SignBot

Requirement and Specification Document

22nd March, 2022

Rev 1.0 Major

1. Project Abstract

Our project is to develop an audio/text to sign language converter to help the hearing-impaired community in India. We will develop a web application, SignBot, that will take live audio speech or typed text as input and convert it into the corresponding manual (hand gestures) Indian Sign Language animations. These animations will be displayed on the web application. Those who do not know sign language can easily use SignBot to communicate with the deaf. Also, SignBot can be used to translate the available text resources like books into sign language, which will make these more easily accessible to the deaf.

2. Document Revision History

Rev 1.0 22-03-2022 – initial version

3. Customer

SignBot will be developed for an open market specifically for people who have no pre-requisite knowledge of sign language and hence have difficulty communicating with deaf people. Customers can also include any business wanting to translate a written work into sign language for easy access to the deaf community.
The dummy customer for the project is a person who does not know sign language but wants to communicate with the deaf through sign language

4. Competitive Landscape

The proposed project is not being formally used in the market as of now. On the country and industry basis, this kind of software is not

used currently. Instead, a similar kind of software is used by DD news; but it requires a person to show the signs, which makes it a tedious task. Software's which are able to convert text and represent individual characters as signs have been developed but these take a lot of time to convey a message and are not as feasible in the market.

Advantages and Disadvantages:

Our software shows the following strengths. Clear and concise 3-D animations are used for easier and faster understanding of the target user. It is easy to setup and is suitable for regular updates to web content. It is also suitable for isolated environments. The animations for the web-app are made using Blender which makes it easier to design 3-D characters and define render parameters. Some weaknesses of our software are that the animations must be made individually for each word in the dictionary which makes it a tedious job and as newer words are introduced into the database the size of the software increases linearly.

Differentiating Features:

Even though such software's are rare in the market, but it is essential for us to differentiate our software from out applications in the same genre. The following features can be useful for this purpose:

- 3-D animations are used to show various signs as the output whereas pre-existing software's in this genre typically use gifs and images for the same.
- A portal is implemented through which users can give feedback and suggest us more words which can be added to the software.
- Users can create their account and if they forget the password, the access to the account can be regained in a very fast and secure way.

Competitive Barriers:

- Since the software is specific to a certain group of users hence heavy advertising is essential to make people know about our software.
- Issuing of the patent for the software needs to be done before entering the market.

Patent Status:

It is possible to obtain a patent for our software since any software in this genre has not been patented yet.

5. System Requirements

Stimulus/Response Sequence

Our tool is a web-based application. Once the user accesses the website, the first page he gets a welcome page with two options, log in for already registered users and register for unregistered users. Once the user successfully logs into the web app, he has an option to record the audio corresponding to which signs he wants to see on the screen. Once he successfully records the audio and submits it, the web app will process it and generate the corresponding animation. In this, the web app can successfully serve the purpose of bridging the communication gap among disabled and non-disabled people.

System Specifications

Functional Requirements:

The software is scalable with respect to the number of animations corresponding to signs that can be added to the software. In a basic version, if we don't find animation corresponding to a particular word, we break it into alphabets but in the advanced version, we can add animations corresponding to these words. The interface used will be user-friendly. The management of the user's data is done using a database where all the information will be safely stored.

Non-Functional Requirements:

Timing Constraints:

The project is needed to be completed in 25 to 30 days. As we are using an iterative waterfall model for the development of the project, we plan to deliver the complete project with basic signs in 25 days. Later when the project enters the maintenance phase, we can add more animations corresponding to complex words under perfective maintenance. Perfective maintenance is done to improve the performance of the system or enhance the functionalities of the system based on the customer's request.

Security and Privacy Issues:

The user of the software will need to register himself before using the web app. The login id and password of the user will be securely stored in the database. The developers will encrypt the details of the user and then store them in the database so that the privacy of the user is maintained.

Memory Requirements:
If we take an overview of the whole project, we find that the size of the software will vary with two distinct factors one being the number of animations added to the software and the other being the number of users registered in the database, rest all components of software will be contributing a definite memory. In order to manage the memory requirements of the software, we will add the optimal number of animations such that the trade-off between the memory of software and the number of signs used to communicate the word is made. For storing the data, we will increase the number of databases if the number of users is increased. We will be using lightweight libraries in the development of the software.

Performance Requirements:
The criteria which will be used to judge the performance of our system will be the time taken between taking audio as input and generating animation as output. With the use of API and framework, we will get the best response time which will enhance our performance. Instead of building from scratch for audio to text, we are using the API in order to get the results in the minimum time possible.

Data capacity Requirements:
The Web Speech API provides a limit of speech detection of 60s.

Software Quality Attributes

User Friendly:

- The interface is user-friendly.
- The system is easy to use.
- No need to install any software as it is a web app.
- It does not ask for unnecessary information.

Availability:
The website is hosted on the internet and is easily available to a wide range of users.

Recoverability:
The database used is very secure and hence very less chance of loss.

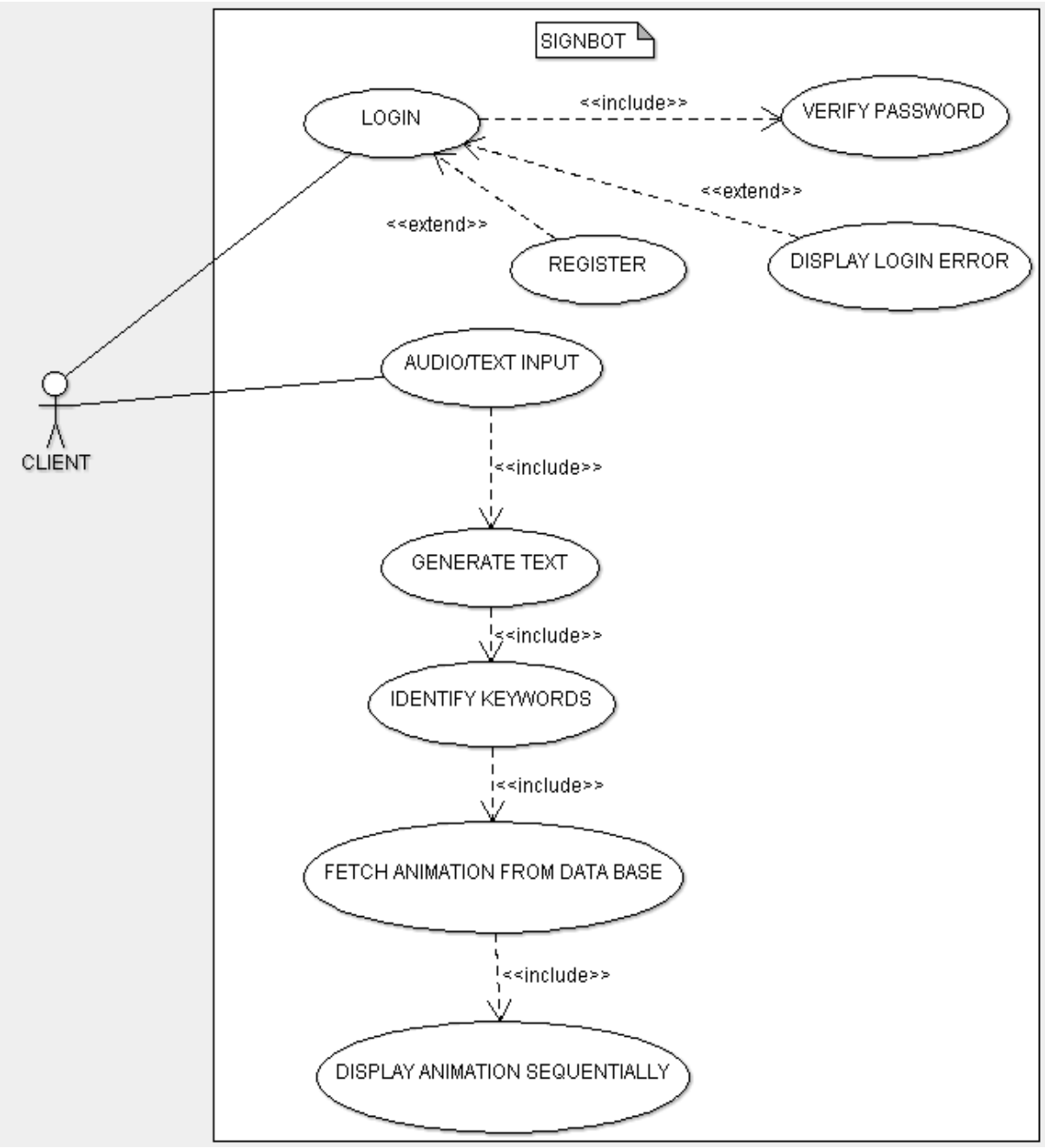
Manageability:

The system is easy to manage once completely developed as the chances of data crashing are very bleak, moreover, we have ensured the privacy of the user with the use of encryption.

Maintainability:
After deploying the software, we work on corrective and perfective maintenance. In corrective maintenance, we work in making the software free from any bugs, and in perfective, we enhance the functionality of the software.

Use Case Diagram -

Register: a user must register on our site, filling in information like name, email address, phone number and password.
Login: once registration is done, a user will have to login using email address and password.
View Animation: On giving the audio Input, the software displays the corresponding Animation on the screen.



Customer User Requirements

User interface is the front-end application view to which the user interacts to use the software. Users can manipulate and control the software as well as hardware by means of the user interface. The graphical user interface helps the user to interact and control the software and hardware via use of different icons such as buttons, sliders etc. And mouse pointing device.

Graphical User interface Requirements:

- Front-end development tool: HTML5 (scripting language), CSS (for styling), JavaScript (language - for creating graphical user interface).
- Back-end development tool: Python, Django- (enables the rapid development of secure and maintainable websites), SQLite (database to store all the information about the user), JavaScript Web Speech API (To convert the audio to text) Natural Language Toolkit (pre-process the text to get the keywords from the text)

Hardware interface Requirements:

- Any operating system – Windows, MacOS
- Any browser that supports HTML, JavaScript: google chrome, Microsoft Explorer

Software/Programming interface Requirements:

- An operating system - Windows, MacOS
- Development tool: Python
- Django Framework.

Communication interface Requirements:

- Web Browser - As It's a web-based application thus it uses web browser as a communication interface

External Entities:

- Web browser: A web browser which supports Html and JavaScript
- Databases: a centralized database and a local database.
- Operating System: As our project is a web application any operating system which supports web browsers is sufficient.