Voice Controlled Home Automation using Linkit Smart 7688 Duo

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Abstract:
Home automation or smart is the residential extension of building automation and involves the control and automation of lighting, heating and appliances [1]. 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. Media Tek LinkIt™ is a collection of development platforms designed for the prototyping of Wearable and Internet of Things (IoT) devices. [2] Each development platforms provide a collection of tools, hardware and related resources to enable developers to address various Wearable and Internet of Things (IoT) device sectors. The system discussed in this paper makes use of Medic Tek Linkit one and Linkit Smart 7688 duo boards.

Keywords: Voice Controlled Home automation, Linkit Smart 7688 Duo, Mediatek LinkIt One, Server.

1. INTRODUCTION

The concept of home automation is not new in today’s world. It basically helps the user to remotely control and monitor the home activities in the home environment. Home automation is a trending field and a lot of research has been done and many systems regarding this have been implemented to control and monitor various appliances and devices. For communicating and controlling the home appliances, they have used internet, wireless technology, and Bluetooth and GSM technology. The system we have discussed in our paper uses Wi-Fi technology. Automation might lower the human judgment to the lowest degree possible but it surely does not eliminate it. After so many researches, controlling and monitoring has the concept of home automation become a reality. This is a system through which users can view and control the status of home devices of his/her choice. For example, if a user wants to adjust the temperature of the air conditioner, or wants to switch on/off the lights, or even check the current temperature or pressure of his/her room, he can do it from anywhere using this system. The above described example is one of the many features of the home automation system smart home or office and it’s functionalities are endless. The system considered here consists of switches and sensors connected to a central hub from which the system is controlled through a user interface, which can be interacted either via a wall-mounted terminal, or mobile phone software, a tablet computer, or even a web interface, often but not always using internet cloud services. The Voice Controlled Home Automation System discussed in this paper uses easy to use libraries making use of any android device and a Linkit Smart 7688 Duo, which uses a command library to get sent back to the Android application. MediaTek Link It Smart 7688 development platform consists of a Linux Wi-Fi SOC based development board which is mainly designed to enable the prototyping of IoT devices. [4] These devices include a lot of features such as Wi-Fi security web cam and sensors for the home or office, real time camera monitors for toddler and seniors as well as cloud-based applications.

2. LITERATURE REVIEW

In this section, we have provided some of the related systems which were designed by other researchers.

Thoraya Obaid [5] —Zigbee Based Voice Controlled Wireless Smart Home. In this paper the home automation system was built based on voice recognition for the commands given. The goal was reach out to the elderly and disabled people. This prototype could control most of the electrical devices in any home or office environment.HM 2007 is being implemented for voice recognition. ZigBee RF modules are implemented for wireless network, since they are efficient and power consumption is less. The results of the preliminary test were promising.

In “Home Automation Using Raspberry Pi through Siri Enabled Mobile Devices” (2015) by Ana Marie. D Celebre, Ian Benedict A. Medina.In this paper, the system was implemented using Raspberry pi. It automates five home devices using Siri’s speech recognition capability. To connect Siri enabled mobile devices using Raspbian operating system, Raspberry pi’s network and DNS settings were configured. The results were that it could automate five devices.

In “Voice Recognition Based Wireless Home Automation System” by Humaid AlShu’eli, Gourab Sen Gupta, Subhas Mukhopadhyay [7].In this paper, a home automation system was built and implemented based on voice recognition. The main aim of this system is to help elderly and disabled people. The prototype developed is able to control electrical devices in a home or office. In this system, Microsoft speeches APIs are used to implement Automatic speech recognition. The system implements the wireless network using ZigBee RF modules are used in the system to implement wireless network for their efficiency and low power consumption. To implement Multimedia streaming through the network,
Differential Pulse Code Modulation was used.

In their paper, Conte and Scaradozzi [8] (2003) see home automation systems as multiple agent systems (MAS). In this paper, the home automation system proposed includes home appliances and devices that are controlled and maintained for smart home management. The major goal was to improve performance.

Jawarkar, Ahmed, Ladhake, and Thakare [9] (2008) propose remote monitoring of home appliances involving the use of spoken commands through mobile phone. The spoken commands are generated and sent in the form of text SMS and then the microcontroller on the basis of SMS and key words takes a decision of a particular task to the control system.

Murthy (2008) [10] explores primary health-care management for the rural people. The solution proposes the use of the mobile web-technologies providing the PHC services to the rural population. The system includes the use of mobile phone and SMS technology for information management, transactional exchange and personal communication.

Potamitis, Georgila, Fakotakis, and Kokkinakis, [11] (2003) suggest the use of speech to interact remotely with the home appliances to perform a specific action on behalf of the user. The approach is aimed at people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is taken to appropriate decision by speech recognition.

3. SYSTEM OVERVIEW

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

- Using voice command android client to turn lights on/off remotely.
- Using a tracking device track the position of specific objects.
- Measure the temperature and pressure of the home environment.
- Detect intruders at home using noise sensors.
- Measure the quality of air and amount of dust in the home environment.

3.1 System Architecture

The various components of the system are given in detail.

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

- **Linkit One**: LinkIt one is a co-designed product by MediaTek and seeed studio. It brings together both Parties’ technology in open hardware and industrial leading reference designs for IoT devices and wearable to create a powerful development board. These devices provide the user with control options on the device and feedback, 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 a major component in the home automation system. It has inbuilt GPS functionality which is used for tracking objects. It updates the position from time to time and sends it to the server which can be accessed from anywhere. The Linkit One is also attached with dust and noise sensors to measure air quality and noise pollution.

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

- **UDOO Quad**: This development board is equipped with Linux OS in this system and has a scanner attached to it which is used to detect whether specific objects are available in our home. It makes use of RFID tags to distinguish between various objects.

- **Android Client**: Android app built using android studio which provides an interface through which the commands can be given for monitoring and controlling home appliances.

![Diagram of home automation system](https://via.placeholder.com/150)

Figure 1. Voice Controlled Home Automation System architecture

![Diagram of Linkit Smart in Station Mode](https://via.placeholder.com/150)

Figure 2. Linkit Smart in Station Mode
4. WORKING OF THE SYSTEM

The response of the system may change from time to time based on the set of voice commands given. There is constant communication between various components of the system for the perfect execution. The general working of the proposed system is explained here in detail.

Android Client:
- User presses mic on the application screen to speak to the microphone ("Turn the lights on!").
- New intent of google speak pops up which will signal the user when to speak the commands.
- User speaks command, for example- "Turn lights on!":
  - Intent closes, and converts whatever command is given by the user through google speak into a string for further operations.
  - Android extracts current IP and Port from saved file. If input on screen doesn't match the saved file then it'll use the default IP and Port.
  - The Linkit Smart 7688 Duo sends the command via TCP to server. It waits for a response which should take no longer than 10 seconds.

Android Client:
- The Android Client is still waiting for a response so we will give it a command as response.
- Now the lights are on and we want to tell the user in multiple ways, Text, Image and Speech.
- Using the library (through Simple parsing ) provided the user can send commands back like this Command. Flash ("Turning the lights on!") and/or Command. Speak. ("Lights are on")
- Those commands are sent back via TCP and python server closes the connection.

5. CONCLUSION

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

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7. REFERENCES


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