Raspberry Pi through Siri Enabled Mobile Devices” (2015) by Ana Marie. D Celebre, Ian Benedict A. Medina [3]. Ahome automation system was implemented using Raspberry Pi that automates the 5 appliances using Siri’s speech recognition capability. In order to connect to Siri-enabled mobile devices, the Raspberry Pi’s network and DNS settings were configured using the Raspbian operating system. The system was able to automate the five appliances inside the room.

In "Voice Recognition Based Wireless Home Automation System" by Humaid AlShu'eili, Gourab Sen Gupta, Subhas Mukhopadhyay [4]. A home automation systemwas built and implemented based on voice recognition. The system is targeted at elderly and disabled people. The prototype developed can control electrical devices in a home or office. Microsoft speech APIs are used to implement Automatic speech recognition in this system. The system implements the wireless network using ZigBee RF modules for their efficiency and low power consumption.Differential Pulse Code Modulation was used to implementMultimedia streaming through the network.

In their paper, Conte and Scaradozzi [5] (2003) view home automation systems as multiple agent systems (MAS). In thispaper, home automation system has been proposed that includes home appliances and devices that are controlled and maintained for smart home management. The major aim was to improve performance.

Jawarkar, Ahmed, Ladhake, and Thakare [6] (2008) propose remote monitoring involving the use of spoken commandsthrough mobile phone. The spoken commands are generated and sent in the form of text SMS and then the microcontroller on the basis of SMS takes a decision of a particular taskto the control system.

Murthy (2008) [7] explores primary health-care management for the rural population. This solution provides the PHC services to the rural population using mobile web-technologies. This system includes the use of SMS and cell phone technology for information management, transactional exchange and personal communication.

Potamitis, Georgila, Fakotakis, and Kokkinakis, [8] (2003) suggest the use of speech or voice to interact remotely with the home appliances to perform a particular action as required by the user. The approachis a little more inclined towards the people with disability to perform real-life operations at home by directing appliances through speech or voice. Appropriate decision by speech recognition is taken by Voice separation strategy

III. System Overview

The voice controlled home automation system is an integrated system with a simple interface which can used with ease by everyone. The system implements various functionalities by interacting with various components This system provides the user with following functionalities

- Turn lights on/Off remotely using voice command android client.
- Track the position of specific objects at home using a tracking device.
- Measure the temperature and pressure of the home environment from time to time.
- Intruder detection at home using noise sensors.
- Measure the air quality of the home environment.

A. System Architecture

The various components of the system are listed below in detail.

- Linkit Smart 7688 Duo:The LinkIt Smart 7688 hardware development kit (HDK) delivers two development boards: LinkIt Smart 7688 (offering an MPU alone) and LinkIt Smart 7688 Duo (offering an MPU and MCU). serves as the as the server and communicates with android application based on the requests it receives and sends back the requiredinformation. The server communicates and co-ordinates with various sensors all around the home and pulls values from it as required. This server can also access the internet when required to pull information. In additional to this functionality it also has a relay component attached to it turn the lights on and off.

- Linkit One:LinkIt One is a co-design product by Seeed Studio and MediaTek.it brings together both parties technology in open hardware and industrial leading reference designs for wearables and IoT devices to create a powerful development board.
  These devices provide the user with feedback and control options on the device, and can exchange data and control messages with users, other smart devices, and cloud applications using GSM messaging, GPRS, Wi-Fi or Bluetooth connections. [2] It's major component of the home automation system. It has inbuilt GPS functionality is used for trackingobjects. It updates the position from time to time and sends it to the server which can be accessed remotely.The Linkit One is also attached with dust and noise sensors.

- UDOO Neo: It's an Arduino-powered development board which has temperature and humidity sensors attached to it placed at a certain location in the home. The android app can be used pull information from the sensors based of which various decisions can be made

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- UDOO Quad: This development board isequipped with Linux OS in this system has a scanner attached to it which is used to detect whether specific objects are available in hour home. Itmakes use of RFID tags to distinguish between different objects.

- Android Client: Android app build using android studio which provides and interface through which the commands can be given.

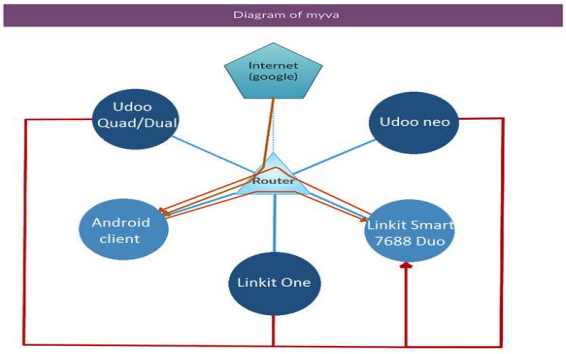

Fig. 1 Voice Controlled Home Automation System architecture

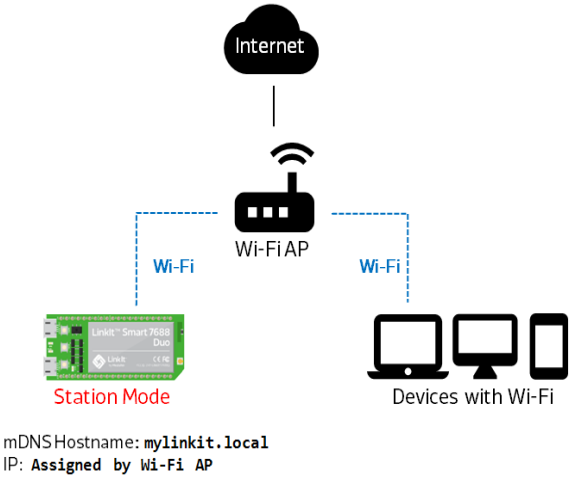

Fig 2 Linkit Smart in Station Mode

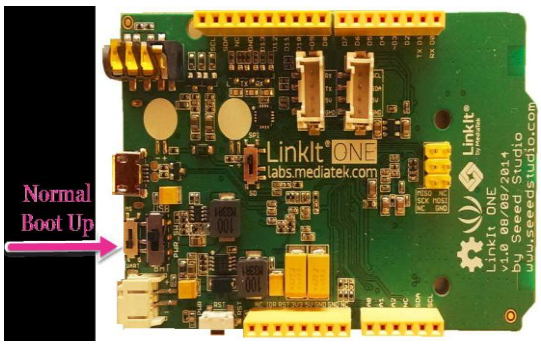

Fig 3.Linkit One development board

IV. Working Of The System

The response of the system differs from time to time based of the set of voice commands given. There is constant communication between various components of the system. The general working of the proposed system is explained below in detail.

A. **Android Client:**

- User presses mic on the screen to speak to so as to get the required task done.
- The google voice pop up intent signals the user to give the command.
- The user gives the command. The command can be anything already predefined in the server.
- The voice command which is given by the user through google speak is converted into a string for further operations.
- Android application pulls current IP and Port from saved file if input on screen doesn't match the saved file then it'll use the inputted IP and Port.
- The Android application then sends the command to the server via TCP protocol. (The LinkIt Smart 7688 Duo)
- The Server waits for a period of 10 seconds for the appropriate response from various sensors and monitoring devices.

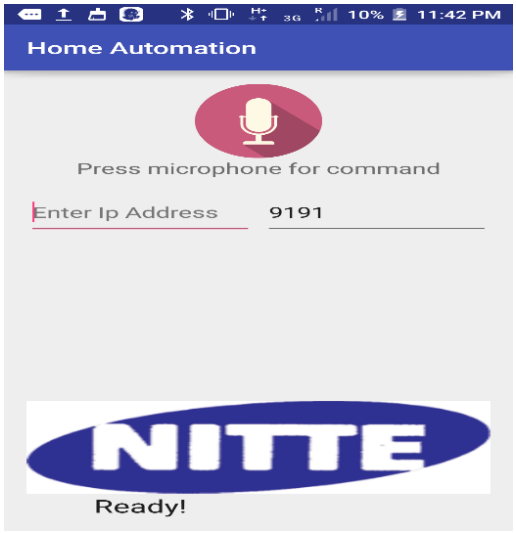

Figure 4. Android Application interface

B. Linkit Smart 7688 Duo Server:

- The LinkIt Smart 7688 Duo should be in the station mode as shown in the Fig 2.
- The Server receives the command in form of a string from the android application. The string is then searched for trigger words which are different for every command.
- If the trigger words match the appropriate commands are executed and information is sent back to the client.For example, if both trigger words are present then turn a relay On.(For the lights)
- The Android Client waits for time period to get the response from the server. In the above example the lights are On. The user is made aware of this information through speech, text and graphic images.
- Library provided can be used to send commands back like this:
  command. Flash ("Turning the lights on!") and/or
  command. Speak. ("Lights are on")
- The commands are send back to the client using TCP protocol. After this the Server

connection is terminated. The Sever implemented here is Python Server.

C. Android Client:

- The command received from the server by the client are checked and based it appropriate actions are taken. Below are some of the commands which the client may come across
  - If the command is to display an image, the image is pulled from the internet using the provided URL.
  - If the command is flash, then the appropriate text is displayed below the screen
  - If the command is to speak, the message is converted to voice and is spoken by the speaker which is inbuilt in the phone
  - If the command is maps, using the value of co-ordinates received from the GPS, the latitudes and longitudes are marked and current position is displayed using google maps
- The client then waits for another command and the entire cycle is repeated again.

V. CONCLUSION

The system can be further development to accommodate more functionalities. Other improvements can be made to automate certain functionalities based on the sensor readings. The system security can be improved by incorporating voice recognition to the current system so that system recognise specific voice and respond accurately.
The currently system was developed successfully and fully operational. The system can be scaled up to various levels depending upon the requirement. Home Automation in this system senses the changing environment of home in great detail based on which the user and make improvements.

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