IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

A Comprehensive Study of Face Recognition for Security-Based Systems

Chethana Prasad K[1], Disha S[2], Divya TM[3], Sunil Kumar GR[4]

Student, ECE, K S Institute of Technology, Bangalore, Karnataka[1,2,3]

Assistant Professor, ECE, K S Institute of Technology, Bangalore, Karnataka[4]

Machine learning is employed in a range of computing tasks where designing and programming explicit algorithms with good performance is difficult or infeasible. Within the field of data analytics, machine learning is a method used to devise complex models and algorithms that lend themselves to prediction. These analytical models allow researchers, data scientists, engineers, and analysts to "produce reliable, decisions and results" and uncover "hidden insights" through learning from historical relationships and trends in the data.

- To create a secure system to authenticate users who are not completely blind.
- To create a secure password authentication system which uses Morse code.
- To make sure that the captured face should be detected and recognized by the system and should be validated.

To provide a platform for the people who have to enter a secured place by which they can create a secure private account to which only they can access. Our solution would allow persons to interact with devices and in this authentication is bit more increased by instead of giving some authentication code by keyboard. This project gives catch phrase and less using of hardware sensors which is using in nowadays.

Main Motivation for this project is to avoid frauds happening in bank or any government zones. Face detection provide better security compared to any biometric authentication. Camera is the instruments that measure the visual activities. This makes it possible for physically disabled users to interact with computers using their eyes. Our main motivation is provided authentication process for people from kids to old people, which includes physically challenged people.

I. System Requirement Specification

This document details the requirements for Management System for Distributed Environment. The software requirements shall be specified for all the phases of Management System.

3.1 Overall Description

A Software Requirements Specification (SRS) is a complete description of the behaviour of the system to be developed. It includes a set of use cases that describe all of the interactions that the users will have with the software. Use cases are also known as functional requirements. In addition to use cases, the SRS also contains non-functional (or supplementary) requirements. Non-functional requirements are requirements which impose constraints on the design or implementation (such as performance engineering requirements, quality standards, or design constraints).

3.2 Functional Requirements

The functional requirements for a system describe what the system should do. These requirements depend on the type of software being developed; the general approach taken by the organization when writing requirements. The functional system requirements describe the system function in detail, its inputs and outputs, exceptions and so on. Functional requirements are as follows:

- Time delay is minimized.
- Extracts the eye features efficiently.
- Provides faster GUI interaction
- Face Detection.
- Face recognition.

3.3 Non-Functional Requirements

Non-functional requirements, as the name suggests, are requirements that are not directly concerned with the specific functions delivered by the system. They may relate to emergent system properties such as reliability, response time and store occupancy. Alternatively, they may define constraints on the system such as capabilities of I/O devices and the data representations used in system interfaces. The non-functional requirements are as follows:

- Provide easy interface for physically challenged and disabled people.

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

- Provides maximum accuracy.
- Handles errors efficiently.

II. Methodology

Face Recognition:

The total system is divided into 3 modules- Database creation, Training the dataset, Testing, sending alert messages as an extension.

1. Database creation

a) Initialize the camera and set an alert message to grab the attention of the students.
b) Get user id as input
c) convert the image into gray scale, detect the face and
d) Store it in database by using given input as label up to 20 frames.

2. Training

a) Initialize LBPH face recognizer.
b) Get faces and Id's from database folder to train the LBPH face recognizer.
c) Save the trained data as xml or yml file.

3. Testing

Load Haar classifier, LBPH face recognizer and trained data from xml or yml file.
a) Capture the image from camera,
b) Convert it into gray scale,
c) Detect the face in it and
d) Predict the face using the above recognizer.

This proposed system uses Haar cascade algorithm for face detection which uses modified Haar Cascades for detection. Raspberry Pi is the main component in the project. We will be using USB webcam to capture photos. We can access System console either by using SSH in laptop. Firstly, the algorithm needs a lot of positive images and negative images to train the Haar cascades classifier. Positive images are images with clear faces where negative images are those without any faces.

4.1 Architecture

A dataflow diagram (DFD) maps out the flow of information/ data for processes or systems. They use defined symbols like rectangles, circles, arrows and text labels to show data inputs, outputs, storage points and routes used by the system. DFDs can be simple, hand drawn overviews to in depth descript descriptive diagrams that delve deeper into the flow of data.

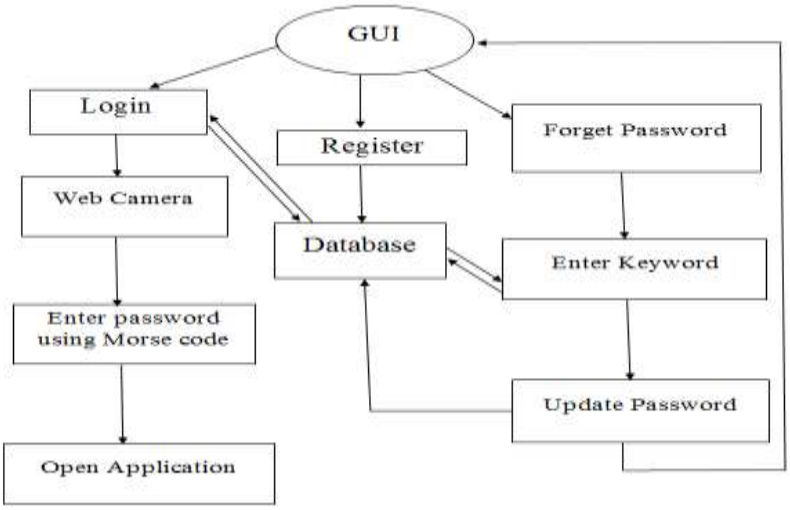


Fig .4.1 Dataflow diagram of the model

The above diagram represents the dataflow diagram of our project. With the GUI (Graphical User Interface) the user can register as a new user by providing the required credentials or log in if the user is already an existing user. After registration the details of the user is stored in a database. This database is checked for the user credentials when the user

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

logs into his account to verify whether the user exists or not. The webcam is used to identify the user and takes input of the password that is entered in the form of Morse code. The webcam converts the blinks generated by the user into Morse code. When the password matches then the required application is opened. In the case that the user has forgotten his password then the user needs to answer the security question for which the user had given a keyword at the time of registration. When the keyword is matched with the one in the database then the user can update the password with mouse clicks in the form of Morse code. This change is also updated in the database in real time.

4.2 Use case Diagram

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

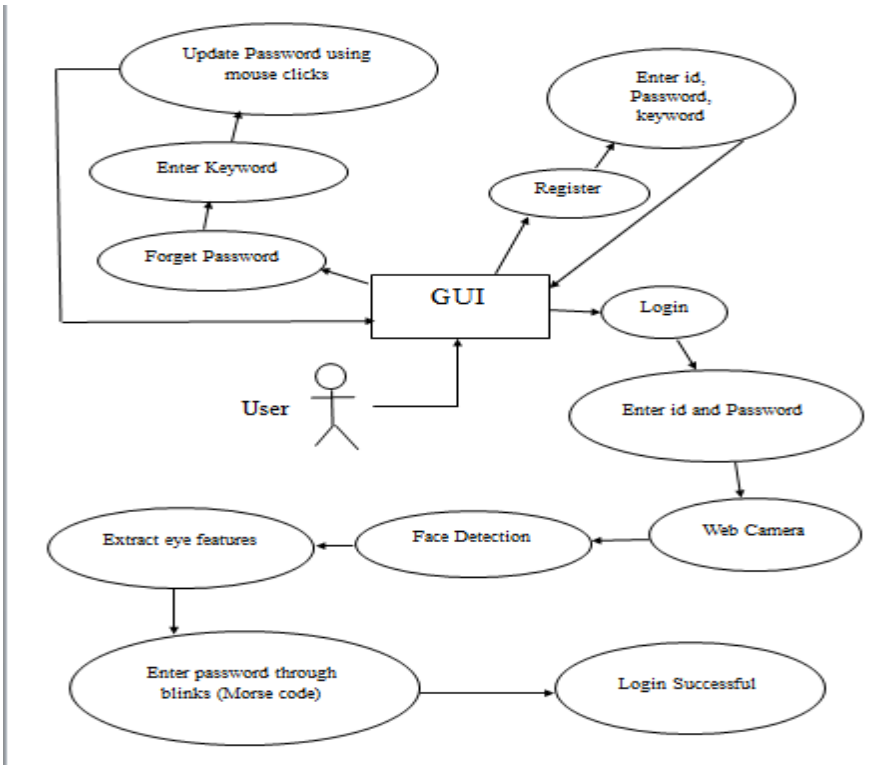


Fig. 4.2 Use Case diagram of the model

The above diagram depicts the Use case diagram for our project. When the user interacts with the GUI (Graphical User Interface) they can login or register themselves as a user. When the user is registering they need to provide a user id, password and a keyword. When the user needs to log in to their account then they need to enter their user id and password. Once they are recognized as genuine users then the web camera is launched. The webcam is used to identify the users face and it begins to extract the features of the eye in real time. During this time the user needs to enter their password in the form of Morse code by blinking their eyes. If the user is able to correctly enter the password then their login is successful. Suppose there occurs a situation where the user is not able to remember their password or wants to change their password then the user needs to answer the security question with the keyword that they had given when they had registered. When the keyword matches the password can be updated.

4.3 Sequence Diagram

A sequence diagram simply depicts interaction between objects in a sequential order i.e., the order in which these interactions take place. Sequence diagrams describe how and in what order the objects in a system function. Sequence diagrams are sometimes also called event diagrams, event scenarios and timing diagrams.

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

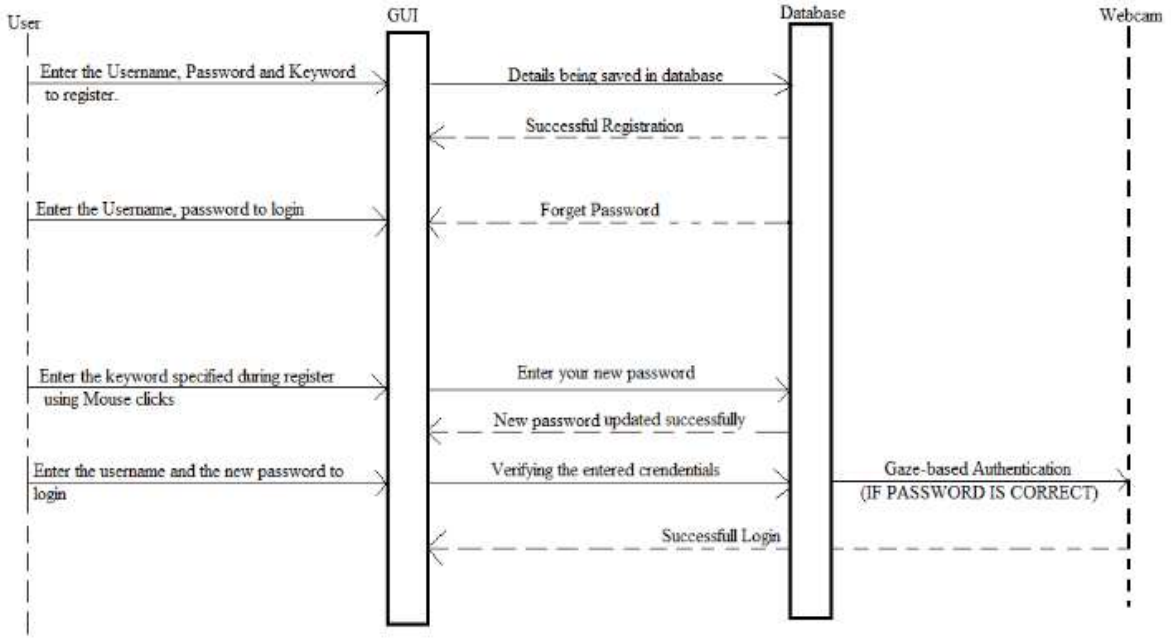


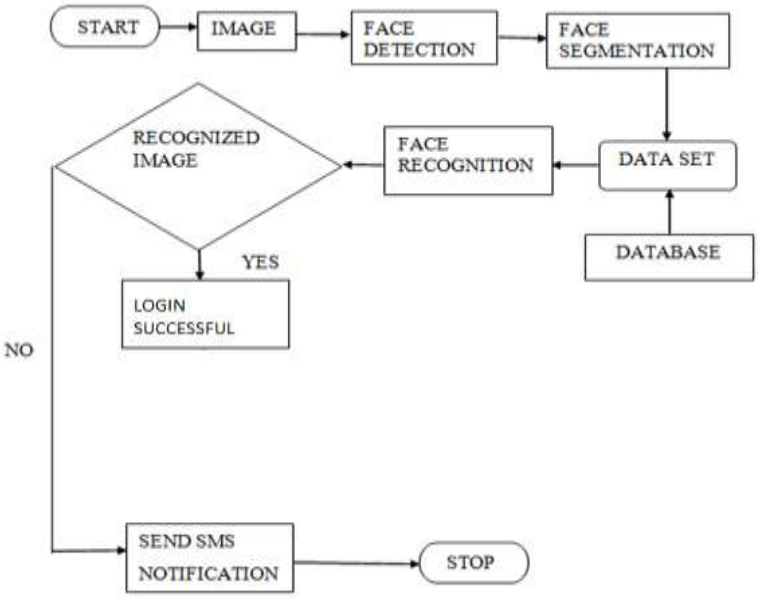
Fig 4.3 Sequence Diagram for the model

The above diagram represents the sequence diagram of the model. This diagram consists of three components. They are GUI, database(txt file) and a webcam. The User has to perform three actions here. First action is the register process, where the user has to enters the username, password and keyword. The communication is between user and GUI. After a successful register process, the second action is performed where the user has to login. If the credentials matches then the user can proceed through gaze-based authentication. Here the user has to blink his eyes to enter the password in morse code. If the user forgets his password, the third action is invoked where the user has to create a new password. The new password is created using mouse clicks.

Then the user can re-enter his credentials, if it is a match to the details that was entered in register, then the user can the password through gaze-based software.

4.6 Data Flow Diagram

1. Face recognition



IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

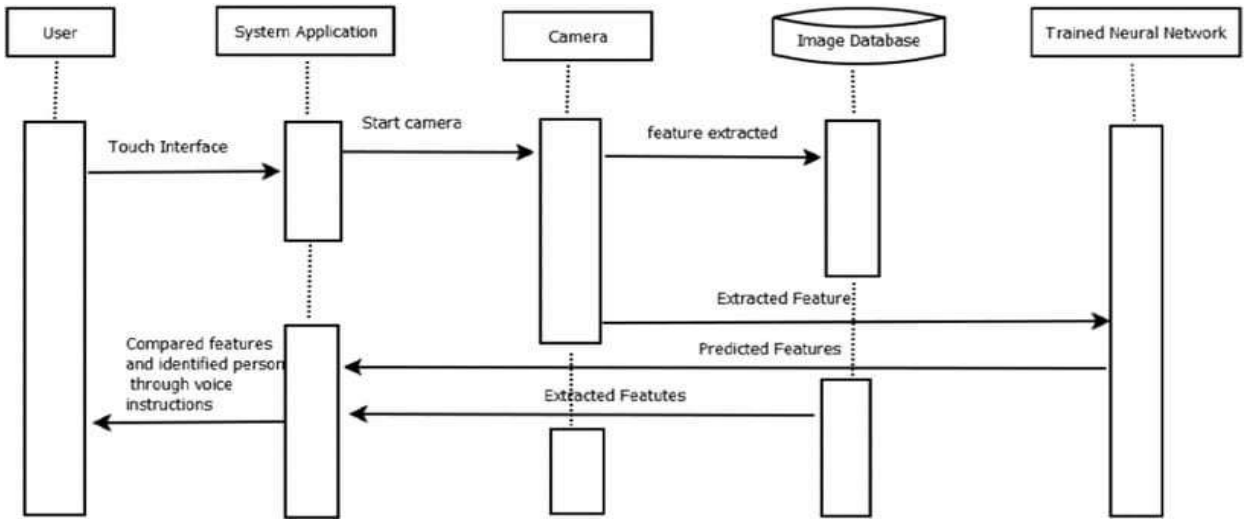
International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

4.7 Sequence diagram

1. Face recognition



5.1 Implementation processes

- Facial Landmark

Face landmark detection is the process of finding points of interest in an image of a human face. For example, we have shown the ability to detect emotion through facial gestures, estimating gaze direction, changing facial appearance (face swap), augmenting faces with graphics, and puppeteering of virtual characters.

To achieve this, the landmark detector must find dozens of points on the face, such as corners of the mouth, corners of eyes, the silhouette of the jaws, and many more. Many algorithms were developed and implemented in OpenCV. To run the face mark detector, a pre-trained model is required. This pre-trained model which we have used is shape_predictor_68_face_landmarks. The indexes of the 68 coordinates can be visualized on the image below.

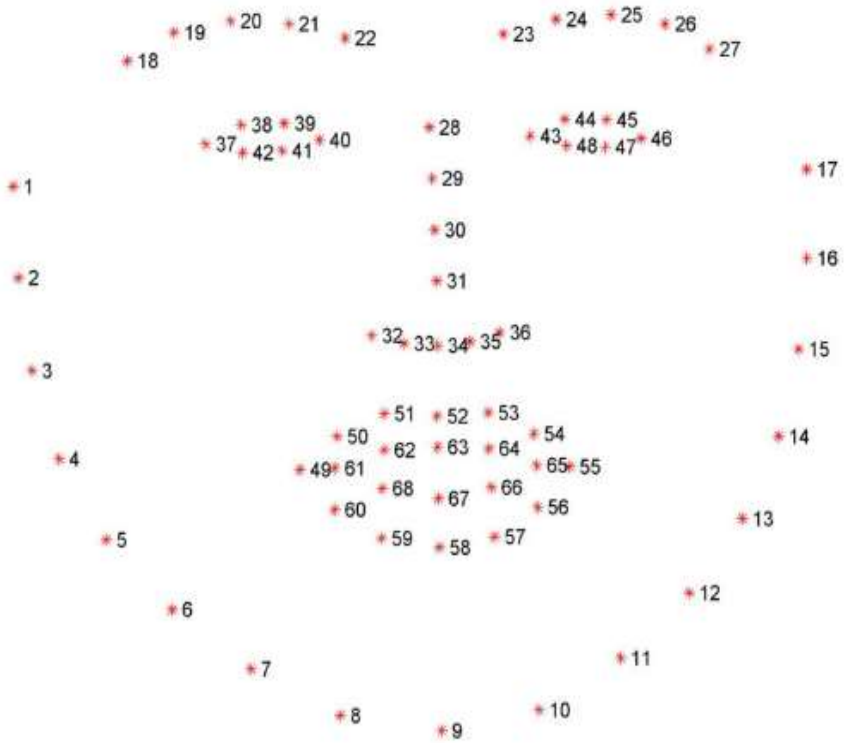


Fig 5.1 Visualizing the 68 facial landmark co-ordinates

IARJSET

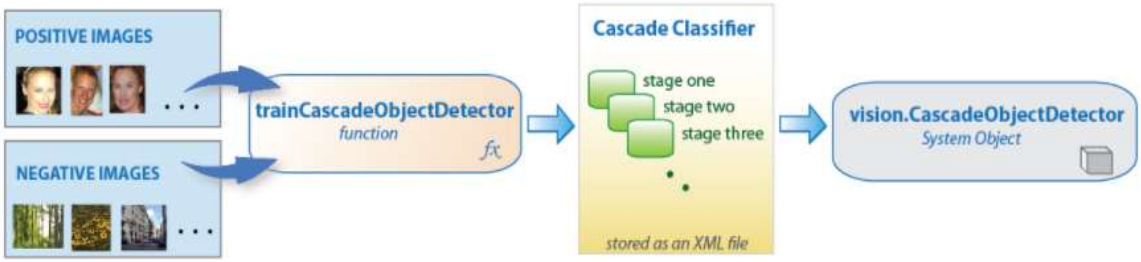
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

- *Haar-cascade Algorithm*



Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. It is well known for being able to identify almost any object. First step is to collect the Haar Features. A Haar feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums.

III. RESULTS

This chapter gives the outline of all testing methods that are carried out to get a bug free system. Quality can be achieved by testing the product using different techniques at different phases of the project development. The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components sub-assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement.

6.1 Test Environment

Testing is an integral part of software development. Testing process certifies whether the product that is developed compiles with the standards that it was designed to. Testing process involves building of test cases against which the product has to be tested

6.2 Unit Testing of Modules/Result:

- *Module 1: Registration*

Steps	Test Data	Expected Results	Observed Results	Remarks
Step 1	Enter Username	Successful	Successful	Pass
Step 2	Enter Password	Successful	Successful	Pass
Step 3	Enter Keyword	Successful	Successful	Pass
Step 4	Face Capture	Successful	Successful	Pass

- *Module 2: Login*

Steps	Test Data	Expected Results	Observed Results	Remarks
Step 1	Face Detection	Successful	Successful	Pass
Step 2	Face Recognize	Successful	Successful	Pass

- Module 3: Forgot Password

Steps	Test Data	Expected Results	Observed Results	Remarks
Step 1	Enter Keyword	Successful	Successful	Pass
Step 2	Enter New Password	Successful	Successful	Pass

6.3 Integration Testing of Modules

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 8, Issue 5, May 2021

DOI: 10.17148/IARJSET.2021.810562

Integration testing is a phase in which individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing.

6.3.1 Registration

This module consists the first page that the user sees to enter his credentials. The entered credentials (Username, Password and keyword) will be stored in a separate text file. This module is represented by using front end implementation of the project.

6.3.2 Login

In this module, the user or the admin enters his or her credential as per the details given in the register module. If the login is a success, the user can authenticate the password through gaze-based authentication. The conversion of eye blinks to morse code is represented by using back-end implementation of the project.

6.3.3 Forgot Password

In this module, if the user forgets his password, he can create a new password by entering the keyword presented in register module**.**

IV. CONCLUSION

With the improved technology comes different ways in which we can make our lives better and more efficient. This led to the introduction of many branches ,one of them is Data Science . To put it in simpler words Data science is the study of where information comes from, what it represents and how it can be turned into a valuable resource in the creation of business. Mining large amounts of structured and unstructured data to identify patterns can help an organization rein in costs, increase efficiencies, recognize new market opportunities and increase the organization's competitive advantage.

REFERENCES

[1]. Katie A. Hart, Jennifer Chapin, and Dr. Kyle B. Reed, “Haptics Morse Code Communication for Deaf and Blind Individuals” 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2016

[2]. Cheng-Hong Yang, Ching-Hsing Luo, Yuan-Long Jeang, Gwo-Jia Jon, A novel approach to adaptive Morse code recognition for disabled persons, In Mathematics and Computers in Simulation, Volume 54, Issues 1–3, 2000, Pages 23-32.

[3]. Albano Carrera, Alonso, Ramón de la Rosa and Evaristo J. Abril, “Sensing Performance of a Vibrotactile Glove for Deaf-Blind People”, Optical Communications Group, ETSI de Telecomunicación, Universidad de Valladolid, Paseo Belén, 15, 47011 Valladolid, March 2017, Spain; ejad@tel.uva.es

[4]. Shubham Oulkar1, Ram Bamane, Sagar Gulave and Pravin Kothawale, “Voice Controlled Home Automation Using Raspberry Pi 3”,Student, E&TC, Sanjay Ghodawat Institute,Atigre , India