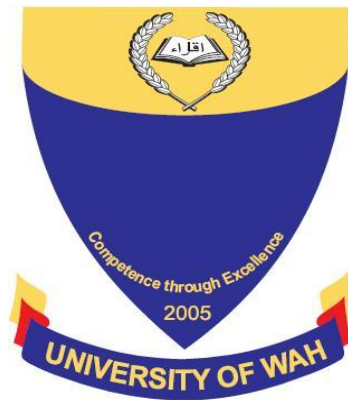# A Web Site: Talking Hands to Reduce Communication Gap with Hearing and Speech Impaired Persons

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Session 2014-2018

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A DISSERTATION SUBMITTED AS A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

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Undertacken

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Dedication

This Website is dedicated to my loving parents and teachers. Without their knowledge, wisdom, and guidance, I would not have the goals I have to strive and be the best to reach my dreams for professional goals
Thanks.

Acknowledgements

Abstract

The "A Web:Site Talking Hands to reduce communication gap with Hearing and Speech Impaired persons" is basically designed for persons who are impaired of speech and hearing as well as for normal people. This web site provides a platform for both categories of people to communicate even they don't know the sign language. Rather, there is a facility to learn sign language through this website. This web site consists of various parts, which include (a) Speech to sign/ video translation, (b) Text to speech conversion, and (c) Sign language learning. In speech to sign/video translation a normal person who doesn't know about sign language can speak with disabling person in the form of images and videos of sign. The second perspective is from text to speech, in which learned impaired people can talk to the normal person by typing text which is converted to speech. This website focuses on those people who don't know about sign language so, a learning system is also introduced in which a registered user can search and learn the signs. In addition, quiz option is available for self-assessment purposes of the learned sign language. Quizzes are in the form of multiple choice questions and one has to select the correct option in specified time. When a quiz is finished it is marked/ evaluated automatically. The website also provides our registered user to contribute to our sign language database by uploading their respective image or video with the description which is then picked by admin to allow to the general public. In this way, our database is also growing as our user increases. Another feature is that in case a user wants to give their feedback they can do by well-known social website Facebook.

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1. Introduction

1.1　Introduction

Sign language is the source of conveying the message for those people who can't communicate because of any natural reason, psychological reason or due to some disease. There are round about 70-80 million people depend on sign languages to communicate with one another but can't communicate to those people who don't know anything about sign language. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) report, only 5% of deaf children who have attended any special school for their education and other children which are approximately 950,000 have no access to special schools. According to UNESCO's 2018 report 1.4 million Pakistani's disables has no access to special schools. So they face many problems into their daily life while they want to communicate [1].

In the past few years, there has been increased interest shown by the researchers toward the reduction of communication gap with hearing and speech impaired people. For communication of special people to normal people, there is the number of electronic devices are introduced. These methods are distributed under two broad categories wearable communication devices and Sensor based communication devices.

Glove base method–is the most famous method in which the special person wears the glove and his movement of hands are translated by the system that what he wants to say [2]. Google a well-known organization also proposed a Wrist base communication system for special people which is just proposed concept till now which will translate the muscle movement into speak via android device [3]. Toshiba is also trying to make a sign language base robot who can reduce the barrier between the normal and special people [4]. WI-see Technology this concept introduced a wireless non-instrumental technology work on the Wi-Fi signals. The WIFI signal is deflected through the motion of hands in the air then different antennas receive the deflected frequency and in response system give the description of sign that is received in a text as well as in speech synthesis [5].

Our proposed system has two perspectives first perspective is to deal with the communication issue between the normal and special persons and second perspective's focus on the learning i.e. the person who doesn't know about the sign language can also learn the signs.

1.2   Motivation

This project is carried out in order to reduce the communication gap between the normal people and the deaf and dumb persons. Due to this disability of the persons they feel disconnected from community and the barrier of being hearing and speech impairment causes physiological issues. This project is designed to reduce the communication gap between such people. These people do not communicate with others even a layman don't have knowledge about sign language. We are highly motivated to enhance this project in future to make these people a useful member of our society.

1.3   Problem Statement

In nowadays where every field is revolutionized with computer science there is no reasonable development for those people who are unable to do their daily communication with other people. Like in Pakistan 1.4 millions of special people have no access to any of the institute for special people, also the equipment which are used for the purpose of communication are very costly and difficult to use as well as understanding its functionality. In addition, there is no interactive source for normal persons who want to know or learn sign language except books which is time consuming effort. The proposed system's main focus is to reduce the communication gap between special people who are unable to speak/ hear and the normal people. Moreover, users of this website can learn the signs so that they can learn the sign language without going to any institute. Following are the main objectives of our system.

- To develop a system which reduce the communication gap between the impaired and the normal persons.
- To develop a system that can help to learn American Sign Language effectively and efficiently.

1.4   Features

To address the communication issues the project provides two interfaces.

- Speech to Sign
- Text to Speech

Speech to Sign interface provides the facility for the normal person to communicate with the special persons. For communication person speak and his spoken words are then converted into specific American Sign Language sign(ASL) so, the impaired

person can understand that what normal person want to tell to him. If normal person speaks a single word our system shows the corresponding ASL image, however if sentence is uttered then system shows the relevant video.

Text to Speech interface provides the facility to speech impaired people so to communicate with normal one should have to write text in the English language then system converts it to the speech in this way the normal person can hear the message of impaired person.

In our system learning, we have also included following two interfaces.

- Learning
- Evaluation

Learning interface provides learning for those who don't know sign language so the person who wants to know the specific sign have to write that specific word or sentence and system searches the database and provide the relevant sign relevant to input the learner had entered.so in this way one can easily learn the sign language without going to any specialized institution or taking any special classes.

The evaluation section includes the Quiz section so the person who had learned the different sign can evaluate his self by giving a quiz. Quiz includes multiple choice question (MCQs) in which different pictures of different ASL signs are given and the learner has to select the correct one. Quiz also includes a timer so learner should have to complete his/ her quiz in proper given time. This section also apply the scoring system so one can be evaluated on the basses of right or wrong answers that have been selected by the user.

1.5   Thesis Organization

Chapter 1 has the basic introduction of our web site which e.g. brief explanation of speech to sign for deaf to communicate with normal person and for dumbs to speak with normal person chapter 2 has all the literature review from which we have go through. Chapter 2 has the problem analysis of the system. Chapter 4 has analysis of our system which includes UML diagrams e.g. Use case, system sequence diagrams and fully dress use cases chapter 4 also includes system design which has diagrams of our systems e.g. SD (sequence Diagram) and Class diagram. Chapter 5 has brief detail about implementation of our system. Chapter 6 has detail about testing of our system

on different browsers and devices. Chapter 7 has user manual .Chapter 8 has conclusion and future work.

2. Literature Review

Many studies have been carried out in order to reduce the communication gap between the normal person and the deaf and dumb people. Different methodologies are used by different people in the field of communication between the deaf and the normal people. There are two types of systems used for the communication purpose.

- Wearable Communication Device
- Online Learning System

Wearable communication systems involves the glove based system which was invented 30 year ago and research is still continuing. E-learning environment is one of the most used techniques for educational purpose of Deaf and hard hearing person. Researches on the usage of the e-learning environment for hearing impaired students started from the year 2005 and still it is going on to make it more effective. With the advantages of different systems there are also some limitations of the above category systems which are discussed below. These system have different functionalities and methods and have different principles on to which they are working. Some of the systems are given below.

2.1 Deaf Mute Communication Interpreter

In this research paper, Saraswathi et al. [6] proposed different kinds of interpreter used in communication system for deaf and dumb persons. These interpreters includes the Wearable Communication Devices and the Online Learning Systems. Wearable Communication devices includes the Glove base System in which user wear a glove and uses it as interpreter to communicate with the impaired person using different sensors like Flex Sensors, Tactile Sensors along with Accelerometer, Controller and Text To Speech Conversion Module embedded on glove. Glove base system improves the ambiguity of gesture made and thus improves the effectiveness of gesture for deaf person. On the other hand Learning base System includes SLIM Module, TESSA, Wi-See Technology, SWI_PELE System (Secure Wireless Infrastructures and Personalized Educational Learning Environments) and the Web Sign Technology.

Following are some of its components on which that system perform its different functionalities for the purpose of communication.

2.1.1 Flex Sensors

Five flex sensors are used which measure the angle of each finger. By bending the finger the sensor produce resistance in relation to voltage and the magnetic field.

2.1.2 Tactile Sensors

These sensors consist of two pins among which one is grounded and other is of +5volts. These pins were used in order to improve the accuracy of the words.

2.1.3 Accelerometer

It uses the low pass filter and temperature compensation to get the output voltage proportional to acceleration.

2.1.4 Controller

The most important part of the system includes ADC module that converter analog signal from sensors to digital signal.

2.1.5 Text To Speech Module

This module converts the input gesture into voice by the use of encoder and microprocessor that has various. The system proposed in the above work is hardware base system and it uses expensive components for its functionality however, our system is fully software based and need no additional hardware to work

2.2 Full Duplex Communication System for Deaf & Dumb

In this system, Ghorpad, et al. [7] proposed artificial speaking mouth for dumb people in which the recognition of Sign Language and converting it to voice signal. Automatic speech recognition system is also use to change the speech to text and sign language. The system includes two parts Image to sound conversion and Voice to image conversion. Image to sound conversion includes Extraction Method, Features Extraction and Gesture Classification for the normal person to understand the gesture. While on the other hand, Voice to image conversion includes Acoustic preprocessing, Feature Extraction using MFCC and Speech-Recognition Algorithm for impaired person to communicate with the normal person.

a) Extraction Method Segmentation

b) Features Extraction Feature Vector on segmented image like fingertip etc.

c) Gestures Classification Classification and matching of input.

2.2.1 Extraction Method

This method involves the segmentation of input image into regions depending on the tracking information such as skin color, shape using tools such as Kalman filter.

2.2.2 Feature Extraction

Feature vectors of the segmented image are extracted in this process by the use of method "hand contour and silhouette". Segmented image is divided into different block sizes and each block represents the brightness measurement in the image.

2.2.3 Gesture Classification

This method was used to classify the gesture. By the use of Euclidean distance metric, gesture was classified. Statistical tools used for the classification are "HMM tool, Finite State Machine (FSM) and Learning Vector Quantization, and Principal Component Analysis (PCA)". Neural networks are also used for the classification of the gesture in many other devices.

This system is also hardware base system and uses Glove that impaired person has to wear. Flex sensors are used in this system. This system is uni-directional communication however our developed system is provides bi-direction communication and fully software based.

2.3 Hand Gesture Recognition And Voice Conversion System

In this research paper, MONISHA.J et al. [8] proposed a Human Computer Interface system that understands sign language to ease impaired people to communicate with the normal ones. This system has a digital glove, which includes CMOS camera, Flex sensors, Leaf switches and cupper plate to generate a digital pattern, which helps in showing the signs for a particular pattern. This system also has a transmitter and a receiver. Transmitter includes the Digital Glove, Microcontroller and the RF Transceiver, which generate a digital pattern and send it to receiver to generate particular text. Receiver includes UART receiver pin, Micro controller, a Module and LCD Display to display the text received by the transmitter. This text is than convert to speech and at last played by speakers.

Following is the algorithm of the system

2.4 Algorithm

Following are sequence of steps use by the following system

- **Step 1** - start

- **Step 2** - read digital pattern from gloves

- **Step 3** - Send characters for corresponding patterns toRF transmitter

- **Step 4** - Receive text from transmitter via UARTreceiver pin

- **Step 5** - Display text on LCD which was enclosed withgestures 'S' and '.'

- **Step 6** - Send that data to emic module via UARTtransmitter pin
- **Step 7** - Text to voice conversion
- **Step 8** - Play voice output

2.4.1 Limitations

- Wireless Data-Glove and Metal Strips (Hardware)
- Other hardware like Leaf switches based glove, CMOS camera.
- Our system is overall software based system.

2.5 Smart Communication System for Deaf-Dumb

In this research paper Masieh et al. [9] proposed a system, which overcome the database issues of the previous systems. This system has several other language like Arabic Sign Language and Arabic Vocal Language. This system includes Xbox 360 Kinect camera and sensor, Image Processing Based Language Converter system using a computer webcam to convert RGB images to binary and 4 flex sensors having an accelerometer in each hand for hand motion detection [10] along with voice and LCD module for output. System works on the two parameters among which first the fingers position using compressive sheet and second hand orientation indicated by the accelerometer. The data from compressive sheet and accelerometer is match with the memory loaded with the sign language database.

System components includes

- Arduino Nano.
- Arduino Mega
- Compressive Sheet
- Accelerometer.
- Rechargeable Batteries.
- RF Module.
- Speaker & LCD.

2.5.1 Limitations

- Accelerometer and Sensors (Motion Detector)
- Hardware like Xbox 360, Kinect camera and sensor etc.
- Our system is totally software based system

2.6 Sign Language Recognition System for Deaf and Dumb

In this research paper, Goyal et al. [11] proposed system in which, real time image is captured first and then extraction of features takes place to identify which sign has been articulated by the user using SIFT (scale invariance Fourier transform) Algorithm. As purposed by the author their system give 95% accurate result for nine alphabets taken from different sides of Indian Sign Language. The proposed algorithm consist of four steps, which are Image Acquisition, Feature Extraction, Orientation Detection and Gesture Recognition. First image is capture and features of that image is extract. Those features are than match with the image in the database using SIFT function by using comparison and finally find the highest key points matching image.

Proposed system includes

2.6.1 Image Acquisition

In this step hand gesture made in front of the camera & frame capture function is used to create a still image from real-time video capture.

2.6.2 Preprocessing & Segmentation

This still image is converted from video frame format to RGB color Model Format for further processing. After obtaining RGB image, it is converted into gray scale. From converted gray scale image interest points are detected using SURF. Interest points of captured image & reference image stored in database is detected.

2.6.3 Description & Feature selection

After feature detection, features are extracted from captured image as well as from reference image. Feature extraction is also refer as feature description. Extraction of features are done using SURF.

2.6.4 Matching

The final step is matching. Matching reference feature and reference points between reference images and input image i.e. captured image with closest match using Minimum Euclidean distance.

The above system uses the Vision Based approach and recognize only the 26 words using SIFT function and have limited database. Our system recognizes all the gestures and images which are in the database of the system. Our database is not limited.

2.7   Image Processing based Language Converter for Deaf and Dumb

In this research paper, Boraste et al. [12] proposed method in which RGB covert to text message. The system consist of two module. Capture color image is convert to gray scale image, which is convert to binary form using coordinates of the image. The system also have two modes, first is Training mode, which is a part of machine learning where we train our system to accomplish the task to implement and the second is Operational mode. This algorithm of the system was implement in C# and .Net using various images captured by the web camera. After the image is capture, different pixels value is calculated and binary image is form. Pixel values are match with different colors to get the text behind those colors i.e. Red color will have an alphabet 'A'. This system also convert text into voice by using speech synthesizer so that blind people can also communicate.

 This system include the following steps in it.

- **RGB Color Recognition** Webcam captures red image. This image will be converted to binary image.

- **Color calibration RGB Adjust software** After the image is captured, pixel values are calculated

- **Conversion of Image from Color to Binary** From the pixels binary values of the image are used for further processing.

- **Coordinate Finding** The above pixel are termed as marker pixel and will be highlighted as white color pixels. From here area for the each color is generated.

- **RGB to Text Conversion** In this process different color are used by deaf and dumb to talk and generate the output as text. For example the red color can be termed as 'a'.

Above system totally work on image processing and uses different techniques in order to get the gesture in order to do communication and it is one way communication. Image processing is not a part of our project but it will be beneficial for both the normal and the impaired person.

2.8   Hand Gesture Recognition System for Deaf and Dumb People Using PCA

In this research paper, Kakde et al. [13] Proposed a system, which recognize nine gestures from sign language using MATLAB. Using YCbCr color transformation

model, features are extract from the captured image using web cam. PCA algorithm is use to recognize sign. PCA compared feature of captured image with the training database to calculate minimum Euclidian distance. Finally, recognized output is convert into text and speech. Step in this system are Image capturing, Color separation, Morphology, Gray Scaling and Thresholding, Binarization, Feature extraction, Recognition and Sign to Text or Text to Speech. The system give high accuracy and output was in form of text and speech format, which helps in reducing the communication gap between normal and impaired people.

- **Database Creation** In this process 100 images are used which are used as 10 images for 10 signs. High resolution camera was used in this system. These 100 images were used as the training and the testing database.

- **Preprocessing**   This process includes the functions like transformation, thresholding, morphology and the binarization. RGB captured image is segmented to YCbCr color transformation where Y is illuminance, Cb and Cr are chrominance (hue, saturation). The standard size of the image was set to 200 x 200 pixels. Noise was add during color transformation so to remove the noise median filter was used by the system. After removing noise or morphological process threshold detection of hand was carried out to separate the object and its background and image is converted to binary form. In binary form image represent the features which are used for the sign recognition. After the binary conversion of the image or the binarization, again the morphological operations are apply to filter out the noise and smooth image is obtained.

- **Feature Extraction and Recognition** PCA was applied on the training set to extract the most significant features of the image.

Steps involve in the system

- Image Acquisition from webcam
- Color separation.
- Morphological Operation.
- Gray Scaling and threshold.
- Binarization.
- Feature Extraction.
- Recognition of gesture.
- Sign to Text and Text to Speech.

Feature extraction involves the following steps.

- **Step 1** Convert the all result image into the column matrix as 'T'
- **Step 2** Calculate the Mean Column Vector 'm' for 'T'.
- **Step 3** Computing the difference for each vector set Ai = Ti– m where (i=1, 2 …N)
- **Step 4** Calculating a covariance matrix C=A*A'
- **Step 5** Calculate eigenvalues and unit eigenvectors of the covariance Matrix 'C'.
- **Step 6** Sort the eigenvalues.
- **Step 7** Solve the mapping eigenvectors and project data on Eigen space for matching [13].

The above system also uses the external hardware like Web Camera and digital image processing techniques like morphological operations, thresholding etc. Our system works on Text to Speech and Speech to Sign APIs. No methods of image processing are being used in our system.

2.9   Real Time Sign Language Processing System

In this research paper, Seth et al. [14] proposed real-time autonomous system using American Sign Language. The system includes five main objectives. First is to be able to recognize the gestures by figure spelling, second is to be able to show letters or numerical digits or some special characters as output, third is to be able to show relevant sign language from the text file, fourth is to be easy to use fifth is to make use of existing hardware. The system is divide into three modules Image Processing module, Training module, Gesture Recognition and Mapping module. Image processing module takes the image via webcam surrounded by four red LEDs and scan through all the pixels of the image. If the image lies in pre-defined pixel value range, make it white or else make it black. If the area of largest white region is less than predefined threshold, move the white region and stop else keep the white region and extract sign shown by the user. Extracted gesture is send as input to the gesture recognition module. Gesture recognition module compare the extracted gesture with all perceptron. If a match found, the relevant letter is display at the screen.

Modules of this system are

- Image Processing Module.

- Training Module.
- Gesture Recognition Module.

2.9.1 Algorithm

Following are the sequence of steps of this system.

- **Step1** Image capture by the webcam.

- **Step2** Scan all pixel of image. If the pixel lines in pre-defined range, make it white else make pixel black.

- **Step3** Area in the white connected region are checked.

- **Step4** Keep larger white region and remove the smaller one.

- **Step5** If the white region is less than the pre-defined area-threshold, then remove the white region else keep the white region and it is the extracted gesture. Send this gesture to gesture recognition module.

This system also involves Image Processing but the above system is limited to the finger spelling method. This method is not the practical processing in the communication with the deaf and dumb. It is also time consuming system to process the gestures. Proper words and sentences are the used but if there is the incorrect of sentence or the sequence the system will no work properly. Our system is fully functional to make communication between deaf and dumb and the normal person.

2.10 Android based Portable Hand Sign Recognition System

In this research paper, Raheja et al. [15] proposed a system, which based on Android or for mobile phones. In this system, frames taken as input from camera and check, whether the frame recognize any gesture. Match the gesture from database using PCA (Principal Component Analysis) and then find the meaning of gesture in the form of text. Text is then convert to speech and get the command in the form of audio. Like face recognition, which is inherently a classification problem in a high dimensional feature space, we also treat the recognition of hand gestures as a problem in the field of pattern recognition, and indeed, many techniques has proposed in this area. PCA is a standard tool in modern data analysis in diverse fields from neuroscience to computer graphics - because it is a simple, nonparametric method for extracting relevant information from confusing data sets. Steps involve in this system are as follow.

2.10.1 Algorithm

Following are sequence of steps for the following system.

- **Step1 -**Static frame as input from webcam if the process recognize the hand gesture, proceed else take another frame.
- **Step2 -**By Principal Component Analysis (PCA) match the gesture from the database.
- **Step3 -**Take/find meaning of the gesture in the form of text.
- **Step4 -**Convert text to speech and get command in the form of audio.
- **Step5 -**From audio device, capture the frames.
- **Step6 -**Send frames to the server.
- **Step7 -**At server use MATLAB to read the frames.
- **Step8 -**If the frame is recognize as hand gesture, proceed for further step else again capture frames from audio device.
- **Step9 -**Again by PCA match the gesture from the database.
- **Step10 -**Find command corresponding to matched frame in form of text or audio.

Processes in this systems are as follow.
- Image Acquisition.
- Edge Detection.
- Hand Token and Recognition**.**

Above system is android based and work on phones or the devices which have android as its operating system while our system works on all platforms because it is web base application and work on all Operating System. Above system also uses image processing in order to form a gesture.

2.11 Aawaaz A Communication System For Deaf And Dumb

In this research paper, Sood et al. [16] proposed to develop a system, which serves the purpose of communication flexibility and absence of proper teaching centers of sign language. This application server as sign language, medical application, automated home. This system includes the features like Input image as RGB, Skin Segmentation, Morphological Operations, Region of Interest, Feature extraction of image and matching, Recognition, Display in Text. Like all other system this system also take image as input, extract its features, match it with the feature of images in the database and recognize the relevant text corresponding to that taken image and showing it as

output. Skin segmentation is done by Hue-Saturation-Value (HSV) histogram. It consist of all illumination changes while Feature are extracted by the Harris Algorithm which detect the necessary interest points in the form of a Nx2 matrix, where N is the number of feature points.

Process involve in the system are

- Image Acquisition
- Skin Segmentation.
- Features Extraction and matching with the database.
- Display text or audio**.**

Flow of the system is as follow

- Take image as RGB image.
- Skin Segmentation of the image.
- Apply the morphological operation in order to remove the noise from the image at the process of skin segmentation.
- Detect the region of interest.
- Feature extraction of the image and matching with the database. If the features matches the gesture in the database recognize the gesture and show the result saved show the corresponding text or the audio to that gesture, else show the message that no image has been found try again.

Aawaaz system uses Indian Sign Language and have the limited database that is it can detect only the 26 ABC words of Indian Sign Language but our system have unlimited database and we can increase it by putting the Gestures and images to the database. Our system is not limited.

3. Problem Analysis

Without communication no one can deliver ideas to others. People use languages to communicate with others. Languages are of different kinds based on the areas where they are spoken. There are some languages which are used by the impaired people to communicate with each other. Normal people also learn these languages to talk with the impaired people and communication with the impaired people have now become very important. In past impaired people felt shy while communicating with the normal person but now as they are working and performing their duties side by side to the normal person so communication have become very important for the normal persons as well as the impaired ones

This section deliver the basic introduction and background information about the application "Web base Application System for Deaf and Dumb people". This section will also be explaining all the phases from which the system is developed and designed. System includes several phases like Speech to Sign, Text to Speech phase. System will also be beneficial for those who want to learn the American Sign Language and to evaluate the knowledge about the American Sign Language. System will also be including the feedback portal for the users to give the feedback in order to improve the website.

3.1   Purpose

Communicating with impaired people like deaf and dumb have been become very difficult for those who are not familiar with the Sign Language used by the deaf and dumb person. Our target is to develop an application which overcome the barriers between the impaired persons like deaf and dumb and the normal ones. Traditional techniques like learning by books is very difficult because everyone don't have access to the book as well as everyone also don't have much time to read every book on every language. The purpose to design this application is to overcome the communication gap between the normal persons and the impaired people. This system is also designed for the people who want to learn American Sign Language. This system will not only be covering the communication system but also help others to learn sign language. System not only targets the impaired people but also the normal ones or the users who want to learn the signs. This system will also be very effective for those who have some knowledge about the American Sign Language because Quiz competition is also added to the purposed system in which user can take part in Quiz competition and evaluate him/herself by getting the result by the system. User can also add account to the system,

to add signs and contributes to increase the database of the system. There will also be a section to give feedback to the system. Users can help the development team by giving them relevant feedback on the system functionality.

3.2   Reading suggestions for the audience

Users, Project managers, Documentation writers and Developers can get relevant information from this section. This Software Requirement Specification explains the functionality of the system and how text to speech and speech to sign perform responsibilities in overcoming the communication gap.

3.3   Product Scope

For an effective communication among deaf and dumb people and normal people this application can be beneficial because this application not only gave the functionality of the communication but we have also incorporated the learning mechanism in our application. This factor can help the user either the deaf or dumb or the normal person to learn different kinds of signs by looking at them, search for particular sign or by uploading the American Sign Language signs or videos in to the database. This application is not the communication system but it is also design to set the learning platform for the people of different types. Users can register themselves in the application but moreover the unregister users can also visit our website. Learning will not be possible for the unregister user but they just only use the application for only the communication purposes. Application targets the people who want to communicate or to learn the American Sign Language.

3.4   Product Perspective

Effective communication is the main goal of our application because to let someone understand what actually we are trying to say become challenging for us and if there is the possibility to let the impaired person to understand our talk, it become more challenging because we often don't have ideas what is the specific sign of particular word. System will help the user to speak and relevant sign will be shown or the user can speak the relevant text will be shown. Learning the American Sign Language is also a part of this project.

3.5   Product Functions

There are major two functions of our project which are discus below

3.5.1 Text to Speech

This functionality will help the user to speak and when he finishes the relevant text of the speech will be shown in the text area of the application. This can be helpful for a person who want to communicate with the dumb person only.

3.5.2 Speech to Sign

This functionality will be helpful for a user who want to communicate with the person who is deaf. Speech will be given as input while the relevant sign or the picture will be the output of that particular speech.

Others functionalities includes the learning phase. In this phase user can register him/her-self into the application and get the access to the learning page. On learning page user can learn the American Sign Language by looking at different sign, or by search for signs or by helping others to know the signs which he/she know in the way to upload the sign by giving user id and the description and verifying him/her-self by the application. There is another part to the learning phase which is called as quiz. In this section we have managed a quiz competition in order to help user to evaluate him/her-self, which he has learning from learning phase.

3.6 Characteristic and user Classes

Main user classes that are used in this system are described below

- Text to Speech
- Speech to Sign
- Learning System
- Quiz Competition

3.7 Operating Environment

3.7.1 Operating System

Our system is developed and designed on Visual Studio. It is web base application and can be run on every operating system. Linux, Windows and Mac OS can use this application because it run onto server and can be used by any operating system which have an active internet connection.

3.7.2 Tool packages

This application is design on Visual Studio Professional. Visual Studio is the Microsoft tool which is used to develop different applications. It is highly used by developers to develop different kind of applications.

3.8 Design and Implementation

3.8.1 Portability

As it is web base application, so it can be opened on every platform i.e. Mobile, Personal Computers etc. But the device should be connected to internet.

3.8.2 Platform dependency

Visual Studio is the tool of windows but it coding versions are also available on Linux and Mac so it is designing is and implementation of the application is not platform dependent.

3.8.3 Authentication

Visual Studio is closed source programing tool. To work professional we have to pay for that so we need some authentication to use this tool.

3.9 System Features

Following are the major features of our system.

- Text to Speech
- Speech to Sign
- Text to Sign
- Learning
- Quiz Competition
- User Registration
- User Login
- Admin Panel
- Uploading Images

3.10 Functional Requirements

Functions requirement are as follows.

- Input of Speech and getting the output image or video.
- Input of speech and getting the output as voice.
- Input as text and getting output as Sign.
- Learning by different signs.
- Participating in the quiz to evaluate the learning.

3.11 Non-Functional Requirements

Functions requirement are as follows.

- Performance Requirements.
- Application Quality Attributes.
- Reliability.
- Portability.

3.12 Feasibility Study

Feasibility study shows that whether the proposed system is feasible and will meet the requirements of the user effectively and efficiently.

3.12.1 Financial Feasibility

The tool which is used in the development of the application is not so expensive as well as trail versions of visual studio is also available in the market. You can also download the trial version. So the outcome of the application is low although the tool is paid. So the project or the system is feasible economically.

3.12.2 Technical Feasibility

As it is web base application so it can be run on every device which have an active internet connection. Devices like mobile phones and laptops can use this application or it can be run on to every device.

4. System Analysis and Design

System analysis basically study of our system, identification of the problems, and collection and interpretation of facts, more precisely in system analysis our system is decomposed into sub components so they can be study and their clear objective can be clarify.

4.1   Specific Functional Requirements

Functional requirements include functions performed by different web pages in it the basic functionalities of different web pages are discussed. All the functionalities that system should have to perform according to the requirements. These are the requirements that must be completed by any system.in our system some of them are mentioned below.

- Speech to sign
- Text to speech
- Learn the sign
- Quiz (etc.)

4.2   Use Case Diagram

This diagrams is use to represents the interaction of user to the system. A single system can have different users so their interaction also vary accordingly. For example manager manages the users in our system while on the other hand user can use other features which are allowed.

4.3   Admin

Manager has authority to check the activities of user for example if someone try to upload number of irrelevant pictures so managers can see him and can delete that user.

4.4   User

 User can be visitor i.e. a normal person visit website for use the speech to sign module so can communicate with deaf or deaf to communicate with user. Or a person want to contribute to our database.

4.5 Usecase Diagram
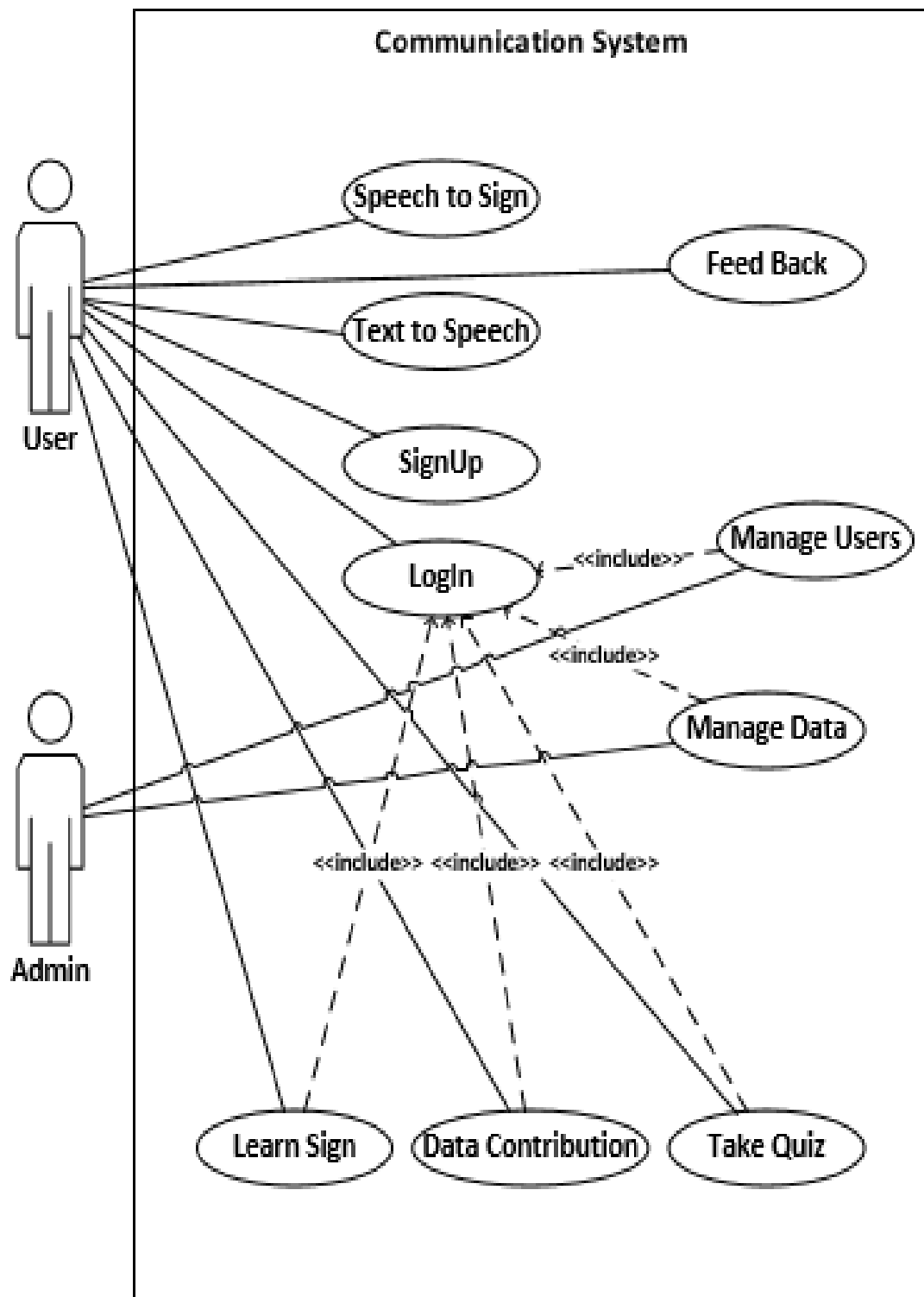
Figure 4.1 Usecase Diagram

Fully Dressed Use Cases and SSDs

4.5.1   Fully Dressed Usecase for Sign Up of the User

Use Case UC1 Sign Up of user

o   **Scope** Website

o   **Primary Actor** Normal Person, Imapired Person.

o   **Stakeholders and Interests**

o   **Normal Person** Person who is normal and want to communicate with the deaf and dumb person.

o   **Imapired Person** Person who is deaf and dumb and want to communicate with the normal person or want to learn signs of American Sign Language.

o   **Preconditions** Normal person or the imapired person is not registered and have no account.

o   **Sucess Guarentee** Normal person or the imapired person is registered and have an active account..

o   **Main Success Scenario**

1.   Normal person or the imapired person enters username, password, re-password,

2.   System match the password

3.   User enter email.

4.   System validates email.

5.   User is registered.

o   **Extensions**

*a. Registration cannot be complete.

            1. Invalid Username or Password

1a. Enter correct username and password.

            2. Password not match.

                    2a. Enter correct password both of time i.e. password and re-password.

            3. Incorrect E-mail

                    3a. Enter correct email.

o   **Special Requirements**

o   User interface of system.

o   Language and wording must cleared.

o **Frequency of Occurrence**

o Could be single time.

o **Open Issues**

o Is E-mail already in use?

o Is the device is connected to internet.

4.5.2 System Sequence Diagram For SignUp
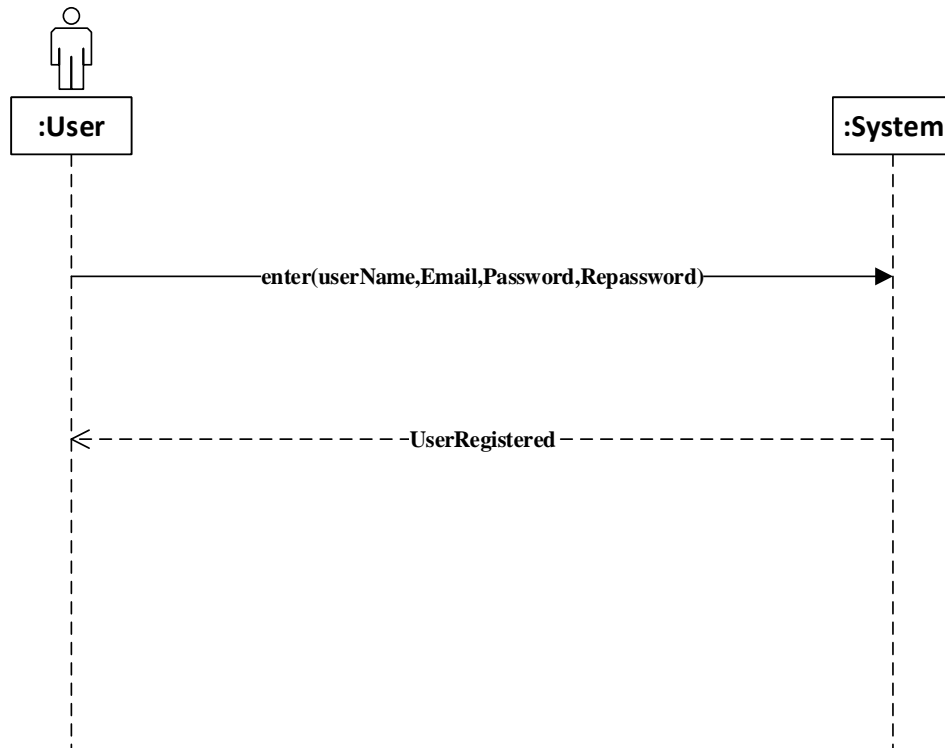
Figure 4.2 SSD For SignUp

4.5.3 Fully Dressed Use case For Login of User

Use Case UC2 Log in

o **Scope** Website

o **Primary Actor** Normal Person, Imapired Person, Admin.

o **Stakeholders and Interests**

o **Normal Person** Person who is normal and want to communicate with the deaf and dumb person.

o **Imapired Person** Person who is deaf and dumb and want to communicate with the normal person or want to learn signs of American Sign Language.

o **Admin** Person who is managing the system.

- o **Preconditions**
- o Person should have registered before.
- o Person should be connected to internet.
- o **Sucess Guarentee** User will be logged in.

- o **Main Success Scenario**
- 1 Person enters the email and password.
- 2 The System verifies all of the given information and successfully and log in the person

- o **Extensions**

a* At any time server is down.

1. All the given information is lost.

1a. Person waits for server up and perform all the processes again.

b* At any time application is closed.

1. Person open the application and repeat all the steps again.

1a. Person enter invalid information.

1. Person is request to enter valid username or password.

2b. Any required field is missing.

1. Person enters valid information to required field.

- o **Special Requirements**
- o Language should be understandable.
- o Interface should be interactive for example mobile or web interface.

- o **Frequency of Occurrence**
- o Could be continuous.
- o **Open Issues**
- o Should any option given to person to contact Admin?

o   Should any option given to user to report for poor interacting interface or sign availability issues?

4.5.4   System Sequence Diagram For Login
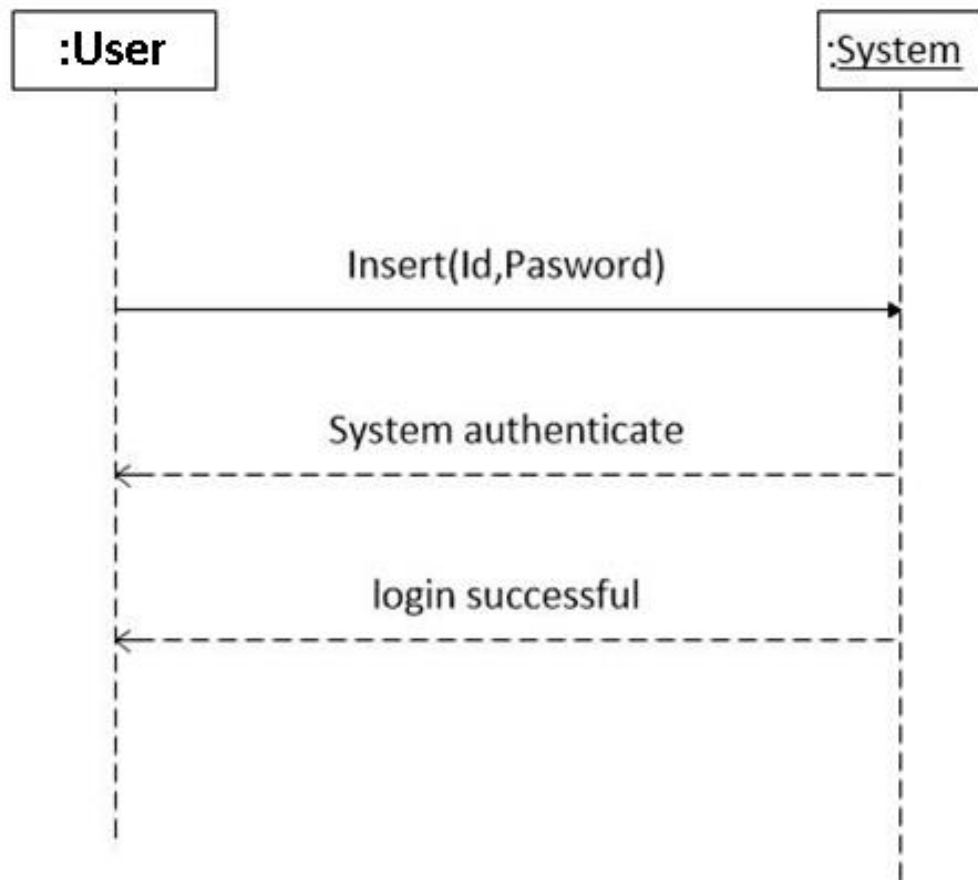
Figure 4.3 SSD For Login

4.5.5   Fully Dressed Usecase for Speech to Sign

Use Case UC3 Speech to Sign

o   **Scope** Website

o   **Primary Actor** User

o   **Stakeholders and Interests**

o   **User** Person who is using the website. It can be register or unregister user.

o   **Preconditions**

o   Person should have open Speech to Sign webpage.

- **Sucess Guarentee** Person should have got his/her desired Sign.
- **Main Success Scenario**

1   Person speaks to generate some text.

2   System validates the given text with its database.

3   Sign against the text will be shown onto the screen.

- **Extensions**

a* Internet not available.

1.   Sign not shown to the user.

1a. Person waits for internet connection and perform all the processes again.

b* At any time server is down.

2.   Person waits for server up and repeat all the steps again.

2b. Speech not found at database.

3   Person will be ask to speak again until the given text do not match with the any sign.

- **Special Requirements**
- Internet.
- Language should be understandable.
- Interface for users.
- **Frequency of Occurrence**
- Could be continuous.
- **Open Issues**
- Should any translator provided to the user to use?
- Should any option given to person to report for poor interacting interface?

4.5.6 System Sequence Diagram For Speech to Sign
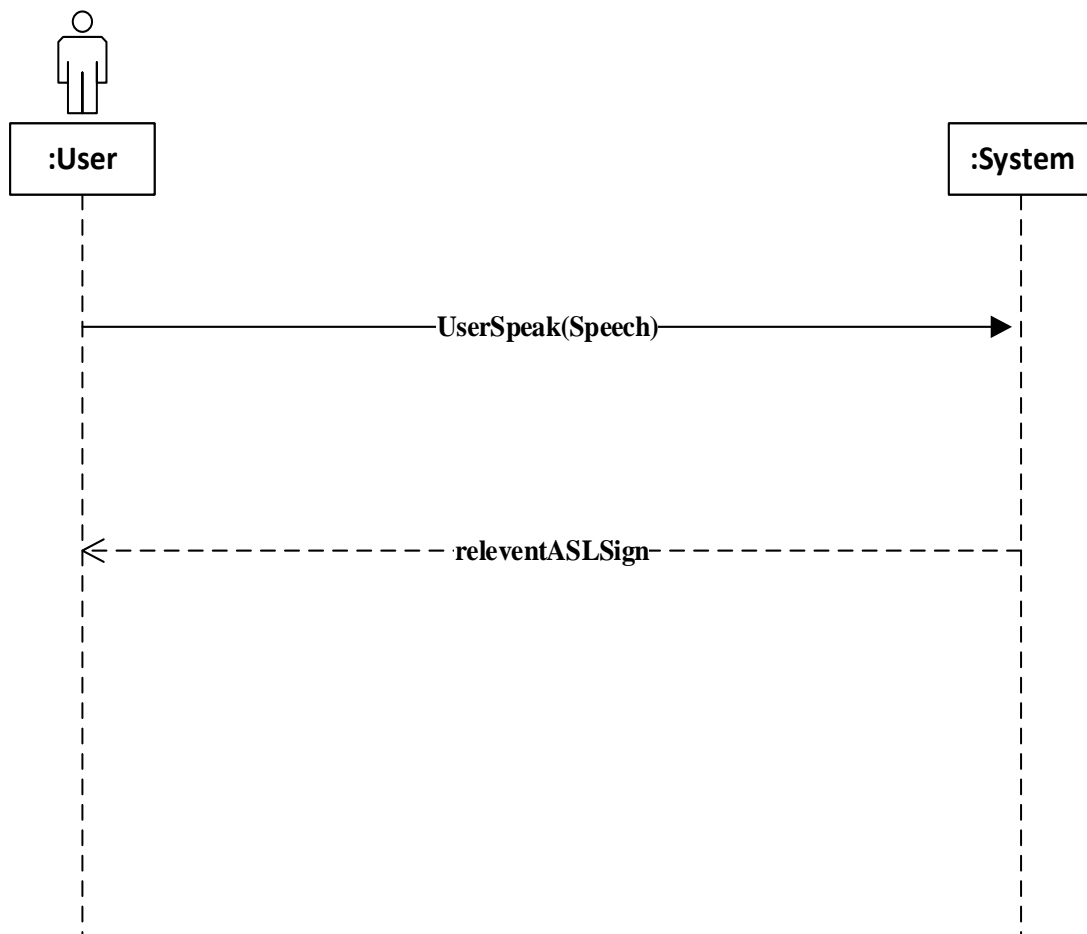
Figure 4.4 SSD for Speech to Sign

4.5.7 Fully Dressed Usecase for Text to Speech

Use Case UC4 Text to Speech

o   **Scope** Website

o   **Primary Actor** User

o   **Stakeholders and Interests**

o   **User** Person who is using the website. It can unresgister or register user.

o   **Preconditions**

o   Person should have open Text to Speech webpage.

o   **Sucess Guarentee** Person should have gotten the required speech.

   o   **Main Success Scenario**

1   Person enters the text into text-area.

2   System validates the given text with its database.

3   System speech out the given text.

   o   **Extensions**

a* At any time server gets down.

1   All the given text is lost.

1a. Person waits for server up and perform all the processes again.

      b* At any time website is closed

2.   Person open the website and repeat all the steps again.

2b. Language not found.

3.   User used unknown language.

a.   User must use standard language like English.

   o   **Special Requirements**

   o   Internet.

   o   Interface for users.

   o   **Frequency of Occurrence**

   o   Could be continuous.

   o   **Open Issues**

   o   Should any language options given to the user to choose?

   o   Should any translator provided to the user to use?

4.5.8 System Sequence Diagram Search the Sign
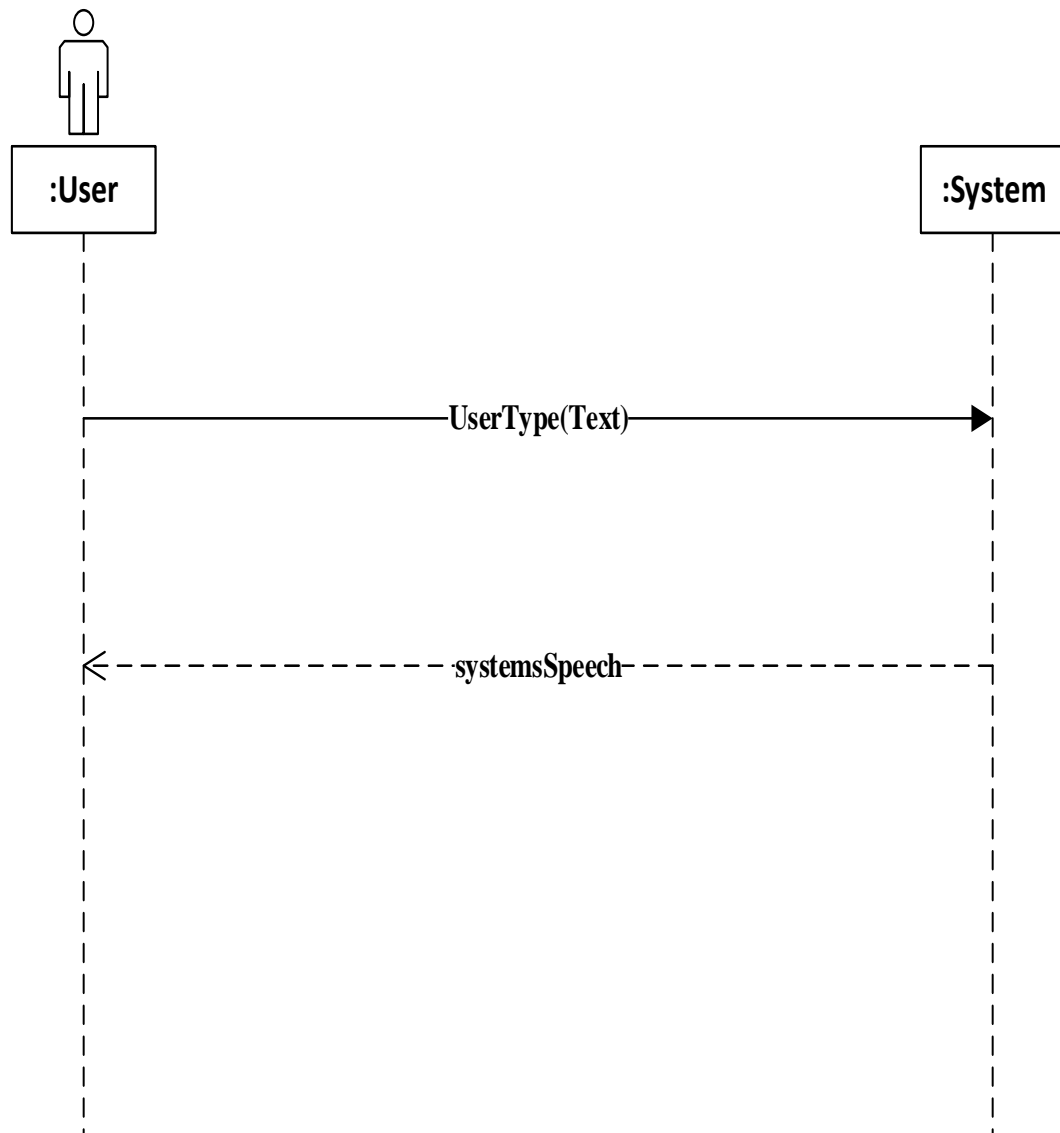
Figure 4.5 SSD for Search the Sign

4.5.9 Fully Dressed Use case for Manage User

o **Use Case UC5:** Manage User

o **Scope:** Web Site

o **Primary Actor:** Admin

o **Stakeholders and Interests:**

o **Admin:** Admin can view the details of images or signs uploaded by the user.

o **Preconditions:** Admin have the account in the database of the website.

o   **Success Guarentee:** Admin successfully manages the information of users visiting the website or learning the system.

o   **Main Success Scenario:**

o   **Basic Flow** – Retrieve basic information of user

Table 4.1 CRUD Operation

Actors Action	System response
1.For information select user profile	
	2.System display the selected records
3. Apply CRUD operation on them	
	4.System will do specified operation

o   **Extensions :**

o   Update the elements of User(Normal or Impaired person)

1) Selects to edit user information.

2) Use case flow continues with basic flow from steps 2-4.

3) Admin edits the information and confirms it.

4) System checks data for consistency.

5) System saves information and gives confirmation message.

o   **Alternate Sub-Flow:**

5(a) Inconsistent data

1. System signals error and rejects to save the edited information

5(b) Essential field left empty

        1. System signals error and rejects to save the edited information

2. Admin account issue, enters the missing data and retries to save the edited information.

o   **Deletion information from profile :**

1) Select to delete User's information.

2) Use case flow continues with basic flow from steps 2-4.

3) Selects to delete the data.

4) System ask to confirm deletion.

5) Confirm deletion.

 6) System deletes the data and displays confirmation message.

o   **Alternate Sub-Flow**:

 5(a) Inconsistent data

 3. System signals error and rejects to save the edited information

5(b) Essential field left empty

3. System signals error and rejects to save the edited information

4. Admin account issue, enters the missing data and retries to save the edited

information.

o   **Special Requirements:**

o   Internet for the Admin and application.

o   Access to data base

o   **Frequency of Occurrence:**

o   Could be continuous.

o   **Open Issues:**

o   How to validate the data getting from Normal or the impaired person?

4.5.10 System Sequence Diagram For Manage User
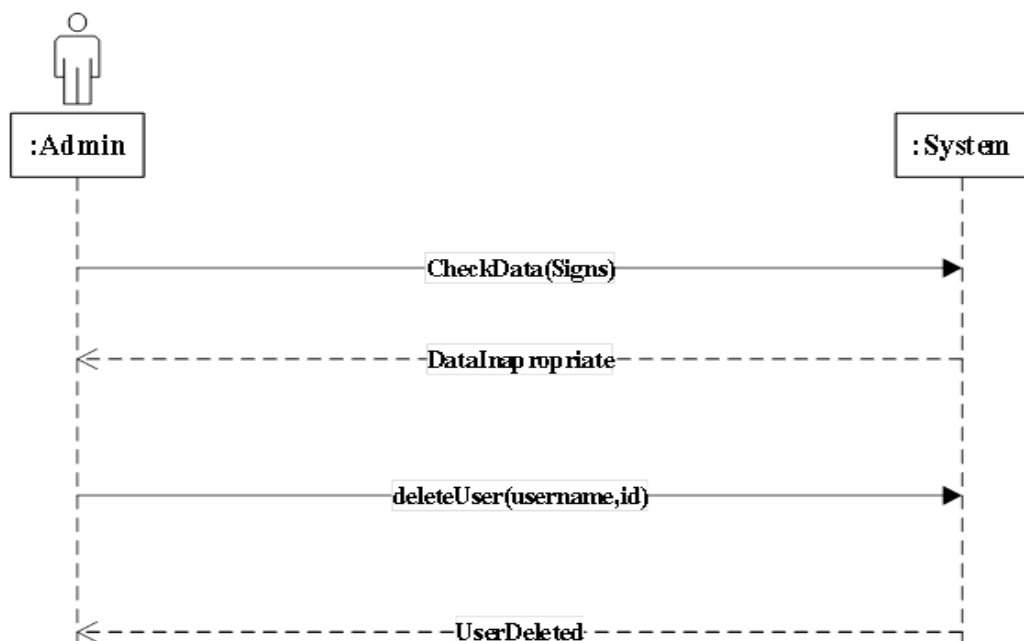
Figure 4.6 SSD For Manage User

4.5.11 Fully Dressed Usecase for Learn the Sign

Use Case UC6 Learn the Sign

o   **Scope** Website

o   **Primary Actor** Registered user.

o   **Stakeholders and Interests**

o   **Normal Person** Person who is normal and want to communicate with the deaf and dumb person.

o   **Imapired Person** Person who is deaf and dumb and want to communicate with the normal person or want to learn signs of American Sign Language.

o   **Admin** Person who is managing the system and have an active acoount to manage all the users.

o   **Preconditions**

o   User must be regsiter and have login to open the Learn the sign webpage.

o   **Sucess Guarentee** Person should have got his/her desired Sign.

o   **Main Success Scenario**

1   Person enters the name of the sign into input field.

2   System validates the given name of sign with its database.

3   System show relevant sign on to the screen.

o   **Extensions**

a* At any time server is down.

2   All the given information is lost.

1a. Person waits for server up and perform all the processes again.

        b* At any time website is closed.

4.   Person open the website and repeat all the steps again.

2b. Language not found at database.

5.   User used unknown language.

a.   User must use standard language like English.

o   **Special Requirements**

o   Internet.

o   Language should be understandable.

o   Interacting interface for example mobile or web.

o   **Frequency of Occurrence**

o   Could be continuous.

o   **Open Issues**

o   Should any language options given to the user to choose?

o   Should any hint for a sign provided to the user to use?

4.5.12 System Sequence Diagram For Search for Sign
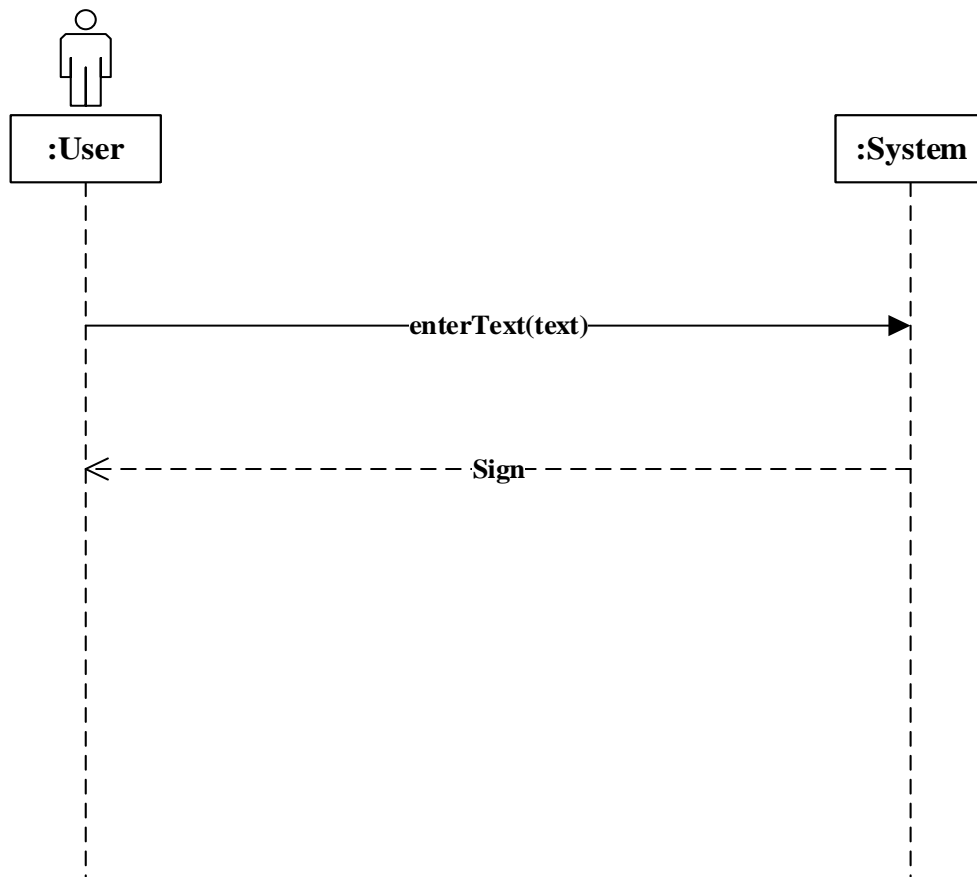
Figure 4.7 SSD for Learn the Sign

4.5.13 Fully Dressed Usecase for Contribute to DB

Use Case UC7   Contribute to Data

o   **Scope**   Website

o   **Primary Actor**   Regisered user

o   **Stakeholders and Interests**

o   **Registered user** User who have registered before and have an access to the quiz page by login him/herself.

o   **Preconditions**

o   User must be regsiter and have login to open the Learn the sign webpage.

o   **Sucess Guarentee** Person should have uploaded the sign successfully.

o   **Main Success Scenario**

1   Person choose the file which he/she want to upload from the device and enter the name or relevant information to the description field.

2   User enter email to get validated.

3   System validates the email from the database

4   System shows the message of "successfully uploaded the sign".

o   **Extensions**

a* Size of sign is large.

1   System show error message.

1a. Person select the limited sign or change the sign.

      b* At any time website is closed.

1   Person open the website and repeat all the steps again.

2b. User enters the incorrect email.

2   Email don't belong to any user.

2a.   User check the given email and correct it.

o   **Special Requirements**

o   Internet.

o   Language should be understandable.

o   Interface should be interacting.

o   **Frequency of Occurrence**

o   Could be continuous.

o **Open Issues**

o Should any sign size limit given to the user?

o Should user upload the sign without email?

4.5.14 System Sequence Diagram For Contribution to DB
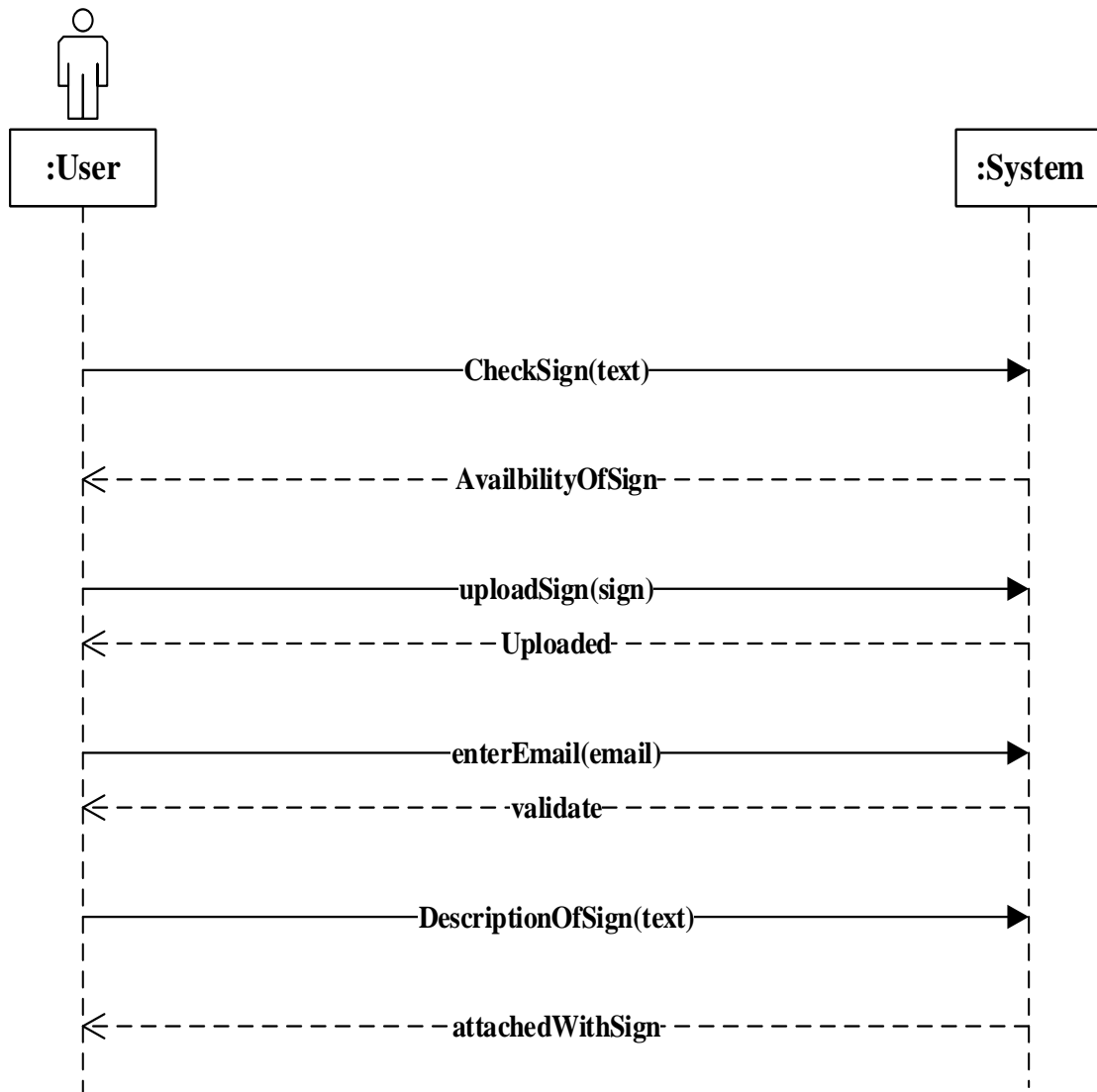
Figure 4.8 SSD for Contribute to Data

4.5.15 Fully Dressed Usecase for Take Quiz

Use Case UC8 Take Quiz

o **Scope** Website

o **Primary Actor** Regisered user

o **Stakeholders and Interests**

o **Registered user** User who have registered before and have an access to the quiz page by login him/herself.

o **Preconditions**

o User must be regsiter and have login to give the quiz.

o **Sucess Guarentee** Person should have uploaded the sign successfully.

o **Main Success Scenario**

1 Person visit the quiz page

2 Person choose the given options with in time

3 Person sumit all the given answers with in the time.

4 System validates the answer choosen by the person.

5 System shows the result againts the given answers

o **Extensions**

a* Time ran out.

1. Person stops and refresh the page.

1a. Person again answer the given questions.

    b* At any time quiz page is closed.

1. Person open the quiz page and repeat all the steps again.

o **Special Requirements**

o Internet.

o Language should be understandable.

o Interacting interface for example mobile or web.

o **Frequency of Occurrence**

o Could be continuous.

o **Open Issues**

o Should any way to quit the quiz?

o Should the person increase the time?

o Should the person submit without answering any question?

4.5.16   System Sequence Diagram For Take Quiz
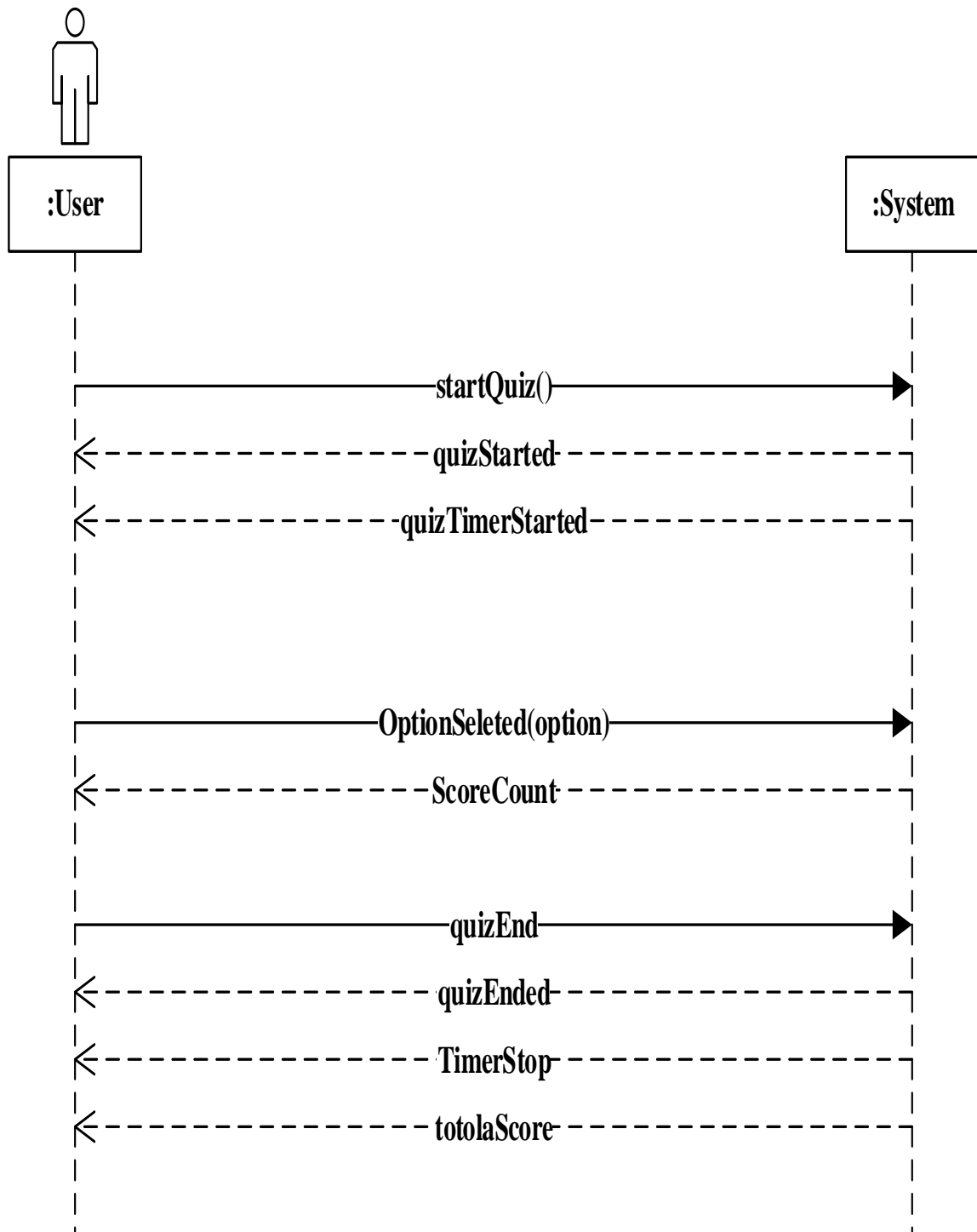
Figure 4.9 SSD for Take Quiz

4.5.17 Fully Dressed Usecase for Feedback

Use Case UC9 Feedback

o **Scope** Website

o **Primary Actor** Normal person, Impaired person.

o **Stakeholders and Interests**

o **Normal Person** Person who is normal and want to communicate with the deaf and dumb person.

o **Imapired Person** Person who is deaf and dumb and want to communicate with the normal person or want to learn signs of American Sign Language.

o **Admin** Admin can view the feedback given by the user.

o **Preconditions**

o User must be on the website and have a facebook account loged in

o **Sucess Guarentee** Person should have given the feedback successfully.

o **Main Success Scenario**

1 Person visit the main page of the website and scroll down to the feedback portal.

2 By using the facebook account user can give the feedback about the website.

3 The feedback will be shown to the facebook as well as on the main page with the username.

o **Extensions**

*a. Add the account.

1. Invalid Username or Password

1a. Enter correct username and password.

2. Password not match.

2a. Enter correct password both of time i.e. password and re-password.

3. Incorrect E-mail

3a. Enter correct email.

*b. **Internet not available**

1. All the given information lost.

1a. User renter all the information again.

o **Special Requirements**

o Facebook.

o Language should be understandable.

o **Frequency of Occurrence**

o Could be continuous.

o **Open Issues**

o Should any other way to give the feedback than Facebook?

o Should the user can give feedback without any account?

o Should any way to give feedback without visiting website?

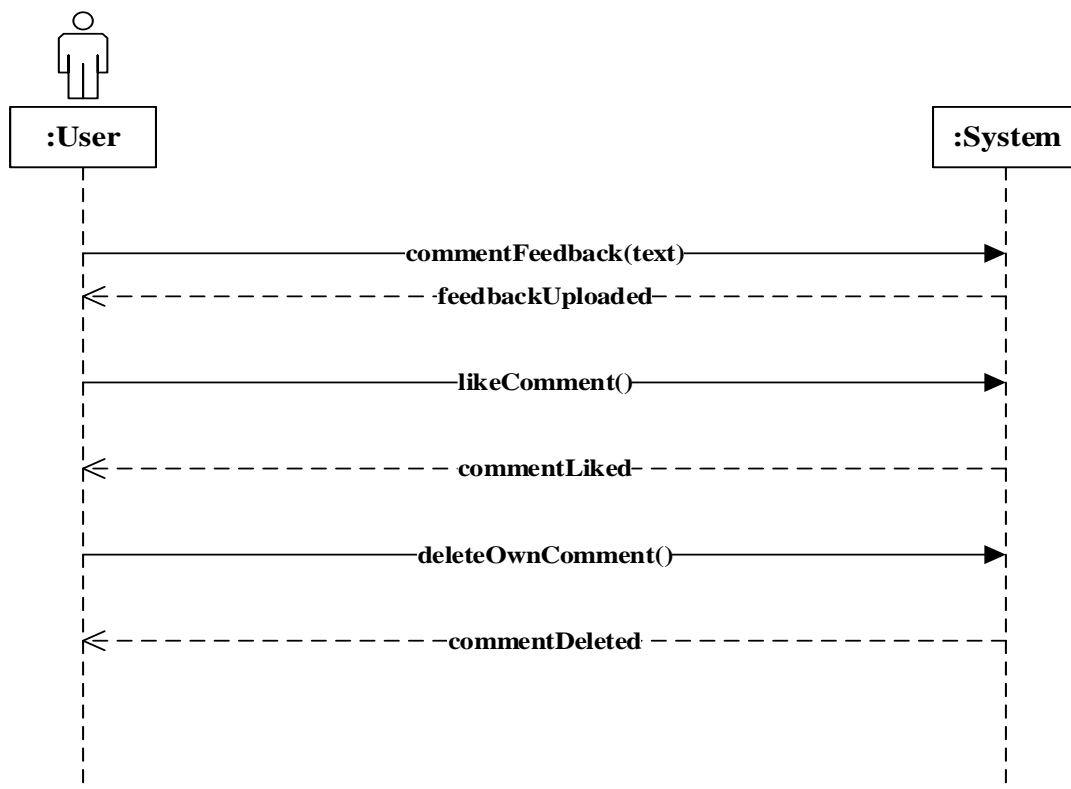### 4.5.18 System Sequence Diagram For Feedback

Figure 4.10 SSD For Feedback
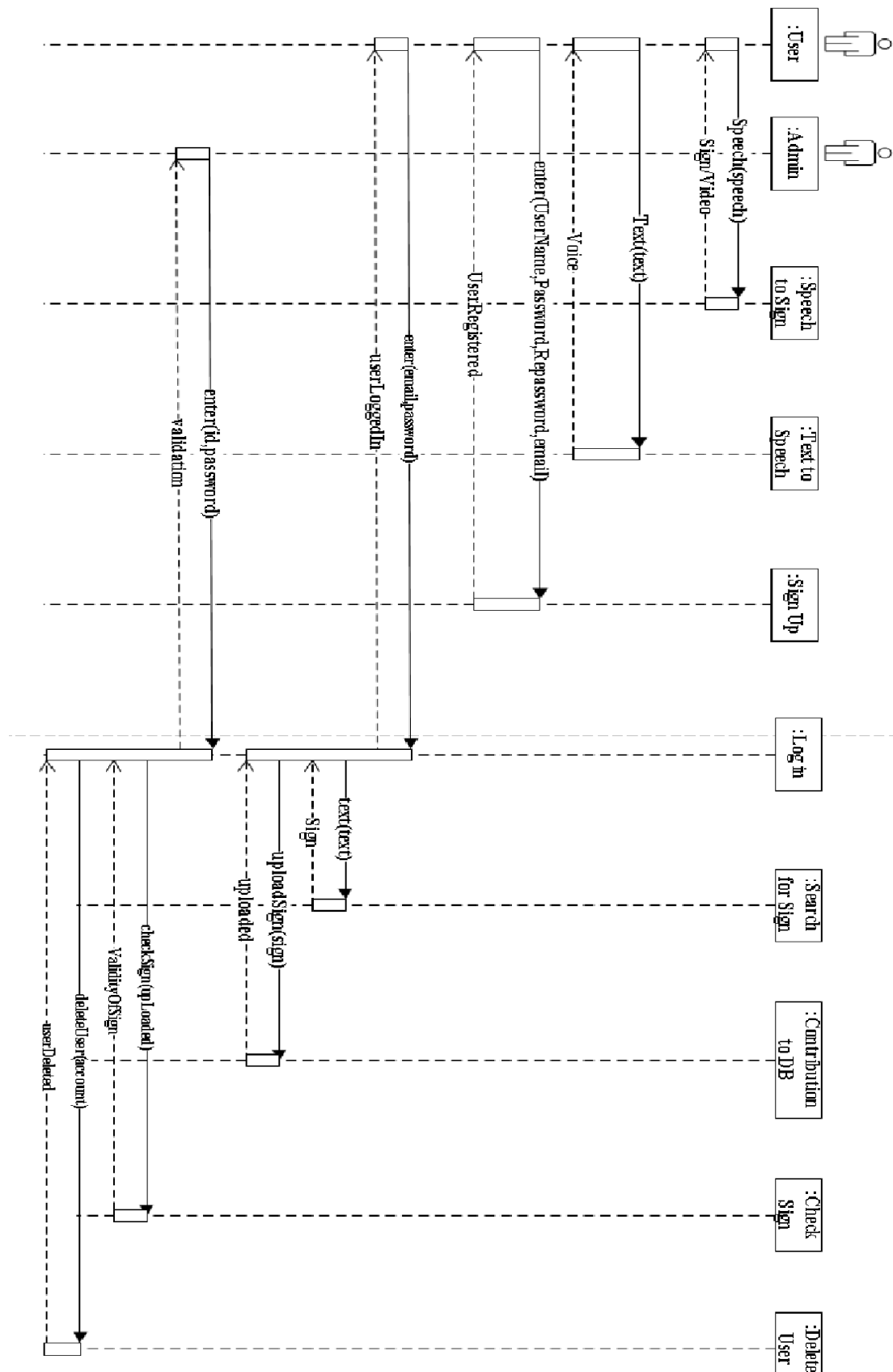
4.6   Sequence Diagram

Figure 4.11 Sequence Diagram

4.7   Class Diagram
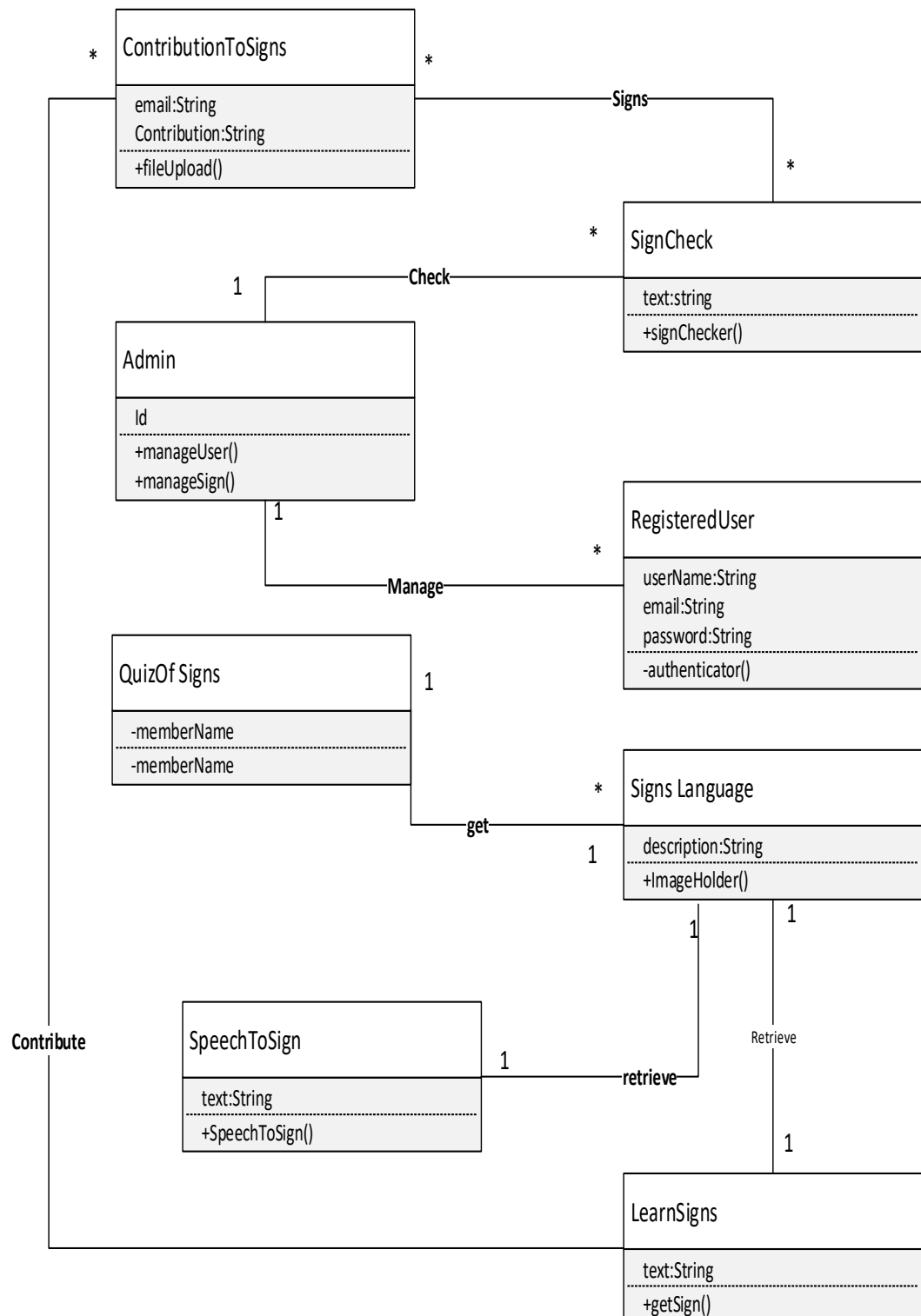
Figure 4.12 Class Diagram

5. Implementation

Implementation introduces how this project is implemented on system. The development tool is used to implement the design and mention, reason for selecting the tools are also discussed. Then the modules being translated into the implementation tools are also discussed. Then the modules being translated into the implementation tools are described.

5.1 Tools

The following tools and technologies are used to build the application

1.   Visual Studio
2.   SQL Server
3.   Adobe Photoshop

5.1.1 Visual Studio

Visual studio is an integrated development environment made by Microsoft for developer to create application for windows desktop PC and for mobiles i.e. IOS, Android, and for Windows also. It has number of comprehensive facilities for example it has its own editor for source code as well debugger with multiple computer languages support on a single platform.

5.1.2 SQL Server

SQL server is DBMS data base management system made by Microsoft. This product use to handle relational data basses for instance its basic functionalities include storing and retrieving of data. By using this tool data can be access store retrieve the data on the same computer and can be access from other computers for example from other network or from the Internet.

5.1.3 Adobe Photoshop

Adobe Photoshop is the predominant photo editing and manipulation software on the market. Its uses range from full featured editing of large batches of photos to creating intricate digital paintings and drawings that mimic those done by hand. The software provides many image editing features for raster (pixel-based) images as well as vector graphics. It uses a layer-based editing system that enables image creation and altering

with multiple overlays that support transparency. Layers can also act as masks or filters, altering underlying colors. Shadows and other effects can be added to the layers. Photoshop actions include automation features to reduce the need for repetitive tasks. An option known as Photoshop CC (Creative Cloud) allows users to work on content from any computer.

5.2   Designing of Interface

User interface designing in other words users interface engineering is the broad field design of different websites, desktop applications (apps), Mobile Application and Software Application just to provide users a better user experience and made his interaction to our website app mobile app or desktop app easy efficient and productive. In terms for increasing the user experience goals what is often called User Centered Design. Graphics are used to increase the final products usability. The process for designing must be in balanced between the technical functionalities to create the system operational as well as adaptable to changing user needs.

The designing of interface has number computer sciences projects for example CAD (Computer Aided Design) for designing of cars, commercial Planes designing. Whether that be software designing, user research, web design, or industrial design. Their basic goal is to provide a user an easy way to interact and communicate with our system.

5.3   User Friendly Design

While designing it is most complex and nervous for designer because a good and high usability base system must have an interface which is easy to use i.e. User Friendly, for that designer should have a well define plan so which can be executed so one can organize and design his system according to users per requirements. Some Basic Features of UI

5.3.1   Navigation

It is easy for user to navigate through out your web site easily, our website also provide all the major option on eyeball view so user can easily interact with his meaningful option which are provided to him

5.3.2   Informative

Your system should be more informative enough so a user who is interacting very first time with your system can get the information about functionality of your system. in our system we also mention notes, validations, labels to guide our user to the right track.

Which make user more comfortable because all the option are available in simple way at the distance of your mouse click.

5.4   Database Implementation

For an efficient system or web site it is necessary that it has database base behind it which help it to do its operations more smoothly related to data. And made data more secure and consistent. We also use database in our website so large number of data ca be mange easily without any complexion, we have different Data table for different tasks for example to manage users registration information, users Quiz information, data basses related to signs admin sign Check etc.

5.4.1   Registration Table

As shown in Table 5.1 For Registrations of UserTable 5.1contains the registration information of all the registered user who want to access learning and evaluation facilities and also who want to contribute to our data base e.g. by uploading any photo and video.

Table 5.1 For Registrations of User

	RName	REmail	RPassword	RRpassword
▷	Bilal Abbas	bilalabbas437...	72a22cnewer	72a22cnewer
	admin	admin@gmail....	admin	admin
	Faizan Shafiq	mfaizanshafiq...	00196157030	00196157030
	Sana Abbas Go...	gondal0444@g...	12345678	12345678

5.4.2 For User Logs

As in given table has Table 5.2 has information about registered users. login information are noted in this table and also they are authenticated here. When they login then can access authorize facilities?

Table 5.2 For User Log In

Id	LEmail	LPassword
1	admin@gmail....	admin
2	bilalabbas437...	72a22cnewer
3	gondal0444@g...	12345678

5.4.3 Quiz Table

Table 5.3 has Quizzes which are given to the learner user having multiple choice question from this table.

Table 5.3 For Quiz Records

QuestionId	Question	Option1	Option2	Option3	Option4	QuestionAnswer
1	Images/qb.png	B	A	Y	Z	B
2	Images/qa.png	D	A	M	G	A
3	Images/qc.png	G	Q	C	P	C
4	Images/qe.png	M	O	G	E	E

5.4.4 Contributor's Table

Table 5.4 it contain record of user's e.g. If any user who know any sign that is not in our data base can upload and do contribution for our data base which is very valuable for other users, but if any user do any malicious activity i.e. upload abusive photos so to handle these type of users admin can delete their account so they can't upload any data again.

Table 5.4 For Quiz Records

Id	Image	Description	Email
7	~/images/Shirt....	shirt	bilalabbas437@...
8	~/images/Hat....	Hat	mfaizanshafiq...
9	~/images/Sock...	Sock	bilalabbas437@...
10	~/images/Skirt....	skirt	bilalabbas437@...

6.   Testing

Web site testing is basically a testing of web application for example looking for bugs, check if web site crash due to some reason, it also includes functionality of website, connectivity of data base, browsers compatibility, responsiveness.

6.1   Functionality Testing

This testing includes as per functional requirements are meeting or not for example basic modules are working correctly or not.

6.1.1   Testing Of Speech to Sign
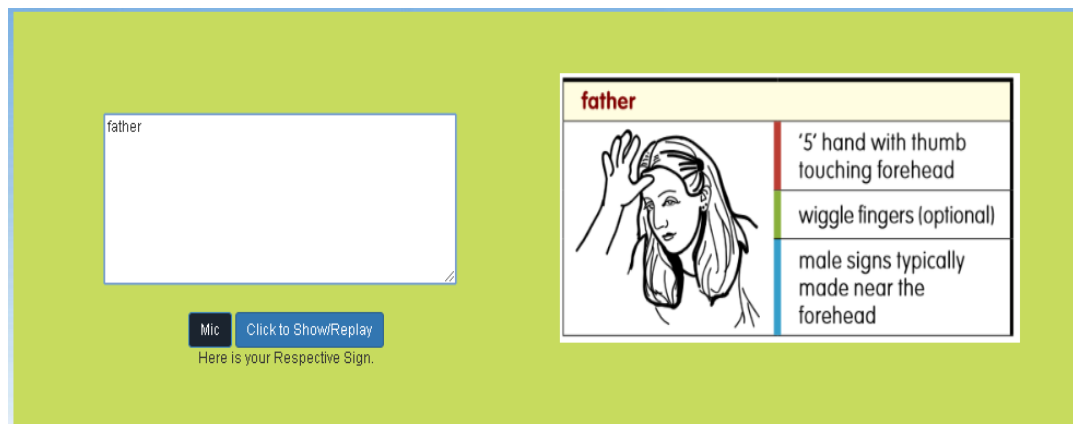
Figure 6.1 Testing Speech to Sign

Test Case # Test Case 1	Test Case Name
Home Page Navigation Test	
System ASL base communication and learning system	Subsystem Speech to Sign
Pre-conditions Browser should Mic enabled	

Table 6.1 Home Page Navigation Test

Step	Action	Expected System Response	Fail/ Pass
1	Click and hold "Mic" button.	Systems mic is activated and de-activated on release of button.	Pass
2	Click "Click to Show/Replay" button.	Show the ASL sign against the spoken words.	Pass

3	Click and hold "Mic" button and don't speak	A message appear under the buttons "Please Speak something"	Fail
4	Click and hold "Mic" button speak un known word	A message appear data not found.	fail

Post-conditions User will be able to see the sign

6.1.2 Testing Of Text to Speech
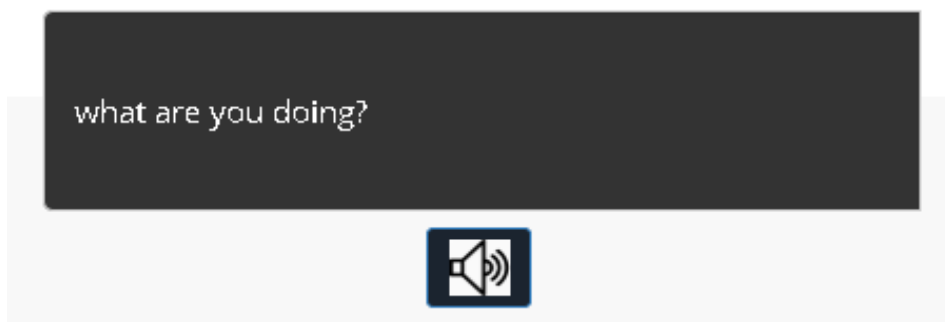
Figure 6.2 Testing of Text to Speech

Test Case # Test Case 2	**Test Case Name** Text to speech
System ASL base communication and learning system	**Subsystem** Speech to Sign

Pre-conditions Browser should have access to audio output devices

Table 6.2 Testing Of Text to Speech

Step	Action	Expected System Response	**Fail/ Pass**
1	Write text in text area	Text is shown in text are box	Pass
2	Click "Speaker" button.	The written text converted into speech.	Pass

Post-conditions User will be able to convert his words to speech.

6.1.3 Testing Of Learning and Evaluation

Figure 6.3 Testing Of Learning and Evaluation

Test Case # Test Case 1	**Test Case Name** Registration
System ASL base communication and learning system	**Subsystem** Registration of user
Pre-conditions User is not registered with same E-mail ID.	

Table 6.3 Testing of Learning and Evaluation

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Enter the User name.		Pass	
2	Field is empty.		Fail	
3	Enter email ID		Pass	
4	Enter the Password.		Pass	
5	Reenter the Password.		Pass	Reenter the same password as above
6	Click the Sign up button.	The website should display an error message of "Please fill out the field.	Fail	

7	Click on login link	Shift to login page	Pass	
Post-conditions User will not be able to Sign up.				

6.1.4   Test of Login

Figure 6.4 Test of Login

Test Case # Test Case 2	**Test Case Name** LogIn
System ASL base communication and learning system	**Subsystem** User LogIn
Pre-conditions User must have to register his self**.**	

Table 6.4 Test of Login

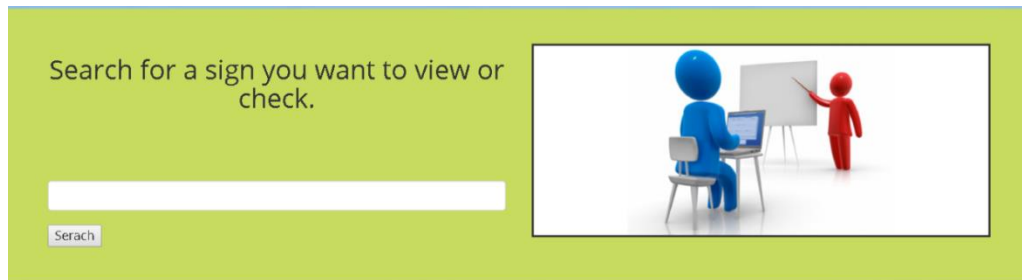| Step	Action	Expected System Response	Pass/ Fail	Comment
1	Enter the Email.		Pass	
2	Enter the password.		Pass	
3	Click on login button	User log in	Pass	If id and password is wrong the system will generate error
Post-conditions User will now able to access learning and evaluation options.				

6.1.5 Testing Of Learning and Evaluation

Figure 6.5 Testing Of Learning and Evaluation

Test Case # Test Case 3	**Test Case Name**
Search for Sign	
System ASL base communication and learning system	**Subsystem** learning
and search for sign	
Pre-conditions user must have to login.	

Table 6.5 Testing Of Learning and Evaluation

Step	Action	Expected System Response	Fail/ Pass
1	Write text in text box	Text is shown in text are box	Pass
2	Click "Sesrch" button.	The written text's related sign shown on right side window	Pass

Post-conditions User will be able to learn the sign.

6.1.6 Testing Of Contribution Section

Figure 6.6 Testing Of Contribution section

Test Case # Test Case 4 Contribution **System** ASL base communication and learning system Contribution to DB	**Test Case Name** **Subsystem**
Pre-conditions user must have to login.	

Table 6.6 Testing Of Contribution section

Step	Action	Expected System Response	Fail/ Pass
1	Click "Choose file" button.	Show file explorer to choose files	Pass
2	Enter text into description text box.	The written text's related sign shown on right side window	Pass
3	Enter Email id.	Check valid email id or not	Pass
4	Enter in valid id	Show validation error	Fail

Post-conditions User will be able to upload picture to our data base.

6.1.7 Testing Of Manual Alphabets
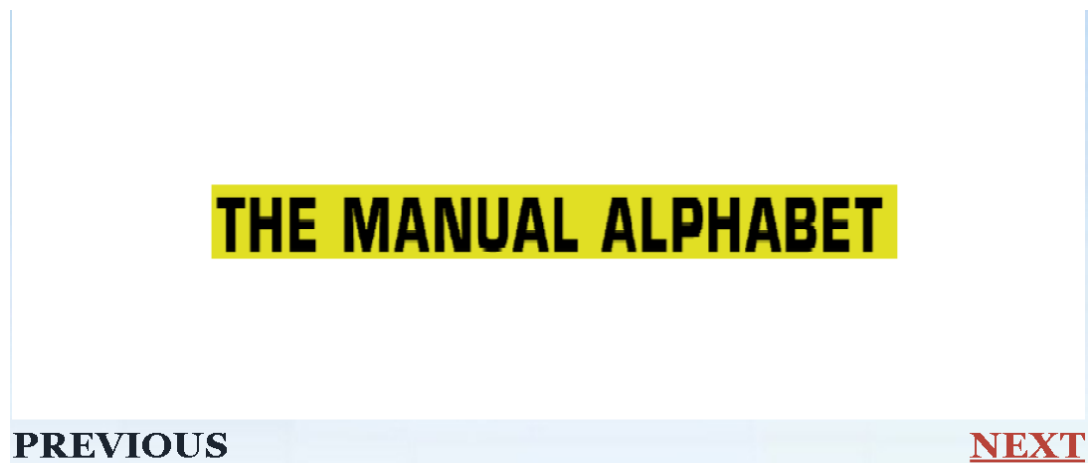
Figure 6.7 Testing of Manual Alphabets

Test Case # Test Case 5 Manual Alphabets for Sign	**Test Case Name**
System ASL base communication and learning system Alphabets	**Subsystem** Manual
Pre-conditions user must have to login.	

Table 6.7 Testing Of Manual Alphabets

Step	Action	Expected System Response	Fail/ Pass
1	Click "PREVIOUS" button.	Show the previous ASL Alphabet sign.	Pass
2	Click "NEXT" button.	Show the next ASL Alphabet sign.	Pass

Post-conditions User will be able to learn the ASL alphabet signs.

6.1.8   Testing of Quiz Page
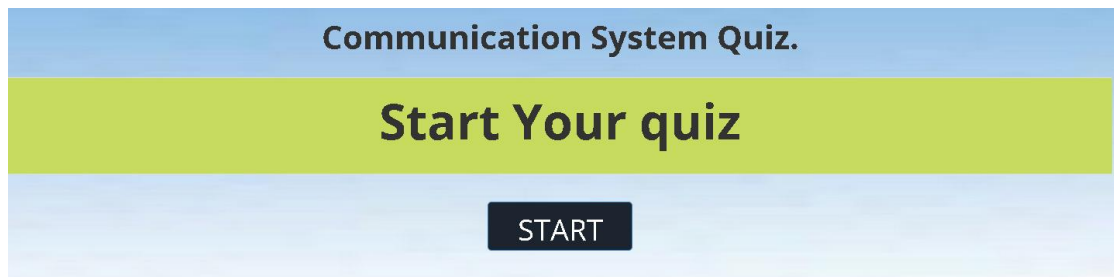
Figure 6.8 Testing of Quiz Page

Test Case # Test Case 6 Quiz	**Test Case Name**
System ASL base communication and learning system	**Subsystem** Quiz
Pre-conditions user must have to login.	

Table 6.8 Testing of Quiz Page

Step	Action	Expected System Response	Fail/ Pass
1	Click "START" button.	Quiz window will appear with started timer.	Pass

Post-conditions User can give the quiz.

6.1.9   Testing of Quiz
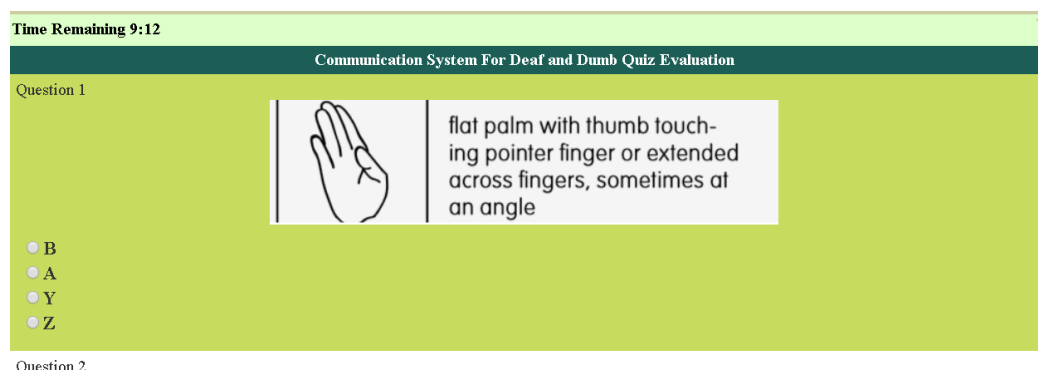
Figure 6.9 Testing of Quiz

Test Case # Test Case 6	**Test Case Name** Quiz
System ASL base communication and learning system Window	**Subsystem** Quiz
Pre-conditions user must have to login.	

Table 6.9 Testing of Quiz

Step	Action	Expected System Response	Fail/ Pass
1	Choose "Radio Button" from all of given questions	System will evaluate score according to choose option true or false.	Pass

Post-conditions User can give the quiz.

6.1.10 Testing of FB Feedback

Figure 6.10 Testing of Feedback

Test Case # Test Case 7	**Test Case Name**
Feedback	
System ASL base communication and learning system	**Subsystem** Quiz
Window	
Pre-conditions user must have to login via Facebook account.	

Table 6.10 Testing of Feedback

Step	Action	Expected System Response	Fail/Pass
1	Enter text into comment box	Comment (feedback) show on the home page via Facebook plugin.	Pass
2	User write abusive comment	Manage according to Facebook's terms and conditions.	Pass

Post-conditions User can give his valuable Feedback.

6.1.11 Compatibility Testing

In today's web development environment the usability is prime focus of any web developer because web sites or web APPs has to operate on number of devices having different screen sizes ,differently operate, different way of navigation. So the web site to be perfect should have to be easy to use and also have cover todays market's large number of devices including Mobile devices, laptops, desktop PCs etc.

6.1.12 Menu Testing

Menu testing includes web page element how they react on any device. How responsive they are? They are visible easily or not. And consistent on all pages for example navigation bar has number of items i.e. links or button on it , what will happen to them if size of the browser windows decreased how may this size will effect size of images, slide show which is used input fields etc.

Figure 6.11 Testing of Menu

Figure 6.11 showing the size of navigation bar on normal browser screen for maintain the usability of browser it should change its size according to size of the browser windows for instance.

Figure 6.12 Testing of Menu Before and After Tap

Figure 6.12 is the size of our website's navigation bar on small device for example IPhone 5S (4 inch screen size).
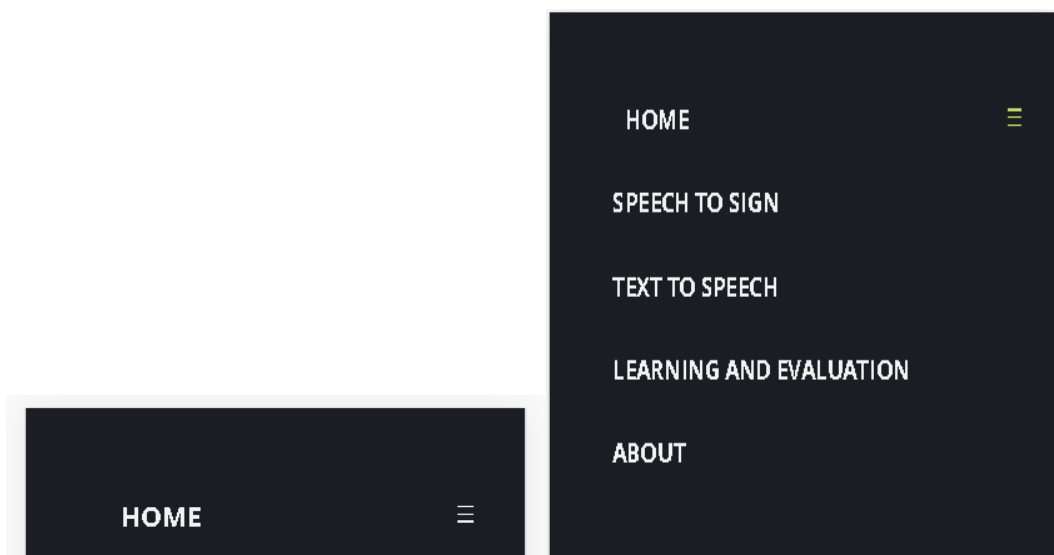

Figure 6.13 Testing of Menu Before and After Tap

Figure6.13 is the size of our website's navigation bar on small device for example IPhone 6, 7, 8, X plus and Samsung Galaxy 6,7,8,9 plus (5.5-5.8 inch screen size).

6.1.13   Web Page Testing

 page testing include that how a web page represents its contents on devices of different sizes for instance, following are some of the examples of Home pages of our website on devices e.g.

- Mini Display Devices
- Large Display Devices
- Extra-large Display Devices

- Desktop

6.1.14 Test on Mini Display Devises

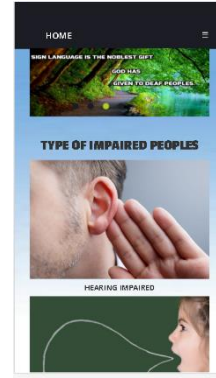Figure 6.14 is webpage automatically adjust its elements according to the size environment of the device.

Figure 6.14 Home Page on Mini Display

6.1.15 Test on large Display Devises

Figure 6.15 is showing Large display devices include devices has screen size up to 5 inches to 5.8 inches. For example iPhone 6, 7, 8, X, Samsung S6, S7, S8, S9 etc.

Figure 6.15 Home Page on Large Display

6.1.16 Test on X-large Display Devises

Figure 6.16 is Extra Large display devices include devices has screen size up to 9.7-inch to 10.5-inch. For example iPads of Apple and tablet 1, 2, 3 of Samsung.

Figure 6.16 Home Page on Extra Large Display

6.1.17   Test on Desktop Display Devises

Figure 6.17 is Desktop display devices include devices has screen size up to 14-inch to 10.5-inch. For example iPads of Apple and tablet 1, 2, 3 of Samsung.
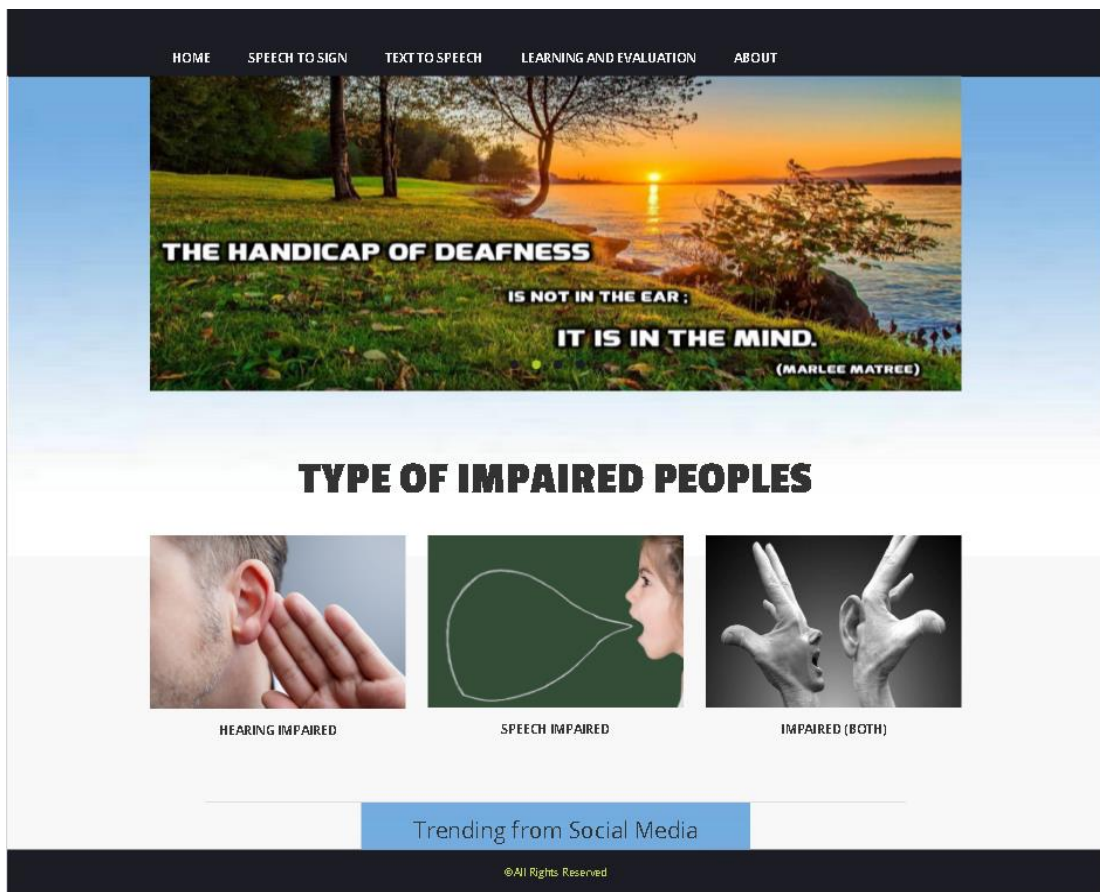

Figure 6.17 Home Page on Desktop Display

6.1.18   Compatibility Testing on Different Browsers

It is very important for a web site to compatible with number of browser. Because some browsers allow some type of scripting language but some browsers don't, so some

browser only accepts basic html (Hypertext markup Language) but most of browser along with basic html they are also allow CSS (Cascading Styling Sheet) and Ajax.
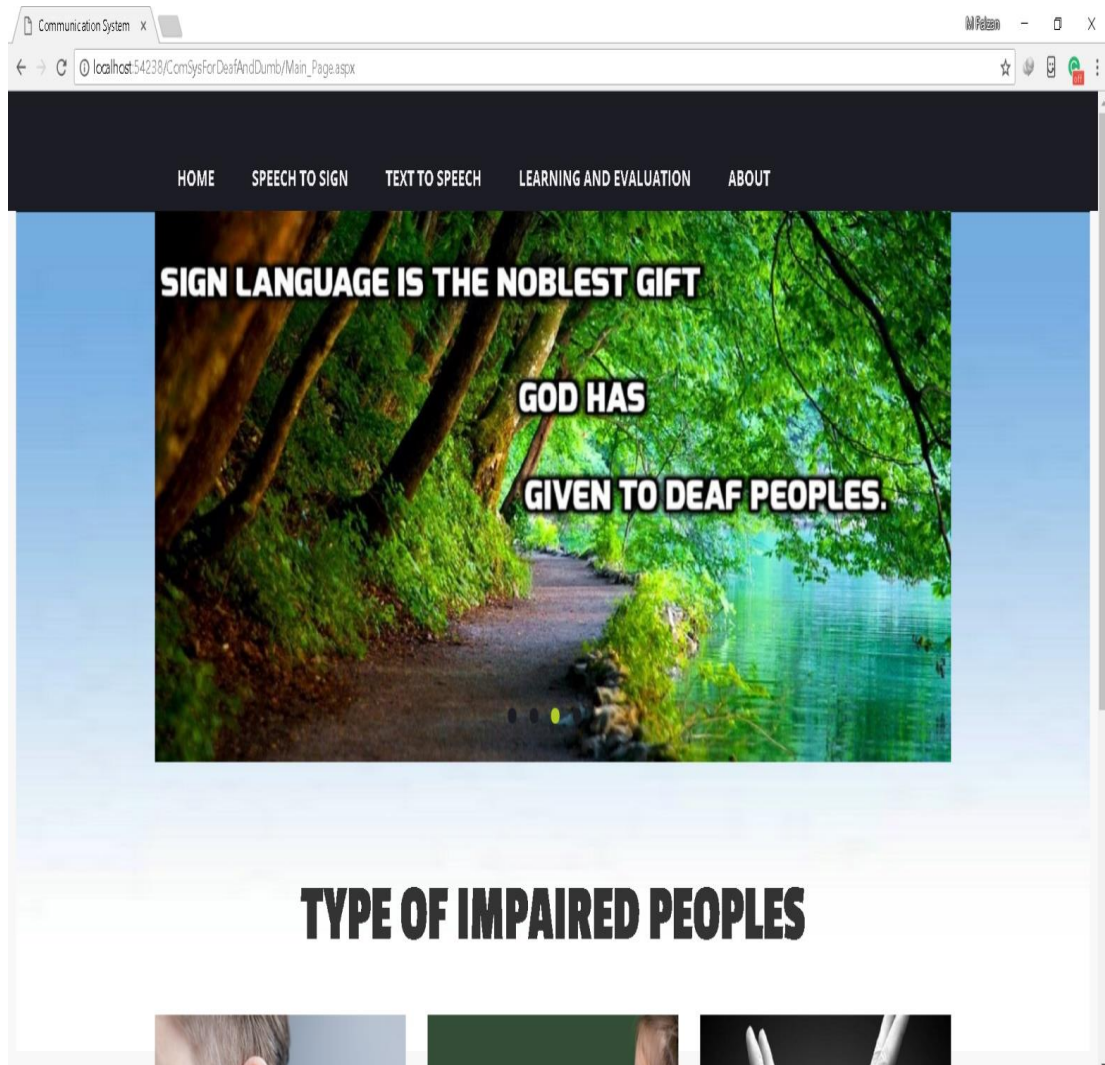
6.1.19 Testing on Google Chrome

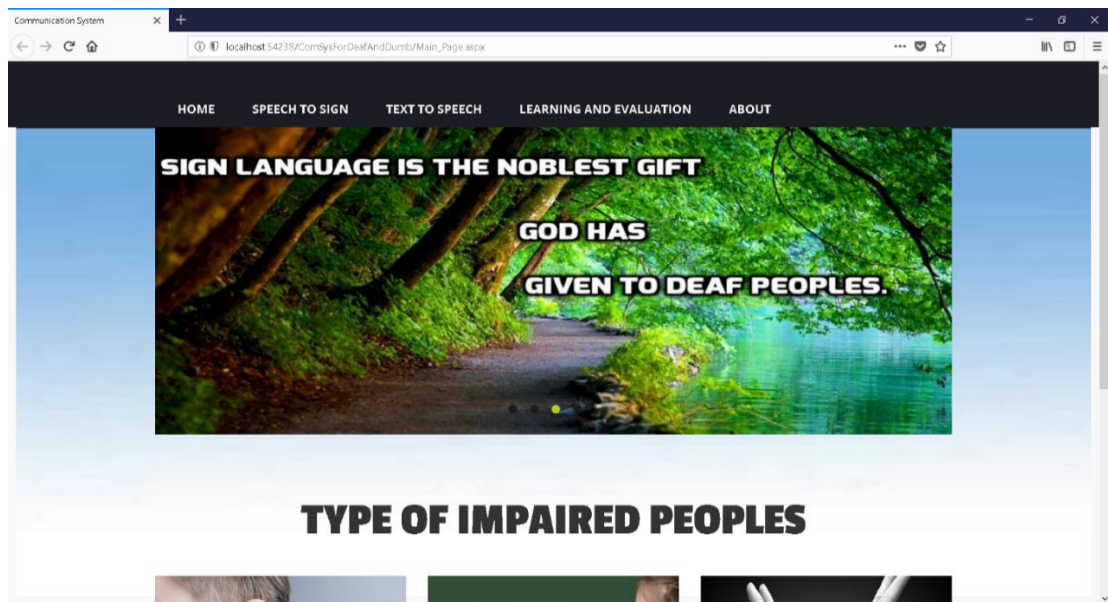**Figure 6.18 Testing on Google Chrome**

6.1.20   Testing on Firefox

Figure 6.19Tesing on Firefox

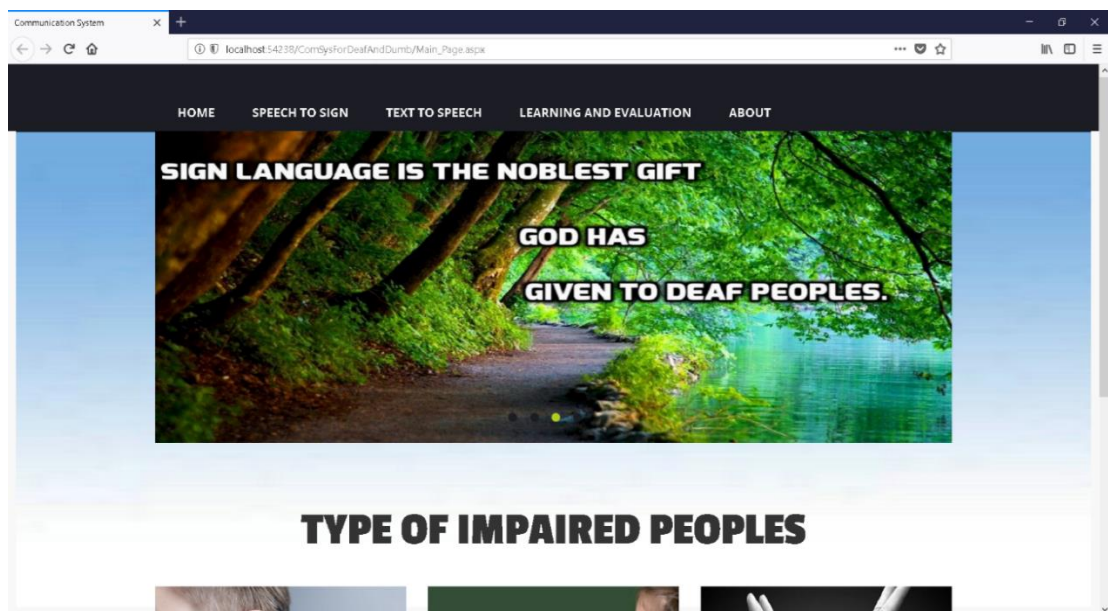## 6.1.21   Testing on Microsoft Edge

Figure 6.20 Testing on Microsoft Edge

7.   User Manual

7.1   Users of System

1. Normal people
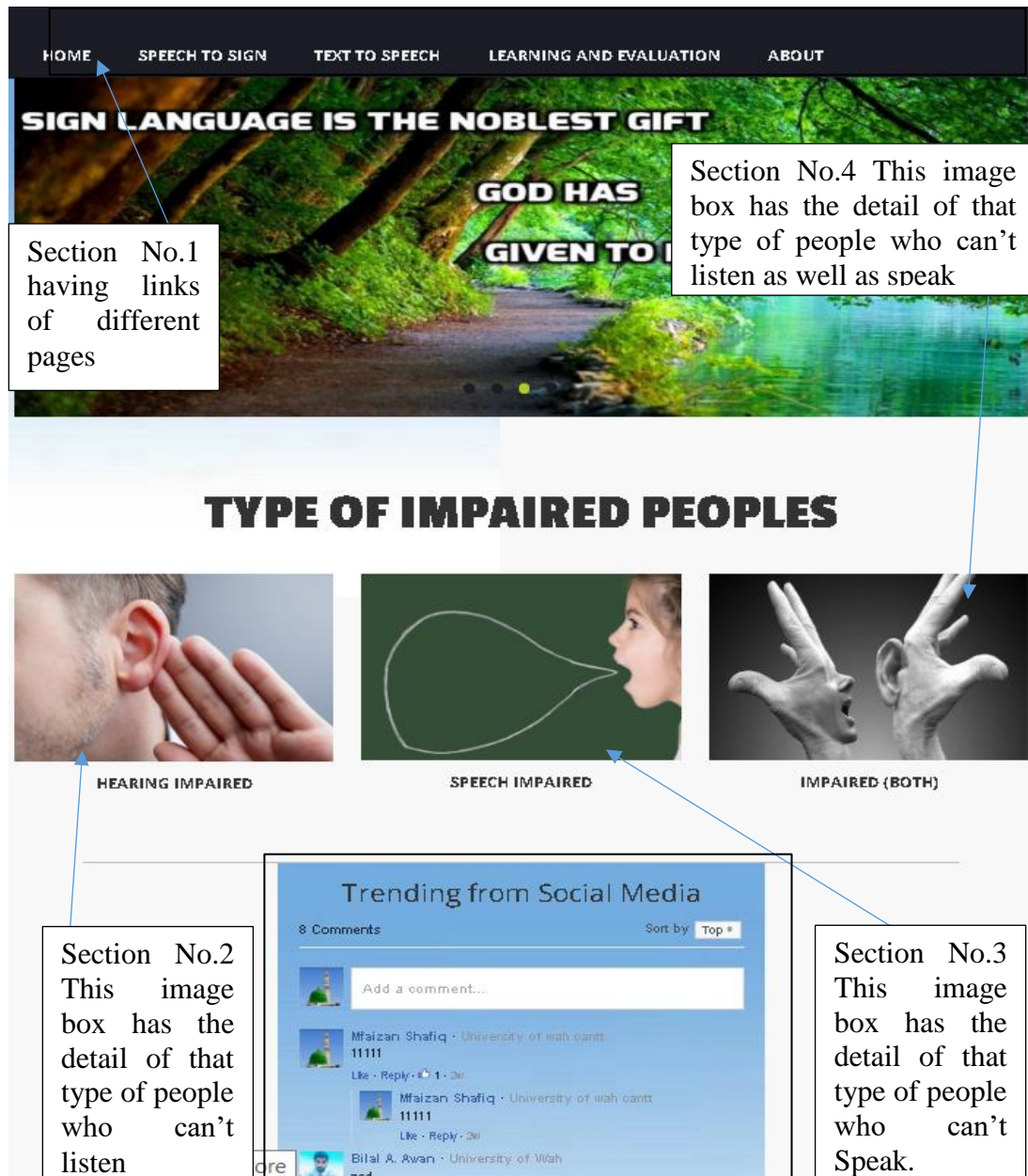2. Hearing and speaking impaired.

7.2   Main page of website

Figure 7.1 Main Page

Section No.1 having links of different pages

Section No.4 This image box has the detail of that type of people who can't listen as well as speak

Section No.2 This image box has the detail of that type of people who can't listen

Section No.3 This image box has the detail of that type of people who can't Speak.

Section No. 5 Social Media section

7.3   Home

After the section 1 having all websites links we have following 3 sections which are**.**

Figure 7.2 Main Sections

Section 2	Section 3	Section 4
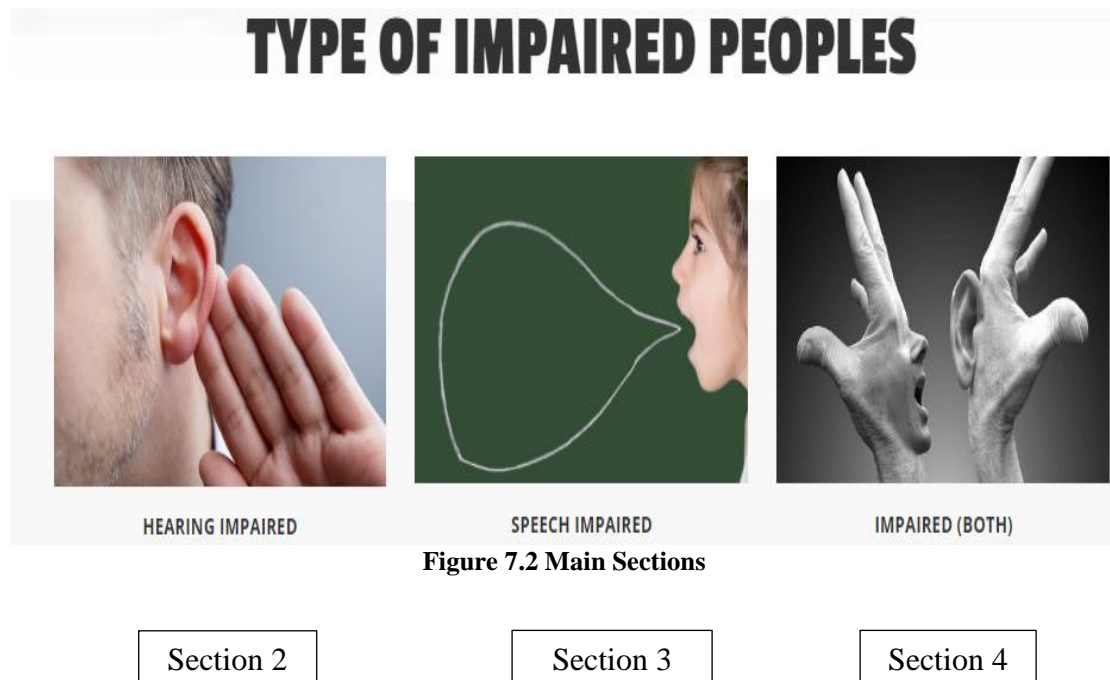
7.3.1   Section 2

This section includes webpage having textual information about people who are unable to listen due to any biological disease or due to natural disableness by birth. In some cases people can listen but their sense of listening is so week.

7.3.2   Section 3

This section also include webpage having information i.e. textual data about those peoples who cannot speak due to any natural reason or due to any psychological reasons or medical reasons.

7.3.3   Section 4

This section also include webpage having information about people who cannot speak as well as cannot listen naturally by birth and which also the basic focus of our system.

7.4   Hearing Impaired

After clicking of user on Figure 7.2 Main Sections this web page will appear having information about the people having week sensation of listening or impaired to listening completely.

Figure 7.3 Web Page about Hearing Impaired

7.5   Speech Impaired

 After clicking of user on Figure 7.2's Section 3 this web page will appear having information about the people having week sensation of speaking or impaired to speak completely

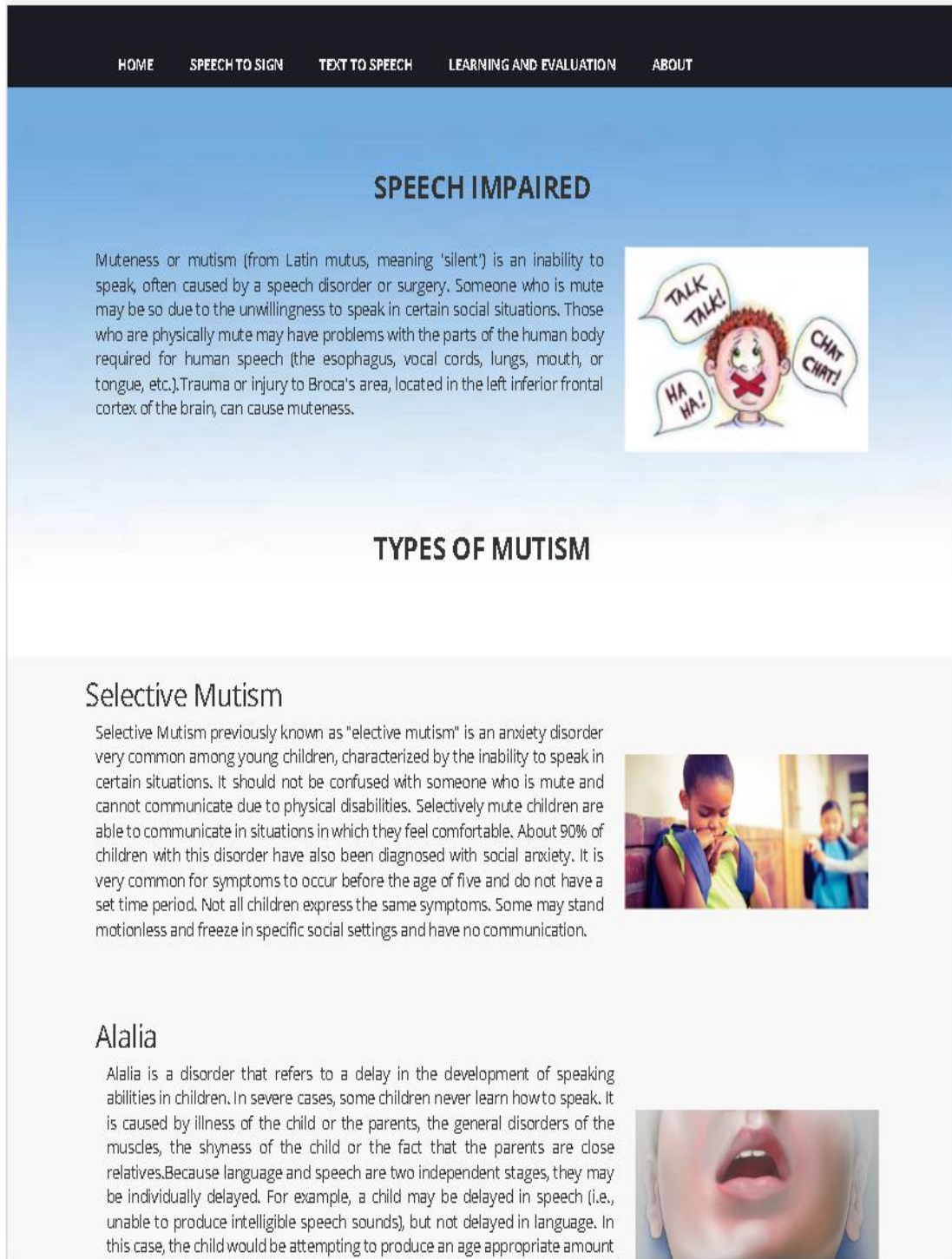Section 2.2 is the web page which will appear is given.

Figure 7.4 Web Page about Speech Impaired

7.6   Impaired Both

After clicking of user on Figure 7.2's Section4 this page will appear having information about the people having week sensation of speaking and listening.Section 2.2 is the web page which will appear is given.

Figure 7.5 Web Page about Impaired Both

7.7 Speech to Text

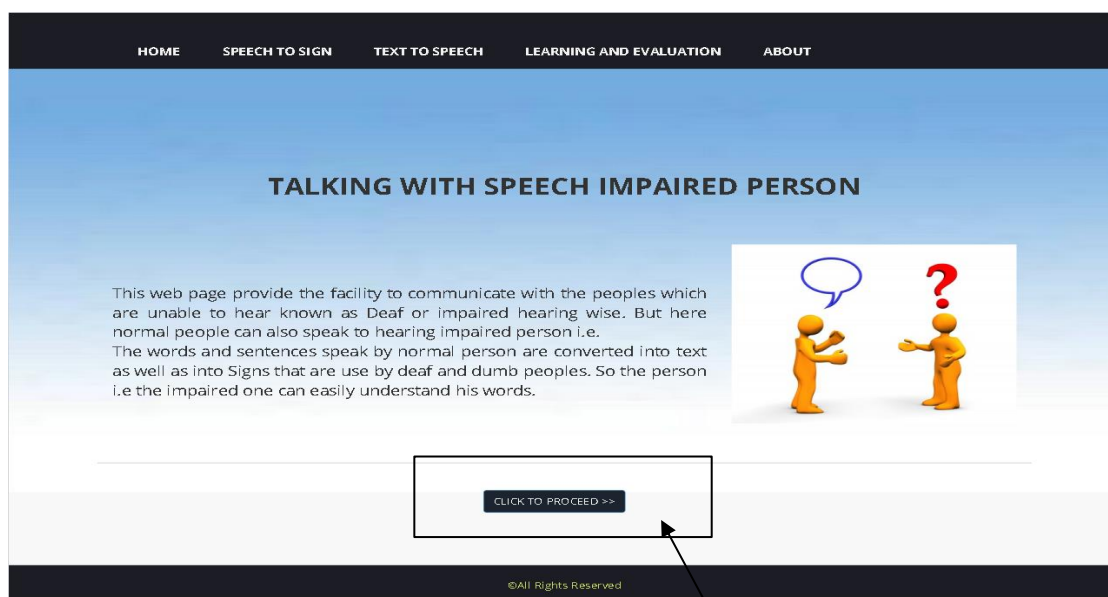After clicking Figure 7.1's link tab the following web page will appear.

Figure 7.6 Web Page Talking with Speech Impaired

This button will provide Speech to sign web app.

7.8 Web App For Communication

This page inFigure 7.7 contain the following web app which will be used by normal user to communicate with people which are impaired hearing wise.
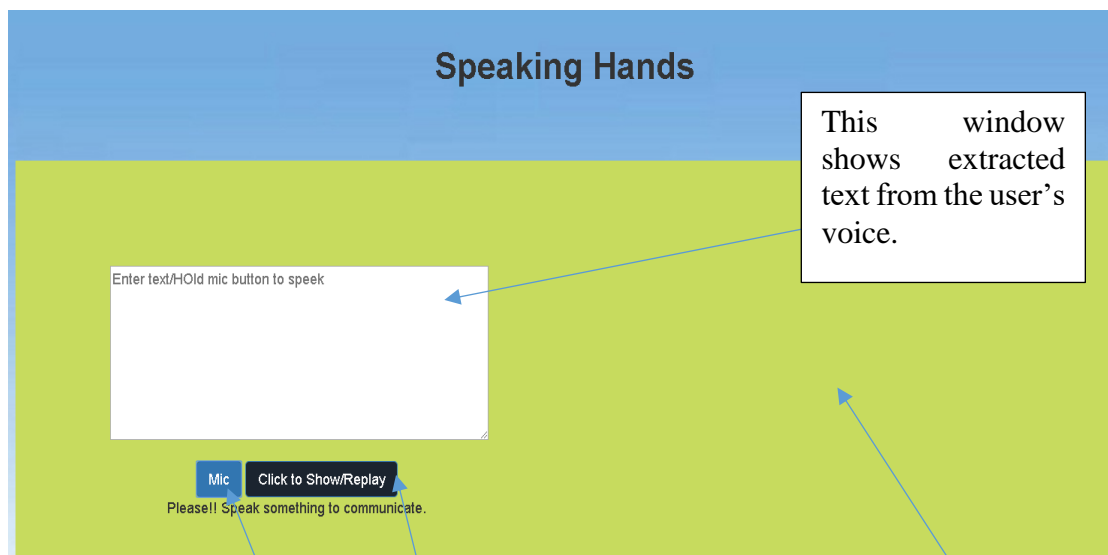

This window shows extracted text from the user's voice.

Figure 7.7 Web App for Communication

By clicking this the app will start listening to the user(normal person)

By clicking ASL sign will appears.

This window will show relevant sign so hearing impaired person can understand that what the

7.9   Text To Speech

This page Figure 7.8 contain the web page having a web app for the speaking wise impaired persons who are unable to speak.so they type their respective words and app will speak out as it is.
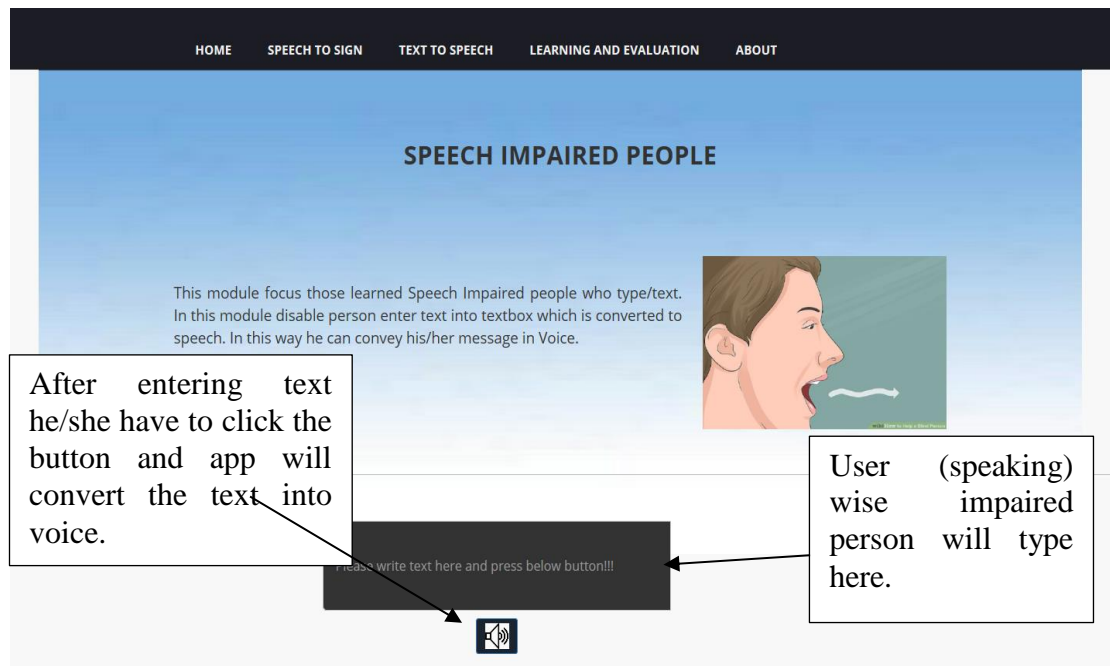

After entering text he/she have to click the button and app will convert the text into voice.

User (speaking) wise impaired person will type here.

Figure 7.8 Web App for Communication

7.10   Learning And Evaluation

Before learning and evaluation link tab one have to go through the REGISTRATION and LOG-IN procedures so after clicking this tab following Figure 7.9 web page will appear.

7.10.1 Registration

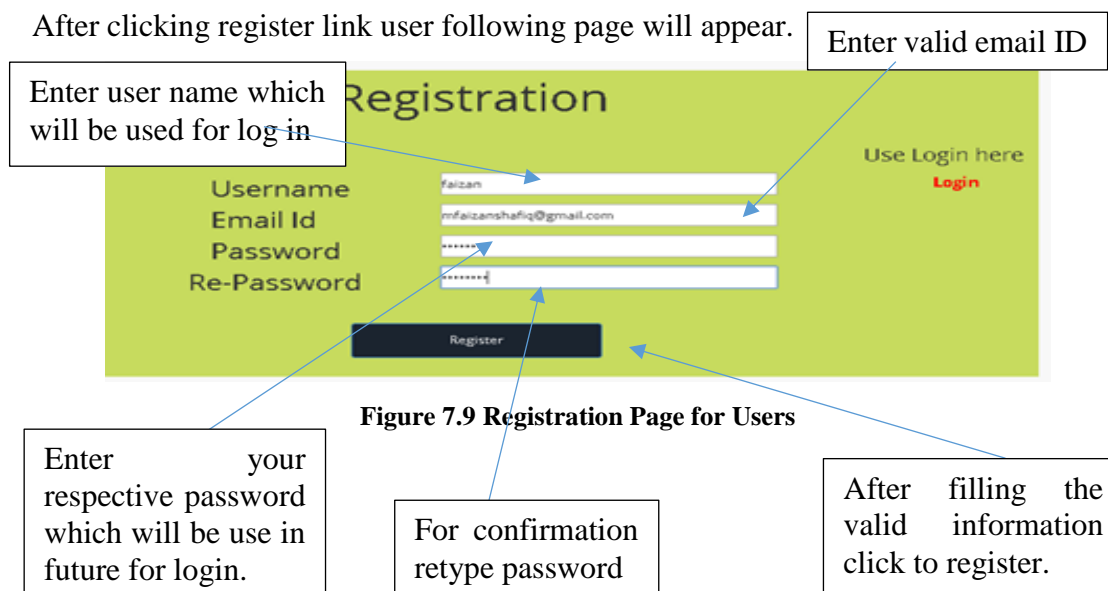After clicking register link user following page will appear.

Enter valid email ID

Enter user name which will be used for log in

Figure 7.9 Registration Page for Users

Enter your respective password which will be use in future for login.

For confirmation retype password

After filling the valid information click to register.

After click on Register button following Figure 7.10 confirmation popup will generate to conform registration.

localhost:51877 says

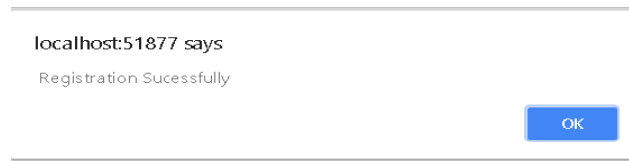Registration Sucessfully

OK

Figure 7.10 Error Message

After this click on ok and then on login link.

7.10.2 Log-In

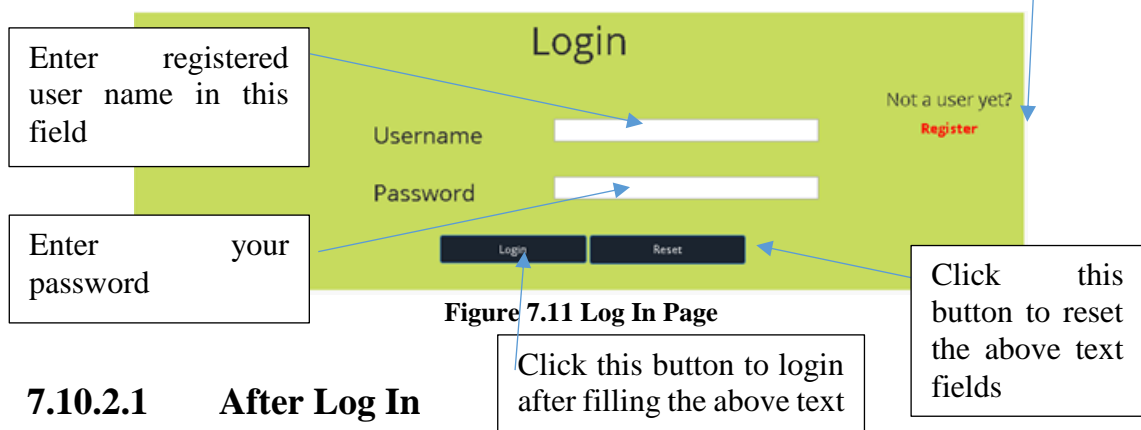Registered user will login here to access allowed options.

Click on this link for registration if you are not a registered user

Enter registered user name in this field

Enter your password

Figure 7.11 Log In Page

Click this button to reset the above text fields

Click this button to login after filling the above text

7.10.2.1 After Log In

As shown in Figure 7.12 web page will appear.

Section 1.4.2.1 For learning sign language
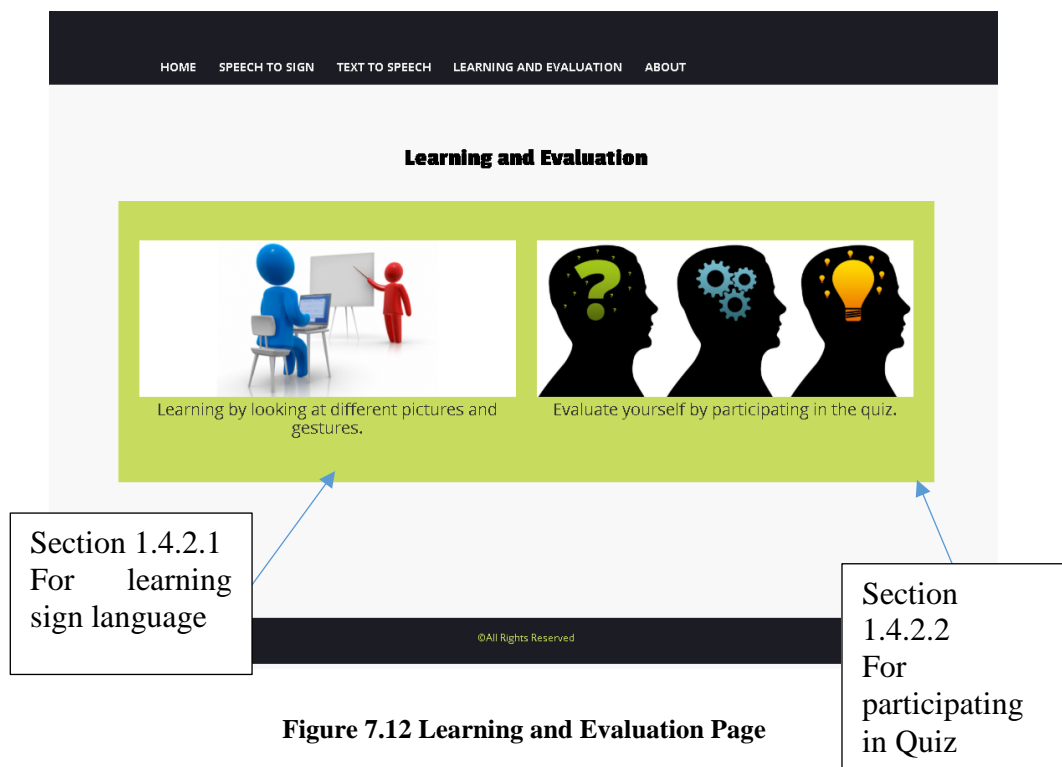
Section 1.4.2.2 For participating in Quiz

Figure 7.12 Learning and Evaluation Page

7.10.2.2   Learning

This section shown in Figure 7.13 is for the users who want to learn something e.g. by typing English words and learn the relevant meaning of that specific word.
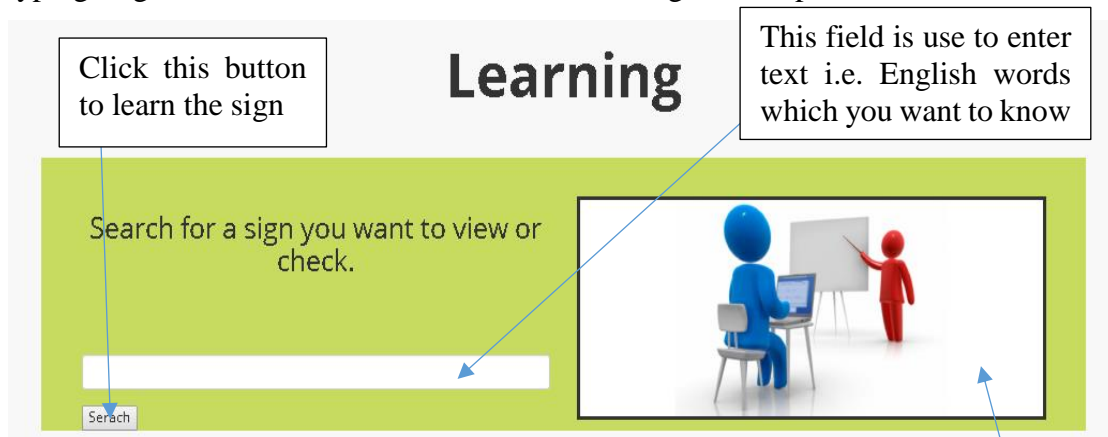
Click this button to learn the sign

This field is use to enter text i.e. English words which you want to know

Figure 7.13 Sign Learning Section

This window show the entered sign

7.10.2.3   Contribution

This section shon in Figure 7.14 is use for those user who want to contribute to our database by uploading sign relevant videos or pictures.
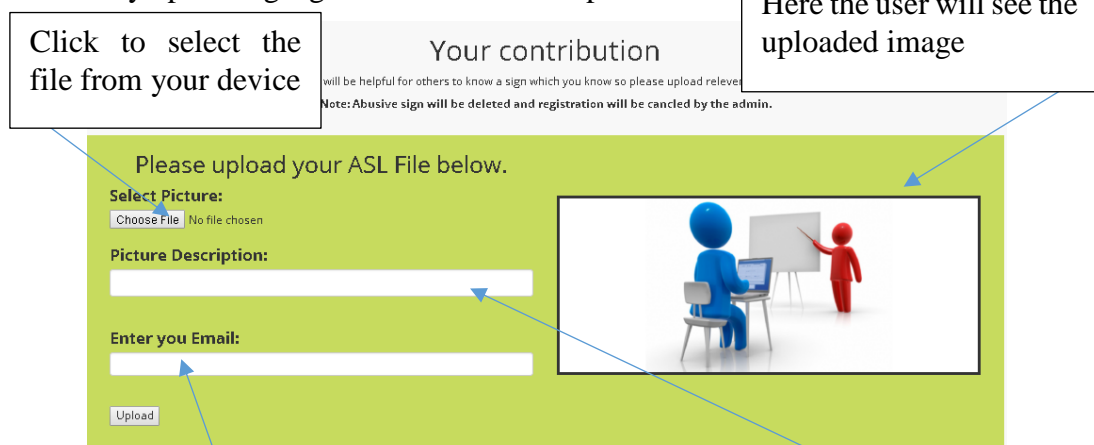
Click to select the file from your device

Here the user will see the uploaded image

Figure 7.14 User can Contribute to DB

In this field user enter the description of his uploaded file.

Only registered user can upload file so he/she have to enter email-id.

7.10.2.4   Manual Learning Slider

Click for previous sign
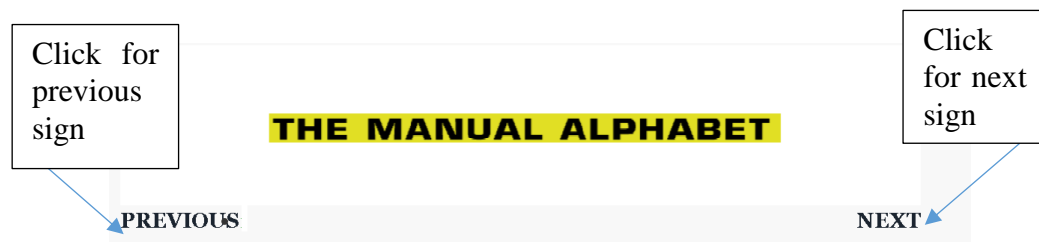
Click for next sign

Figure 7.15 Manual Alphabets

7.10.2.5   For participating in Quiz
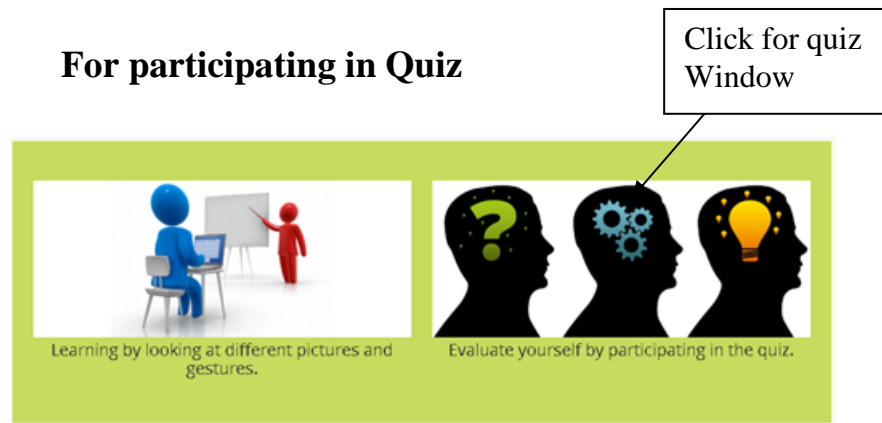

Figure 7.16 Learning and Evaluation Main Page

7.10.2.6   Start Quiz page

As shon in Figure 7.17 web page will appear after the selection of one of the option provided to user i.e. selected option is "Evaluate Your Self By participating in Quiz".
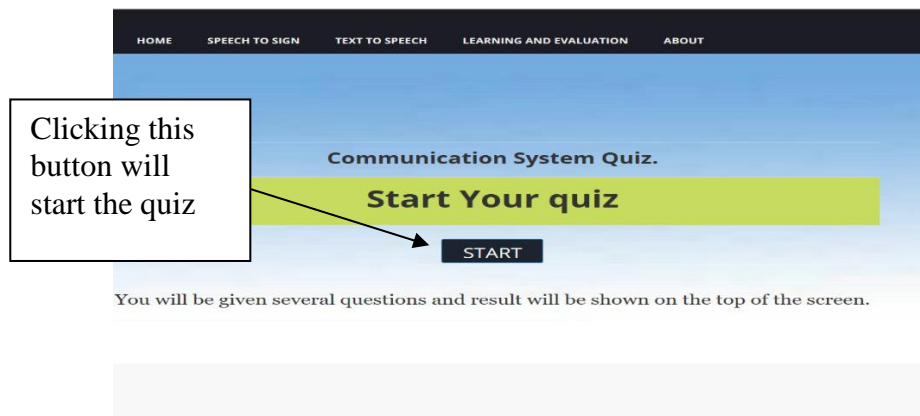

Figure 7.17 Start Your Quiz Page

7.10.2.7   Quiz (Main Page)

As shown in Figure 7.18 After clicking the button the following quiz web window will appear having multiple choice question this window provide quiz timer for users or participants and also user are evaluates according to their true or false options and score will be appear at the right corner of the window.
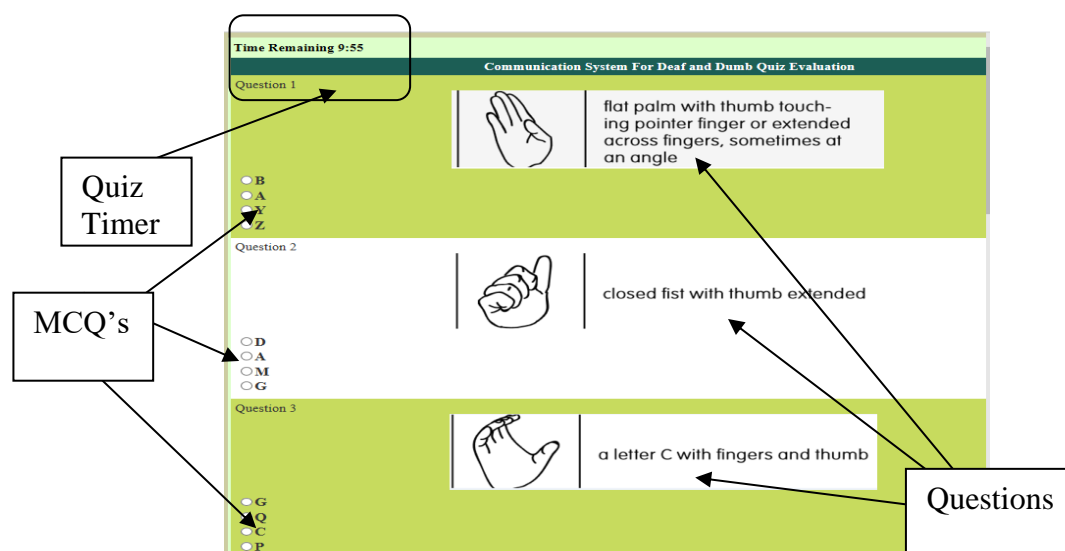
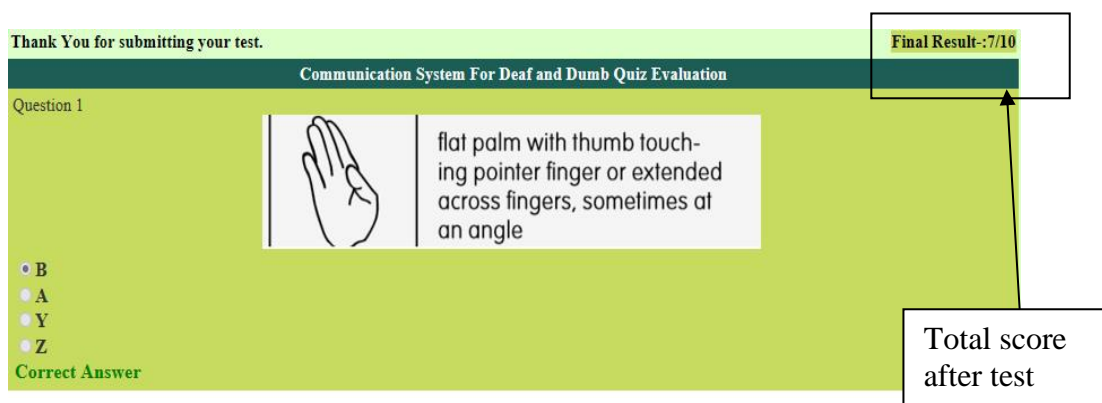**Figure 7.18 Quiz App**

7.10.2.8   Result of Quiz

Figure 7.19 Result of Learner

As shown in Figure 7.19 is the final result of user after the quiz submission or the time exceeding.

8. Conclusion

A Web Site: Talking Hands to reduce communication gap with Hearing and Speech Impaired persons is web base application so any one can use it but all other application on the other hand, discuss in the Chapter 2 are either hardware applications or are one-phase image processing applications. Some application use camera and Sensors while some use glove to give an input to the system. Our application is simple for everyone to use. Our application is two way communication that is it is not only for deaf and dumb but also for the normal people as well. There is another factor that all other application discuss in the chapter 2 are expensive to buy but our application is free to use. User just have to make an account for the learning purpose.

Most of the system are Glove base systems while for learning purpose most of them use SLIM Module, TESSA, Wi-See Technology, SWI_PELE System (Secure Wireless Infrastructures and Personalized Educational Learning Environments) and the Web Sign Technology. Our system uses Speech to Sign Application Programming Interface for communication while for learning purpose Text to Sign is used. These techniques help us in developing the system in less cost as compared to all other systems. Our system, not only help the user to learn the American Sign Language but it also help to update the database or vocabulary of the language which make it limitless with respect to data. We have provided an interface to the user in which user can upload signs relevant to the American Sign Language.

8.1 Future Enhancement

We have develop this application on small scale for communication purposes and with less time and cost but in future this application can be updated by adding more and more signs not only by the developers but can also by the users. Admin of the application have an eye on the data uploaded by the users and irrelevant signs can be deleted from the database. Our future enhancement includes

- Updating the database time to time by adding more and more signs.
- Interface ehancement and adding new features to the application.
- Adding more and more technicality and functionality to the application.
- Maintaining the application and securing it from attacks.
- If the application might get populer than to develop the Andriod App of the same features.

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