



## DESIGN AND IMPLEMENTATION OF VOICE RECOGNITION BASED SECURITY SYSTEM

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### ABSTRACT

In modern days, Internet of Things (IoT) is an ever-growing network of smart objects. Nowadays, safety and security has become a basic necessity in the society. From past few years, different technologies, different approaches have been used to protect lives and properties using smart security systems. Our project aims in developing a door access system which uses voice recognition algorithms that provide a quick way to unlock doors and ensure their safety and security. This system has two phases, one is training phase and other one is testing phase. In training phase, the voice commands are stored in a database. In testing phase, the commands stored earlier are compared and checks for match. If match is found the user access is granted and door is unlocked. If not, an alert message is sent to user with the help of SIM800I module. This demonstrates that the proposed system detects which kind of attack was occurred.

### INTRODUCTION

In this modern and fast-moving world, security and privacy are considered important. Thefts, robberies are increasing day by day. In recent times, biometric technologies are becoming popular due to use of unique characteristics, like fingerprints, faces, signatures, etc. The technology helps various business and government sectors to identify and secure the system. There are many traditional ways of unlocking the door, most used technology is using physical key which is not that secure. Proposed system makes an effect to provide security system that can be monitored by the owner itself. Voice recognition is more accurate, faster, and more convenient. It identifies who is speaking, who is trying to enter the door and unlocks the door if it is user. This system is designed to detect intruders and send information to the owner using alert message with SIM800I module. Our system aims to develop a smart security system using IoT technology and helps to find the intruder.

### LITERATURE SURVEY

In this literature survey, we investigate the most recent developments in voice recognition algorithms and security systems. To pinpoint the most recent trends, difficulties, and possibilities in this area, we specifically review the most recent IEEE papers on the subject.

Various approaches are utilized by researchers to apply these algorithms. These methods vary from researcher to researcher, and may involve different algorithms and models to achieve their desired out [1] Yudi Dong and Yu-Dong Yao proposed "Secure mmWave-Radar-Based Speaker Verification for IoT Smart Home". The authors proposed a novel approach to secure speaker verification for smart homes using mmWave radar technology. The proposed approach represents a promising new direction for secure speaker verification in smart homes, and could have broader applications in other domains, such as healthcare and public security. However, the authors also acknowledge that there are several challenges that must be addressed before this technology can be widely adopted, including issues related to cost, scalability, and user acceptance. Overall, the paper presents a well-researched and well-executed study that provides valuable insights into the potential of mm wave radar technology for secure speaker verification in IoT smart homes.

[2]Anju P. S, MidhunaSubart, Nasiya Y Salim and Dr. Vince Paul proposed “IoT Based Home Security System”. This project presents a low-cost and wireless Home Automation System (HAS) that incorporates smart home technology to enhance the overall living experience. The system utilizes a PIR motion detector sensor that detects the presence of a person in front of the house and sends a message to the homeowner. The owner can view the person through camera that is connected to a web page. The owner can set priorities for electrical appliances, allowing for greater control over energy consumption. Access to the system is granted through authentication, which permits the user to unlock the door using a password on the keypad and use the home appliances based on the priority settings established by owner.

[3]Ram Sethuraman, J. Selvin Paul Peter and Shanthan Reddy Middela proposed “An Analysis of Automatic Voice Recognition and Speaker Identification Algorithms and its Applications”. The author has conducted a comprehensive review of voice recognition algorithms. They have analyzed the current state of research on voice recognition and speaker identification, highlighting various speaker recognition algorithms that are being used in different domains. The paper provides a concise overview of the best and most recent applications by comparing the accuracy of various works. The findings of this study demonstrate the widespread utilization of voice recognition algorithms in various fields and encourage further exploration of potential applications in other domains. Overall, this work serves as a valuable resource for researches who are interested in voice recognition technology and its diverse applications.

[4]J Kim and M Hahn proposed “Voice activity detection using and adaptive context attention model”. This paper focuses on the important task of voice activity detection(VAD) in various speech-related applications. The accuracy of VAD performance is crucial, but the usefulness of speech-signal context can vary in unpredictable noise environments. The experimental results in real-world scenarios demonstrate that the proposed ACAM-based VAD system outperforms other baseline VAD methods. This approach has the potential to improve the accuracy and robustness of VAD systems, making them better suited to handle unpredictable noise environments. Overall, this paper presents a promising solution to a critical problem in speech-related applications.

### PROPOSED BLOCK DIAGRAM

The main heart of system is Arduino uno. Using Arduino uno board we will interface voice recognition module, sim800l module and speaker. The input for the system is mic. SIM800l module and speaker are output for the system.

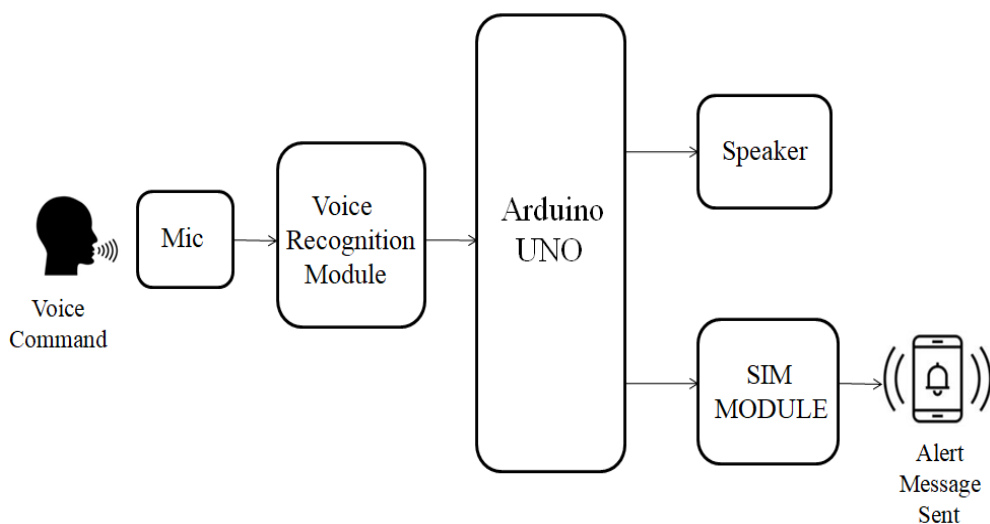


Figure 1. Block Diagram

The voice commands are given through the mic and stored in the voice recognition module. A SIM8001 module has been used in order to send SMS to the user. We have used a speaker to communicate with owner. A transistor is used as an audio amplifier in between the Arduino uno and speaker.

## HARDWARE REQUIREMENTS

### Arduino UNO

Arduino UNO is a popular, microcontroller board. This board consists of both analog and digital pins which interface with various boards and other circuits. It has 14 digital input/output pins, 6 analog pins, 16MHz quartz crystal, USB connection, power jack and ICSP header for programming. It uses Integrated Development Environment software for programming which is easy to use. It can interface with wide range of modules, sensors and actuators. It is low-cost, flexible, powerful, and versatile.



Figure 2. Arduino UNO

### Voice Recognition Module

Voice recognition module is used to recognize voice commands. It is an easy speaker dependent module. It can store upto 15 commands. Those 15 commands are divided into 3 groups and each group contains 5 commands.

This module can operate in between 4.5-5.5 V. It takes analog signal and convert that into digital signal. It can analyse the voice commands and deliver to the computer through mic.

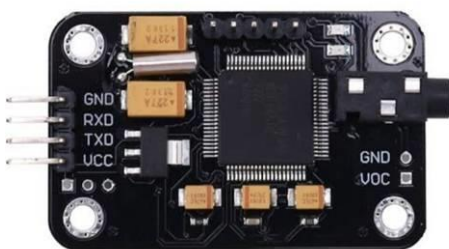


Figure 3. Voice Recognition Module

### SIM8001 Module

SIM8001 module is used for sending and receiving SMS and making calls. The module is attached to the microcontroller. This module has a small form factor and a subscriber identity module (SIM) attached to it. The helical antenna attached to the module searches for network and connects the device to network.

It requires 3.4 V to 4.4 V. It requires 2A current. SIM8001 module is a power-hungry device. Extra power sources like 3.7 V 2000 mah battery or DC to DC buck converter are required in order to set the

required voltage to power on the SIM800L module. Based on the led blink we can know whether the power is enough or not, whether the device is connected to the network or not. Here the helical antenna plays a major role.



Figure 4. SIM800L Module

### Speaker

Speaker is used to produce audio as an output which can be heard by the listener. They are transducers which convert EMI waves to sound waves. The input for speaker is given from computer or any kind of audio receivers. The input is either analog or digital. It plays the audio required by the user. They make easier for users to listen to music or any kind of sounds.



Figure 5. Speaker

### Mic

Mic is a device which translates the sound vibrations to electrical signals. Here, mic is used as an inlet for voice module in order to record the voice commands. It enables many types of audios like music vocals, speech, and sound recording.



Figure 6. Mic

## IMPLEMENTATION

In this section, we will discuss about the step-by-step procedure of the overall hardware implementation of voice recognition-based security system.

The voice recognition module,  
 Gnd is connected to Gnd of arduino  
 Vcc is connected to 5V pin of arduino  
 Rx pin is connected to Tx pin of arduino  
 Tx pin is connected to Rx pin of arduino  
 A mic is plugged through mic inlet of voice recognition module. The voice commands are received through mic. Arduino 11 pin is connected to base of TIP122. Emitter of TIP122 is grounded. The positive wire of speaker is connected to 5V of arduino and negative wire is connected to collector TIP122.

The SIM800l module,  
 Vcc pin is connected to 3.3 V pin of Arduino.  
 RxD pin of SIM800l module is connected to 3 pin of Arduino.  
 The TxD pin of SIM800l module is connected to 2 pin of arduino.  
 Gnd pin of SIM800l module is grounded.  
 Now, switch on the power supply.

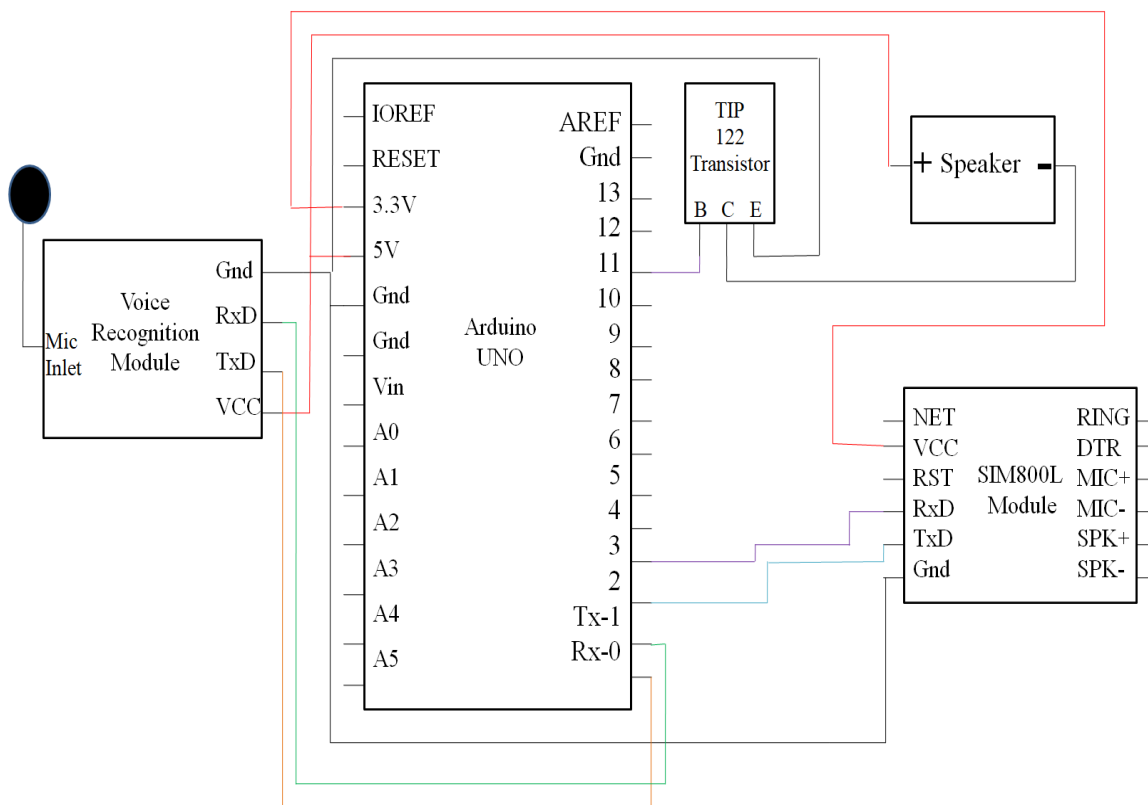


Figure 7. Circuit Diagram of Voice Recognition Based Security System

## PROPOSED SYSTEM

### Training Phase

Firstly, we need to connect the voice recognition module and USB to TTL module. Later, plug the microphone in order to receive the voice commands. Access Port software is used to send HEX commands from windows to USB module.

Now, we use different commands for different purposes,

“aa36” to start the command mode.

“aa11” to start recording.



“aa21” to import commands.

In the window, once we see “START” text we should say the commands which we need to store.

And later the commands are imported.

#### Testing Phase

Firstly, we need to connect the voice recognition module to arduino uno. Now, we interface the speaker. The TIP122 transistor is used as an audio amplifier. The speaker is connected to arduino, with a transistor as a medium in between. The transistor amplifies the audio. Encode audio software is used to convert audio text format. After converting paste the data on code.

Later, interface the SIM800l module. If we see that led blinks twice in a second, it means that the GPRS is connected. While uploading the code make sure that the Rxd and Txd pins of the voice recognition module are disconnected. After uploading again connect the Txd and Rxd pins of the voice recognition module to the arduino.

The speaker and SIM800l module respond accordingly based on the voice commands received. If same, welcome message is sent to user mobile and welcome message audio is played through speaker and door access is granted. If not same, alert message and call is sent to user and alert tone is played through speaker.

#### Flowchart Description

Firstly, include libraries in the arduino. Now, initialize SIM800l. The module gets ready. Enter the encoded audio text data in the code. It checks for voice commands. After detecting the commands, it checks whether the commands are matched or not.

If the commands are matched, a welcome note is played through the speaker and a message saying “Welcome home” is sent to user contact number. If the commands does not match, then an alert note is played through the speaker. Also, an alert message and call is sent to the pre-saved user contact number.

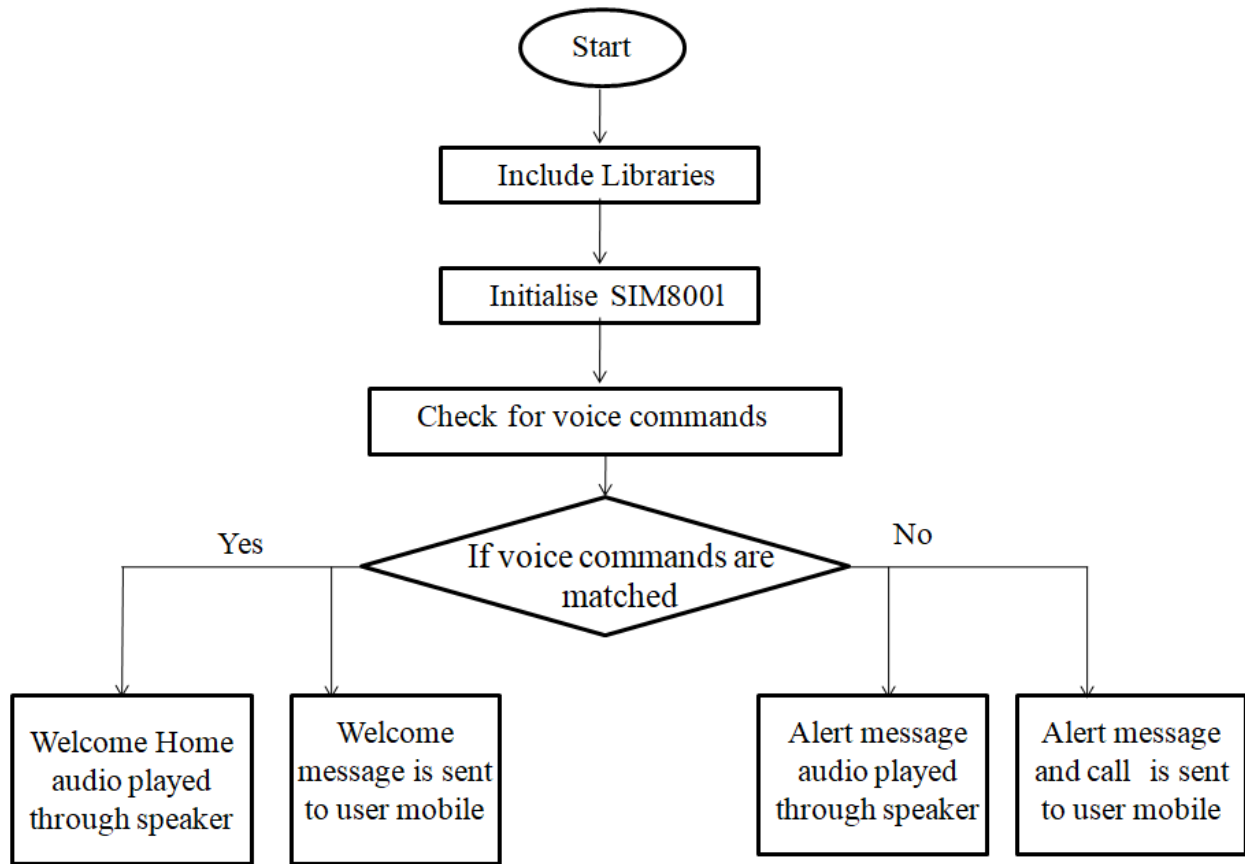


Figure 8. Flow Chart for Software Implementation

### RESULTS AND DISCUSSIONS

In this section, we have discussed the result of our voice recognition-based security system. When the voice commands are matched, then the SIM8001 module sends message “Welcome home” to the “+91XXXXXXXXXX” pre-saved user contact number. If voice commands does not match it calls and sends and alert message to the pre-saved user contact number by GPRS technology. The user reaches the place and avoid theft. And also, an audio is played through speaker.

Here, Figure 9. shows the calling mechanism and Figure 10. Shows SMS sent to user number.

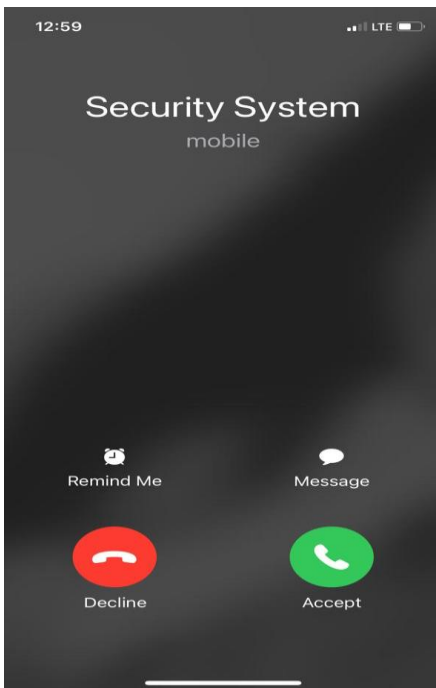


Figure 9. Making Calls

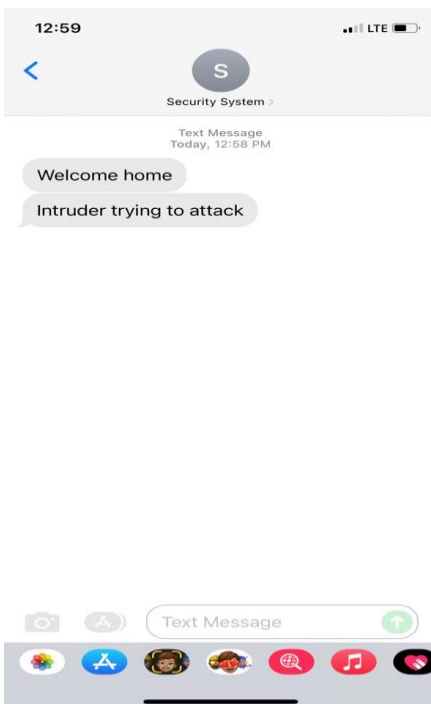


Figure 10. Sending SMS

## CONCLUSION

This voice recognition system delivers biometric security technology to the market at lower cost. The developed system will deal with thefts occurred. This design enhances safety and security in the society. It concentrates on developing a smart low-cost device to help people feel safe and alert them at the time of any circumstances, thefts, or any other dangerous situations.

## FUTURE SCOPE





Voice recognition technology has made significant progress in recent years and has become a popular choice for security system. As the technology continues to advance, there are several potential future scopes for voice-recognition based security systems,

**Improved Accuracy:** Voice recognition technology will continue to improve its accuracy rate, with more robust algorithms and better data sets.

**Multi-factor Authentication:** Voice recognition will become a component of multi-factor authentication systems, along with facial recognition, fingerprint recognition, and other biometric technologies. This will create a more secure and robust authentication process that will be difficult for hackers to bypass.

**Integration with IoT Devices:** Voice recognition based security systems will become more integrated with IoT devices such as smart homes, smart locks, and security cameras.

## REFERENCES

1. Yudi Dong and Yu-Dong Yao: "Secure mmWave-Radar-Based Speaker Verification for IoT Smart Home," IEEE Internet of Things Journal, vol 8, no 5, March 1, 2021.
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4. J Kim and M Hahn: "Voice activity detection using an adaptive context attention model," IEEE Signal Process. Lett, vol 25, no 8, pp 1181-85, Aug 2018.