



## DOOR SECURITY AND INTRUDER ALERT SYSTEM BASED ON FACE RECOGNITION AND SPEECH RECOGNITION

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### Abstract

The security issues have been relevant nowadays. So there comes the need of developing robust security systems. This project is developed with an aim of implementing a security system based on the principles of speech recognition and face recognition techniques. The purpose of this paper is to verify the existing methods in the fields of speech recognition and face recognition and implementing the required embedded door access control system.

**Keywords—**Facerecognition, Speechrecognition, Mail Alert, GUI, Door Access.

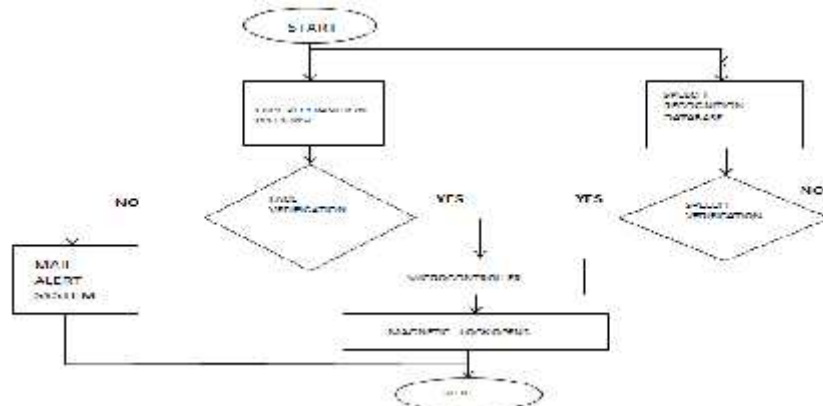
### Introduction

Home security is important for a safe home. This paper explains about a low-cost and intelligent door security system using PIC16F877A, zigbee module & accelerometer. A natural way to identify a person is through their voice and face. Voice characteristics are different among individuals due to differences in their sound dynamics, vocal chords etc. A practical problem is voice can be trap by anyone. This proposed system is to recognize user password through voice and user recognize face at the door. Speech technology is not 100% reliable but using an embedded microphone array increases speech in very noisy environments. Face Recognition is the process of matching the detected 'face' to one of many faces known to the file system. Face recognition is one example of process that improves the security application for building access control. The advantage of using face recognition instead of other identification process such as iris or fingerprint identification is because it least intrusive and more secure The PIC microcontroller analyse the data and opens the door if the input data matches with the existing database. It will trigger an alarm and alert messages along with the unauthenticated person's picture will be sent to user's mobile via zigbee in case of untoward situations. A wireless camera, which is placed on the door is used for taking the picture of the person. The house owner can access the door by sending voice commands using a microphone. Principles of image processing and speech processing techniques are used for development of the device. This device serves the purpose of safety and security.

This paper is divided into several sections. Section 2 briefly explains the system development method. Section 3 explains about circuitry used in hardware implementation. Section 4 explains the development of graphical user interface (GUI) using MATLAB software. Section 5 presents the development of door lock system circuitry using microcontroller and describes the microcontroller programming development. Section 6 provides the results and discussion and finally Section 8 concludes the overall work done.

### Methodology

The developed system is divided into two parts. As shown in Figure 1 the first part of the system is GUI based face recognition system and the second part is microcontroller hardware implementation. The GUI based face recognition System functions as the master unit for microcontroller PIC16F877A. In this system, a recognized image is transformed into 8 bit signal as an ASCII code through serial communication port to microcontroller circuit. The received signal will be analysed by the microcontroller to lock or unlock the magnetic lock.



**Figure 1. Flowchart of Proposed System.**



### Doorlock System

The magnetic lock unit is controlled by PIC16F877A as shown in Figure 4. The microcontroller enables various functions of ports such as digital I/O. Additionally analog input and USART port for serial communication are regulated by the microcontroller.

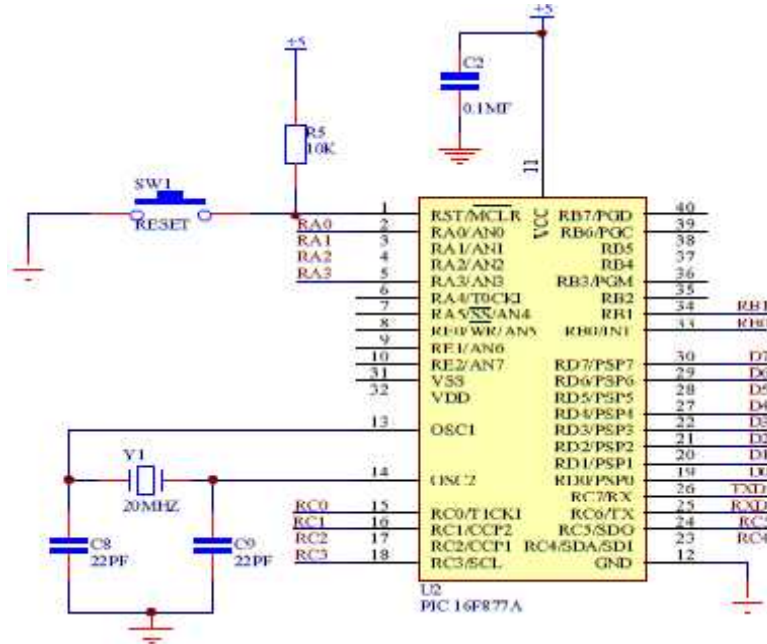


Figure 2. Schematic Diagram Of Door Lock System

To fulfil the requirement for this system, a prototype circuit is developed to control the magnetic lock. A switch is connected to first pin. When the switch presses, MCLR pin will have 0 volt, and microcontroller will go to reset mode. This pin is pulled up to VCC, otherwise noise signal results in reset. A 10k resistor is used to pull up, because to satisfy electrical parameters of microcontroller, i.e., to limit the current flowing through that pin. The relay circuit provides major control of magnetic lock.

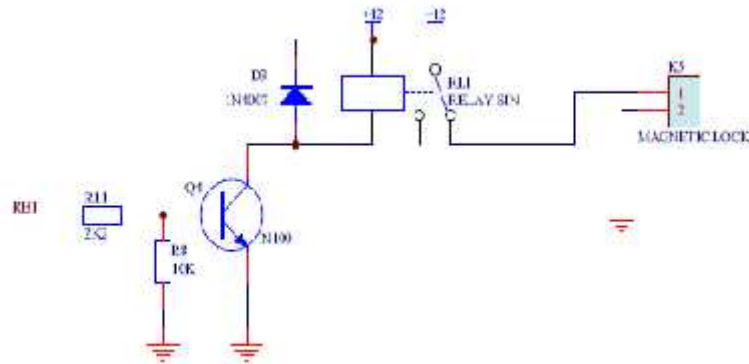


Figure 3. Relay Circuit

When the signal from PIC goes high, RB1 becomes high and the transistor N100 becomes ON. The currents flow through the relay coil and it gets energized. Switch RL1 gets attracted toward coil and the door is unlocked.

An IR sensor is placed in the key hole. So whenever a person inserts a key then the IR wave gets cut and the camera will start to take the images of the person along with that a alarm circuit will also activated. The wireless camera will take the pictures in frames and these are converted into bits and transmitted through antenna. The radio receiver will receive and send the signals to PIC to compare with the database. If the database matches with the real time image then door opens else the



captured image is send to the owner's mail id. A microphone is placed inside the home. So that the owner can send the voice commands to open or close the door.

### GUI Development

A Graphical User Interface (GUI) is a pictorial interface to a program. The GUI is important as it allows user to choose what action should be taken and performed by the system. Figure 4 shows the layout of GUI. The developed GUI consists of 8 push buttons. For selecting camera, image format, selection of port separate push buttons are provided. Each button perform different task. The GUI also comes with two image boxes for image testing and speech testing. The face testing include push buttons for adding database, start and stop buttons for taking image. In the case of speech testing there are pushbuttons for recording the voice and adding speech to database.

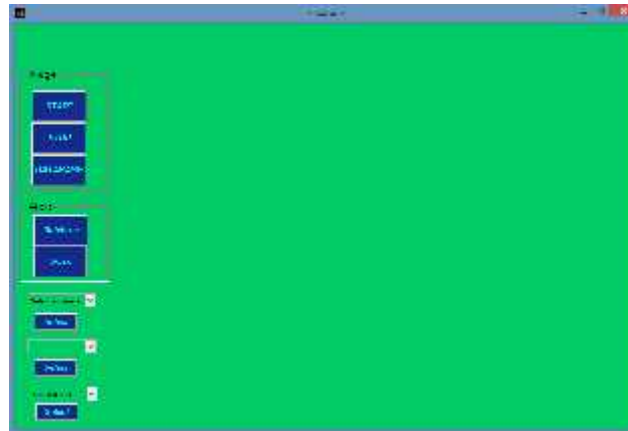


Figure 4. Layout of Graphical User Interface (GUI)

### Simulation and Hardware

#### a. Face Recognition

For doing the face recognition we have to run the face recognition program in mat-lab. Then a box will appear on the screen. It contains buttons like start, stop, database, camera name, camera size, selection of port etc. For creating the database, select camera name, port in which wireless camera is connected, size of image and click on database button. Then select the start button after which our camera will turn on. Then it will capture 70 frames of our face. Then according to our program, the system will extract the facial features. After which we can save the image with the desired name. In order to identify the person, click on the start button after which the system will compare the new captured image with the image in existing database. Then the result will be displayed on the command window of MATLAB. If the person is recognized then the name will be displayed on the command window, otherwise “unrecognized” is displayed.

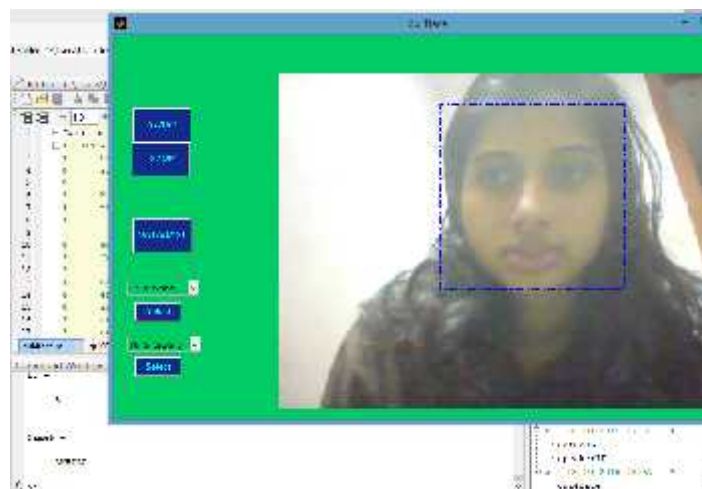


Figure 5. Simulation Result Of Face Recognition



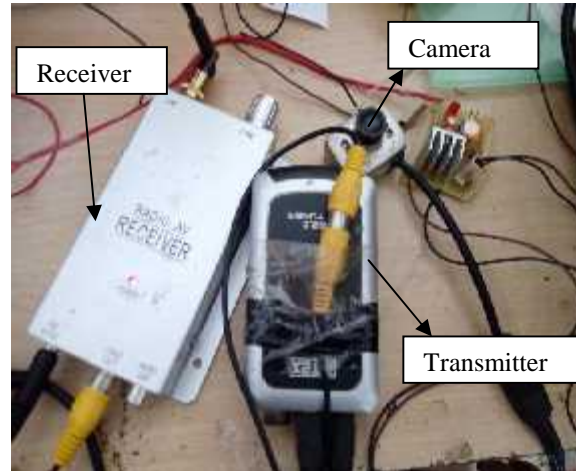


Figure 8. Camera Circuitry

### Discussion and Result

In this device, user authentication information is searched on the database first. If the user does not have any previous record registered to the database, the door will not be open and thus unauthorized entries will be avoided and If any unauthenticated person tries to unlock the door, then suddenly camera will take the photo of that person and image will be send it to owner via mail and along with that an alarm will also ring. If the owner is inside the house, then he can open or close the door by using voice .If the door is opened, it will be automatically closed after specifies time interval.

In this work we have successfully implemented a robust and efficient security system which can be applied to all the areas where security is required. The user can make modifications to existing database at anytime.

### Conclusion and Future Scope

Recent development in technology has made it more convenient for users. Overall the objective of developing the door security system based of speech recognition and face recognition has been achieved. The important thing in this system is that it can detect the presence of an intruder that enters the residential area of the owner and captures the intruder image to be used as evidence for identifying and capturing process. The image will be sent to the owner using zigbee technology.

In conclusion, this project has achieved all the stated objectives at the early stage of implementation. However, a few improvement need to done in the future so that we can modify existing database from remote placed using communication technology.

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