Smart Home with Natural Language Interface Using Arduino

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ABSTRACT

In the fast-paced life of the 21st century, computerization plays a crucial part in mortal life. Home computerization allows us to control home electrical appliances like lights, doors, AC, etc. It also provides home security and allows an emergency system to be activated. Home computerization refers to not only reducing fatal attempts but also increasing energy efficiency and saving time. The main idea of home computerization and security is to help handicapped and elderly people by enabling them to control home appliances and warn them in critical situations.

This design focuses on the implementation of home robotization and security systems using an Arduino microprocessor and an Android smartphone. Home appliances are connected to the microprocessor, and communication is entrenched between the Arduino and an Android mobile device or tablet via the Bluetooth module. It promotes system authentication for a sanctioned person to pierce home appliances.

KEYWORDS: Home Automation, Microprocessor, Arduino, Bluetooth, Android mobile, Handicapped.

1. INTRODUCTION

Now a day's homes require sophisticated control of their different gadgets which are electronic appliances. This has transformed the area of home automation with a concerning increase in affordability and simplicity through the integration of home appliances with smartphone and tablet connectivity. Smartphones are already perfect and can be made to communicate with any other device in an ad hoc network with a connectivity option like Bluetooth. With the rise of mobile phones, mobile application development has seen a major outbreak.

Smart home automation started a long time ago, and the concept was used based on the smart home association. It involves the network's integration of technologies and services. Both the quantity of data sent online and the number of devices with internet access have increased. Hence, there will be around 22.5 billion connected devices by the end of 2021. (Andrew, 2016).

The smart home application is going to be widely used, aiming to make people's lives easier and more relaxed. For example, imagine that people driving home in the summer will be able to turn the AC on before reaching home using their smartphone, rather than turning the AC on after they reach home. Home automation and smart home technology will therefore be major trends in the coming years.

1.1 OBJECTIVE

The main objective of this proposed system is to develop a smart home automation system using an Arduino board with Bluetooth that can be remotely controlled by an Android OS smartphone. It has a natural language interface where users can use different languages to give commands.

1.2 SCOPE

The proposed system's scope is to assist the elderly, blind, or visually impaired by providing voice commands to turn on and off lights and fans using an Android phone rather than traditional switchboards. This project provides a way to interact more easily with the Android app.

2. RELATED WORK

Si.No	Title	Year of the publication	Author	Description	Uses
1.	The implementation model of a Wi-Fi-based Smart Home System	2018	Harsh Vardhan Bhatnagar, Praveen Kumar, Seema Rawat, Tanupriya Choudhury	The system is split into 3 parts Android application, Firebase database and hardware components. The communication channels used is Wi-Fi. All the exchanges of the information takes place via internet so, it is necessary that there is always an active Internet connection for the working of the system.	• Can reduce the physical effort that the aged or disabled people have to do. • Can save time since the user can operate the system from wherever they are.
2.	Implementation of Smart Home Assistance and Surveillance	2021	V Anand Kumar, V Nandala, M Kousalya, P Madhumitha, R Kamaleshwari, N Kalvi Selvi	The application involves two methods, using Bluetooth and GSM technology. The former method uses an HC–05 Bluetooth, which can be implemented when we are at home. The Arduino Bluetooth module, which controls the home appliances, is controlled via a smartphone application. The latter method uses GSM technology.	• It brings control of our everyday appliances at the tip of our fingers thus, providing ease of use and flexibility.
3.	Smart home	2020	M.Sangeetha, T.Karthik	In implementing the prototype model, we first developed a mobile app and tested it successfully. The prototype has two parts. One is a mobile app to control and the other is the appliance to be controlled like the bulb, fans, etc. The mobile app consists of a login page done by mobile number and OTP verification.	•It helps to overcome many problems such as cost, security and flexibility, etc. •It will provide greater advantages like it decreases our energy costs. it improves home security.
4.	IoT Voice Controlled Home Automation with Efficient Energy Management and Security System	2019	Nana Kwasi Diawuo	In the design of the home automation, however, voice will be the main source of giving commands via a smartphone using google recognizer and to provide energy efficiency management mechanisms and a security system.	• Design a low-cost a system that uses voice commands to execute domiciliary activities.

3. EXISTING SYSTEM

In the existing system, home appliances are controlled through Zigbee and other devices. Yet, they are confined to a specific region. In the proposed system, home appliances can be controlled using an Android phone to give commands with a natural language interface. DTMF can also be used, but it isn't practical and is unreliable.

3.1 DISADVANTAGES

- Long-distance communication is not done
- No Android application is involved so we cannot operate from long ranges.

4. PROPOSED METHOD

In day-to-day life, many old aged people are unable to do basic things like switching off lights, fans, and some other home appliances. And for this thing, they should be dependent on someone. So, using our system, we easily controlled home appliances using an android phone. So, they can be used by everyone, not just by particular people. The commands can be given in different languages.

4.1 ADVANTAGES

- Portable
- Low cost
- The equipment is easy to use because we can operate it from a distance.
- Faster operation and efficiency.
- No need to carry a separate remote or any other controlling unit.

5. ARCHITECTURE

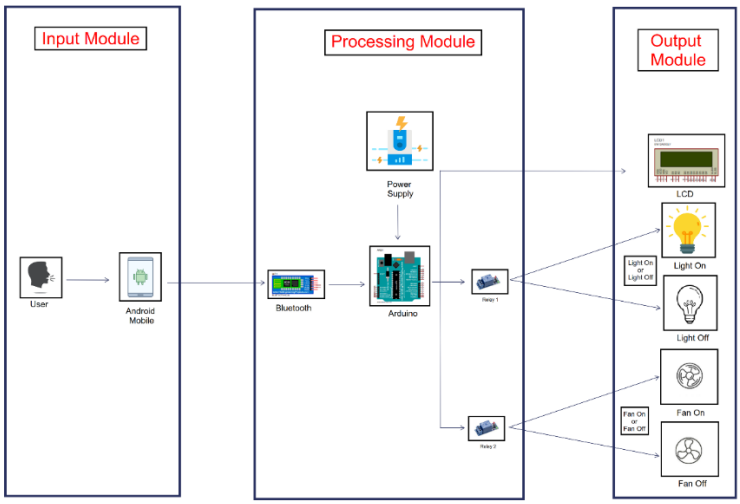

FIG 5.1 ARCHITECTURE OF THE PROPOSED SYSTEM

INPUT MODULE:

In the input module, there are two steps the first one is used to give voice commands in different languages to the android Bluetooth application. The application sends that command to the Bluetooth device which is interfaced with Arduino.

PROCESSING MODULE:

When the Bluetooth module receives a command from the Android Bluetooth application, that command is sent to the Arduino. Then the Arduino checks the command to see if it is valid. It performs command operations like turning the light on or off and turning a fan on or off by switching the relay on or off.

OUTPUT MODULE:

When the Arduino executes the command, the result is displayed on the LCD. Then Arduino turns the relay on the home appliances, which take the power from the source, and the load is activated. If the Arduino turns the relay off, then the load is deactivated.

6. RESULT

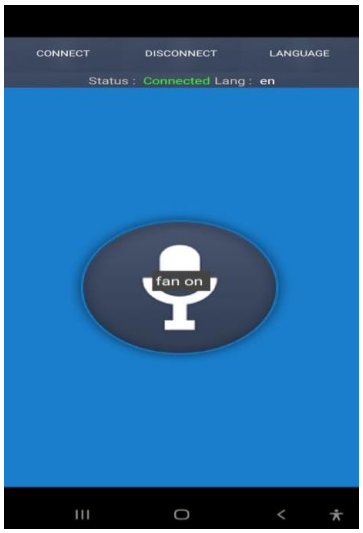

FIG 6.1 (FAN ON COMMAND)

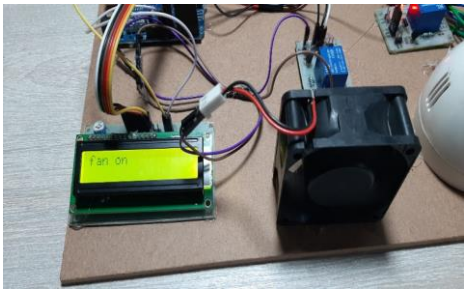

FIG 6.2 (FAN ON OUTPUT)

FIG 6.3 (FAN ON KARO COMMAND)

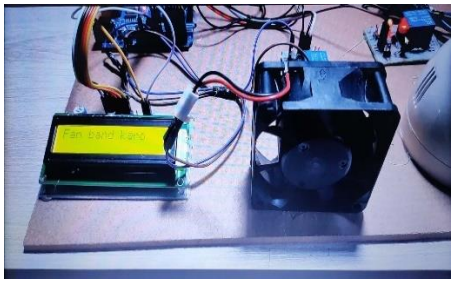

FIG 6.4 (FAN OFF KARO OUTPUT)

7. CONCLUSION

The conclusion of the proposed system is that a home automation system is a very useful project for adults and physically disabled persons who are not able to do various activities efficiently when they are at home and need an assistant to perform those tasks. It is easy to use. The functionality of the system is easy to understand.

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Dr. C. Sunitharam Assistant professor in the department of computer science and engineering, their publications, a published paper titled “Survey on Automatic Multimodal Emotion Recognition system of Autism Spectrum Disorder Peoples” International Research Journal of Mathematics, Engineering, and IT, Volume 4, Issue 6, June 2017