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SECURITY SYSTEM USING BIOMETRICAUTHENTICATION AND IOT

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Abstract

In this present technological worldthe smart home automation system has a significant role in makes daily work easier and efficient. Keeping room keys is an obstacle. Therefore, many research has been proposed however the lack of a security system makes the automation systems less trustworthy, as well as limited control distances. This paper purposes speech recognition to control the door and only registered people can access it.The proposed system uses microcontroller NodeMCU ESP8266 with a wi-fi connection to control door. The android application has features tracking history control menu and speech recognition control. The system security consists of a login system, biometric authentication, and specific speech command.

I.INTRODUCTION

In the current world where communications and information technology is developing rapidly, making it easier for everyone to obtain data information from a certain distance for either home or office appliances.The smart home automation system is now a part of each individual in the community. It can be seen in daily life for example smart doors automation system, home automation system to control home appliances, due to these people are mostly dependent on his/her smartphone which is making their daily work or lifestyle more easier and efficient. There are various combination methods like using face recognition to recognize the owner's face for security measures so that the fans or the lamps can be controlled using speech command.

For that purpose in this research, we will discuss more controlling smart home systems, especially the locking door system using the voice recognition method with a more trusted and reliable advanced security system. It will become more convenient and comfortable for the homeowner which not easy to get up from the chair only to opening the door for their appointment guests and the traditional key is small and easily lost. This system uses several instructions to open and lock the door automatically using word instructions via android. There are several levels of system security used in this system. The first level of security is that the system is equipped with a login system integrated with the database so that only registered users can enter the application. The second security level is that the system is also equipped with a biometric system i.e. finger print where each person has different biometric data. The third level of security is that the system has a unique speech command that is only known by certain users. The system also equipped with a history tracking control system. It will save track record history of which doors are opened or closed, time and also the user. With this, the system will become more complex and very reliable and less costly because it utilizes the user's smartphone.

II. SYSTEM DESIGN AND METHODOLOGY

In this study, voice recognition is the main controller for controlling automation doors. A biometric system called every time the

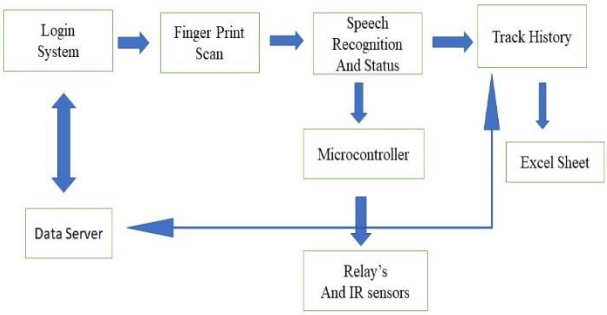

Fig.1.Block Diagram

application user wants to do voice control. To open the application, the user must log-in first using the registered username and password. Each user is responsible for the security of their respective login system. The system design is shown in Figure 1.

Figure 1 shows the automatic doors can be opened and closed based on the speech command from a smartphone that integrated with the database server. As long as the internet connection is stable, the data stored in the database can be called using the API so the microcontroller can read the database through the API. The microcontroller will always read the database every 2s, and if there are changes in parameters from the API data feedback then the microcontroller will control the automatic door based on the parameters it reads either closing the door or opening the door. With a simple system but has a high-security system, it will create a reliable smart home application with unlimited control range as long as the internet connection is stable.

Hardware Architecture

This hardware design to support system requirements consists of NodeMCU ESP8266 12E chip equipped Wi-Fi module, DC Motors, IR Sensors, 9V power supply, L293d Driver IC.The system hardware design is shown in Figure

2.

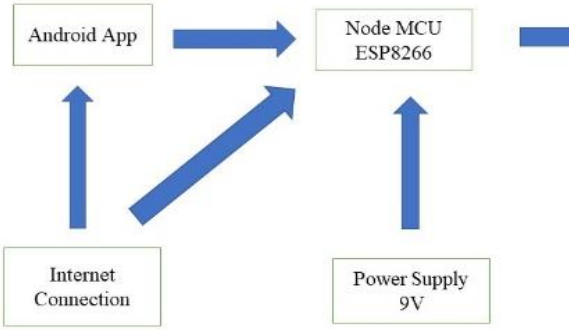

Fig.2.Hardware Block Diagram

Figure 2 shows the microcontroller Node MCU will act following the speech command instructions from the android application to digitally control the IR Sensors. The internet connection itself is used as a bridge to access the database in real-time. Power supply is used to supply the power system.

Software Design

The Android application design software is needed for the user interface and also supports the needs of the smart home system. Everything will be controlled using the android app either voice command,advanced security system. The Android App design is shown in Figure 3.

Fig.3. Login Menu

Figure 3 shows the user must have a user login first to enter the finger print scan menu, the login system will be integrated with the database. If the username and password are registered in the database, the user can enter the main menu. And to access the database system, a stable internet connection is needed. If the internet connection is stable and the user cannot log-in and do voice control, the user may not be registered or the user's fingerprint has not been registered into the smartphone's settings. As shown in figure 4,Finger print menu, the user can scan the finger print by clicking on the scan finger print. Every user who controls the smart home system will be recorded into the database, with parameters being the use id, time and date, and command which is used. The superuser or the administrator can also register a new user if needed. Finger print scan menu and speech recognition and status menu are shown in Figure 5.

Fig.4.Finger Print Scan Menu

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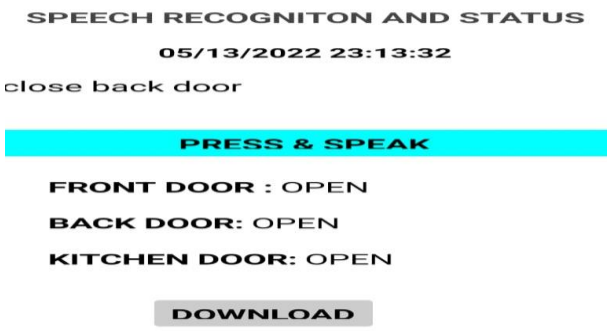

Fig.5.Speech recognition and status menu

To conduct voice control, the user must first check biometric authentication to show that the user is indeed registered as the owner of the smartphone by a fingerprint sensor.. If the owner's fingerprint from the smartphone is not recognized during the biometric authentication process, that person cannot do voice control, so it is necessary to register the fingerprint first into their respective smartphone.

Speech Recognition Method

Google API has provided a feature where developers can use it easily. Speech Recognition works based on Analog sound signals that are converted into digital data form with the final result being in the form of a text. In this study, the system will read the voice instructions given by the user and convert them into text form, if the received text matches the code then operation will perform. If the given voice command is wrong then it will say no matching voice command is found. That is how Speech Recognition works in this study. Voice instructions will be divided into several types of instructions, such as in the following Table 1.

TABLE I. SPEECH RECOGNITION INSTRUCTIONS:-

In this study, the actuator will be divided into 3 such as theFront door, Back door, and Kitchen door. Each door has an instruction code based on the rules on Table 1 that only known by the user. Instructions can be done if the user has logged in and verified the finger that has been registered on each smartphone.

Parameters	InstructionCommand for Unlocking The Door	Instruction Commandfor Locking The Door
Front Door	Open front door	Close front door
Back Door	Open back door	Close back door
Kitchen Door	Open kitchen door	Close kitchen door

Biometric Authentication Security System

Googlehas added Biometric Authentication to its API, so developers can involve it as a security framework. With the goal that the unique mark informationenlisted on their cell phone is very much safeguarded.Biometric Authentication in this examination points as anextra security framework that is extremely productive to find outthat the cell phone has a place with the client or individuals who aretrusted to get to the cell phone. Since to control brillianthome mechanizationentryways,fingerprints should be enlisted oneach cell phone.

III.IMPLEMENTATION AND DISCUSSION

This examination proposed how a high level security frameworkis executed in brilliant home applications to open andlock doors.The system software focuses on advanced security and speech

control while the hardware system focuses on controlling the relays and led indicators.

Software Android Application Implementation

User Id	Password	Finger print Scan	Speech Command	Control
True	True	True	True	True
True	True	False	-	False
False	-	-	-	False
True	True	True	False	False
False	True	-	-	False
True	False	-	-	False

In Software testing, the android application system is developed using MIT app Inventor with the Embedded C programming language using networking. And created an app called "DOOR SECURITY SYSTEM".Following is the algorithm of the application software implementation.The algorithm on the application software:-

1. New users must be registered through the application admin
2. Input Login and Password to enter the Finger print scan menu
3. The finger print scan menu consists of scan fingerprint, Cancel scan , logout.

Voice Control Menu Algorithm:-

1. Click the voice control menu
2. Enter the biometric authentication by pressing the scan fingerprint that is registered on the fingerprint sensor
3. click on Press& Speak button and enter the speech command
4. Call speech to text google library
5. If the text is matched then send a command to update the control menu database and insert the control history for tracking purpose
6. Call text to speech google library

History Control Menu Algorithm:-

1. Click on the download button
2. Excel sheet will be downloaded

Advance Security And Monitoring System Implementation

The Advanced Security system is installed on the android application to prevent others who are not registered into the application from using it. The Advanced Security consists of several layers of security levels,

1. Login System
2. Biometric Authentication
3. Specific Speech Command

TABLE-II. LOGIN SYSTEM, BIOMETRIC AUTH AND SPEECH CONTROL

To login to the application, a new user needs to be registered first. Based on the test result to register 5 new users, the registration menu performed 100% success. Besides the security system, the android application has a monitoring system consists of track record history control with filter date and real-time system monitoring of each door. After success controlling the door, the system will always be updated as shown in Figure 5 for real-time system monitoring and Figure 6 for track history records control.

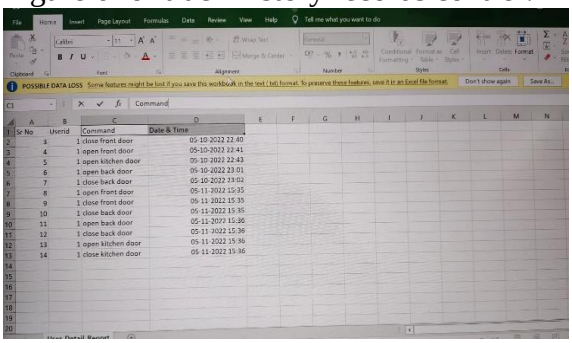

Fig.6. Tracked History

Hardware Implementation:-

The prototype Smart door system uses a microcontroller NodeMCU ESP8266 with a built-in WiFi module. Therefore it is suitable for the internet of things (IoT) projects. We can observe the position of the door using IR Sensor when ever the door is closed the light will be turned on and other wise it will be in off state. The successful thing in this project is when any issue occurred in the system we can easily identified since we are IR sensors. After giving the command if IR Sensor haven't activated then it is the problem regarding the power supply or sensors. But if IR Sensors activated but door is not opening/closing in such cases it may be the problem of power supply in this way we can identify the problem easily. The hardware prototype can be seen in Figure 7.

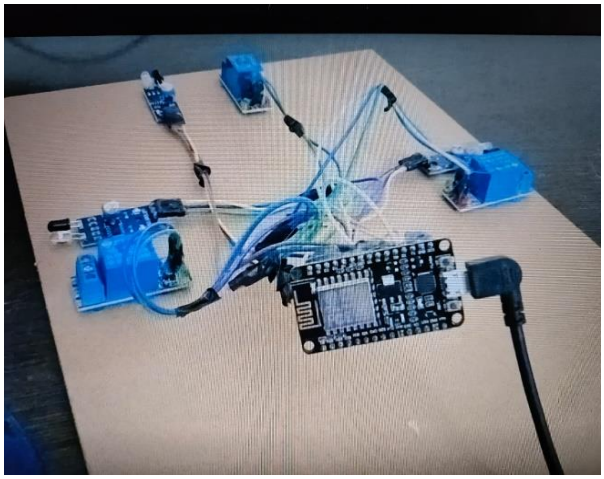

Fig.7.Hardware Prototype

Based on the experimental of the hardware system in retrieving the data from the data server it proved works well 100% success as long the internet connection runs smoothly. The rate of time the lag between the voice control and the response of the android in controlling the actuator is 5 seconds. The test has been carried out 10 times to control smart doors locally and distantly in one city.

IV.CONCLUSION

Based on the experimental results, the 3 levels of security trials have been conducted with 100% success and each level must have a value true before control the smart door. This level of security makes the system are not easy to hack by anyone. The registration menu performs well with 100% success to save the new user identity for the log-in case. The real-time monitoring system and history record control also have done well with 100% success. All the data is stored in real-time successfully in the database server The range of performance speech command tests to get an accurate response from the application in an indoor room works very well when there is no noise from around. But in case outdoor in the crossroad, the application works well, but performance decreases. So that it can say the farther the distance between the smartphone speaker and the mouth, the lower its performance. The speech command consisting of several words so that if one of the words is not read properlythe system is considered to be a failure.

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