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CMPE 491 – Project Analysis Report

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Submission Date

26 November 2023

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1. Introduction

Sign Linga is a project that emerged from a series of discussions with developers to define the core focus of the project. The main theme that arises during these discussions was the identification of features essential to our target audience. SignLinga, aims to provide user-friendly experience, it intends to focus on key features such as “Voice Translation” enabling the conversion of audio files into sign language that users can easily comprehend, “Video Translation” which enables users to translate videos containing sign language on their devices or videos captured via the application, and “Text-to-Video” translation, a feature allowing the conversion of written text into sign language presented in video format.

The primary objective of the SignLinga project is the implementation of the identified features, thereby enabling individuals with hearing impairments to communicate more effectively in their daily lives. As developers we aim to enhance the user experience and manage user information in compliance with privacy principles through the features integrated into the project’s administrative panel. The administrative panel features will play a crucial role in monitoring and improving the use of the project, simultaneously serving as an effective tool for ensuring user privacy and data security. These features include the capability to view user information while ensuring the responsible use of personal data, the ability to review and report on performed activities, and monitoring users' online statuses.

In this report, analysis details of the mentioned Sign Linga project are included.

2. Current System

The ideas are not/will not be built on the existing system. SignLinga will be developed as an application from scratch.

3. Proposed System

3.1. Overview

The application will be designed with the overarching goal of facilitating communication between individuals, specifically targeting those who do not understand sign language, aiming for easy comprehension of sign language videos by end-users in a short period. The application also aims to enable individuals who communicate in sign language to interact seamlessly with others, essentially breaking down communication barriers between two people. Upon entering the application, the user will be greeted by an initial screen. This screen will consist of two essential sections. The first section allows users who have created an account for the application to log in by entering their personal information in specified fields on the screen. The second section is for users who have not created an account; they will be directed to a different page by clicking the "Create New Account" button. On this new page, after entering essential information such as the user's name, surname, date of birth, phone number, email, username, password, and information about their ability to speak/sign in sign language and any disability status, the user can click the "Create Account" button. Subsequently, an OTP code will be sent to the entered phone number. The user can easily create a new account by entering this code on the screen that pops up with the "Enter Code" button. The user data obtained will be stored in a real-time database, allowing registered users to easily log in to the application. After clicking this

button, the user will be returned to the login screen, where they can enter their information and proceed to log in to the application by clicking the "Log In" button.

After logging in, the user will be greeted by the main screen, featuring buttons with important functions. The "Translate" button will be centrally positioned on the screen, ready for action when pressed. Upon pressing this button, three options will appear for the user: "Voice Translation," "Video Translation," and "Text Translation." Each of these options allows the user to perform the corresponding translation task. Below the "Translate" button, there will be three buttons in order: "Translation History," "Settings," and "How to Use".

The "Translation History" button will display the user's past translations, showing what videos, audio, or text have been translated, will be providing easy visibility into the user's translation activities. The "Settings" button will include features such as changing the application theme (light/dark theme), playback speed of translated videos, password change, and updating email and phone information.

The "How to Use" button will contain essential tips and tricks provided by the creators, guiding users on how to effectively use the application. Returning to the "Translate" button, each press will prompt a pop-up displaying the options "Voice Translation", "Text Translation", and "Video Translation".

When the "Voice Translation" command is selected, a new screen will be appear with a microphone button. Holding down this microphone button will record a sound, which will then be ready for translation. After releasing the button, the recorded sound will be translated into a video that the user can easily utilize. The translated video can be saved or shared using the "Save" and "Share" buttons on the screen, like other translation options. To return, the user can click the "Home" button on the screen.

Clicking the "Text Translation" button will prompt a pop-up text box for the user to fill. After entering the text, the user can press the "Translate" button to view the translation video. When clicking the "Video Translation" button, two options will appear: "Capture Video" and "Use Recorded Video." The difference between these options is that one captures a new video for translation, while the other uses an existing video on the device. This way, the application will be facilitate easy and versatile translations.

When attempting to log in as an admin, the user will enter the admin username and password on the login screen, utilizing the pre-existing admin credentials stored in the database. This will grant access to the application with admin privileges. The admin interface will have distinct features compared to the user interface. Upon entering the admin interface, an overview of all registered users will be displayed. This screen will present information such as the names, surnames, phone numbers, and email addresses of users in a list. Additionally, the admin panel will show the current online status of users in real-time. Admins will also have the ability to view the translation history of users. To access this information, clicking on any user will be reveal a list of their past translations, organized in chronological order.

The sub-menu will include a "Settings" button and a "Home" button, allowing admins to access functionalities similar to those available to regular users. This way, admins can efficiently utilize the features accessible to normal users while also having additional capabilities, such as viewing user information and translation histories.

3.2. Functional Requirements

Admin System

- The admin should be able to complete the login process with a password and email.
- The ability to define and manage user roles (e.g., admin, user, disabled user, etc.) should be provided.
- The admin should be able to list all users.
- A search bar should be available, and the admin should be able to search among users listed as program users.
- The ability to disable users and determine which ones are disabled should be present.
- The admin should be able to view all users of the application, then search among them by names and email addresses.
- Filtering users without case sensitivity should be possible.
- Enable the admin to modify user roles and permissions dynamically.
- The admin should be able to return to the home page.
- The ability to show which of the other users using the application is online/offline should be available.
- The admin should be able to log out users.
- The admin should be able to use the application as a normal user.
- Allow admins to send notifications to specific users or user groups.

User System

- The system should be able to register users by collecting their name, email address, and password.
- The system should be capable of verifying user identity using the OTP code sent by users.
- The application should allow users to change themes, access personalized information, log out, and delete their accounts.
- The system should allow users to create user profiles where they can view and edit personal information.
- Users should be able to reset their passwords.
- The "How to Use?" section should be created to guide users on how to use the application.
- User-friendly error messages should be sent to guide users when issues arise.
- The translation feature should be accessible.
- Users should be able to return to the home page.
- Body movements of individuals using sign language should be analyzed from the camera image and converted to text.
- The system should be able to make listen to sign language-translated text aloud at any time.

- It should be possible to translate text written by users who do not know sign language into sign language.
- For users who do not want to type, the system should be able to translate sign language from the microphone.

3.3. Nonfunctional Requirements

Admin System

- **Performance:** Admin panel should manage more than one user process at the same time.
- The admin panel should be designed to minimize errors and bugs in translation features.
- **Security:** Admin panel should only be accessible for admin user.
- **Compatibility:** Admin panel should work large numbers of devices effectively.
- **Availability:** The admin panel should available always.
- **Logging:** Admin panel tasks should be logged, and these logs saved daily.

User System

- **Performance:** The application should provide translation with minimal latency.
- **Reliability:** The Application should have a high level of reliability for accurate translations
- Translation results should consistently match the expected accuracy levels.
- **Security:** The Application should securely transmit and delete after transmission
- **Compatibility:** The Application should be work lots of devices with minimum resource usage
- It should be responsive and work efficiently across various devices, including tablets, and mobile phones.
- The application should be designed to operate smoothly on different operating systems.
- **Usability:** The Application should be easily use to everywhere
- The design should follow accessibility standards, making it usable for individuals with disabilities.
- Provide clear and concise error messages to assist administrators in troubleshooting.
- **Availability:** The application should available always.

3.4. Pseudo Requirements

- The user system should work well with various devices.
- The translation feature should be reliable.
- The application should be secure.
- Both admin and user panel should be user-friendly.

3.5. System Models

3.5.1. Scenarios

Admin System

- Admin opens the application.
- Log In the application within the admin information's.
- Admin clicks to "Admin Panel" button and displays the user list.
- The admin uses the search bar to find a specific user by entering the user's name or email address.
- Clicking on a user's name in the list, the admin views detailed information about the selected user, including their registration date and recent activities.
- Using the admin panel, the admin disables the selected user, preventing them from accessing the application.
- The admin selects a user and navigates to the translation history section to view a chronological list of their past translation activities.
- Admin clicks on "Home Page" button.
- The admin should manage user role.
- The main page show for users shown to the admin and admin can use application as user.
- After completing the necessary tasks, the admin securely logs out of the admin panel.

User System

- A new user downloads and installs the translation application.
- The user opens the application for the first time and registers by providing their name, email, and creating a password.
- After successful registration, the user logs into the application using their email and password.
- The user is presented with the main dashboard, featuring options like "Translate", "Translation History", "How to Use" and "Settings".
- User click on the "Translate" button and are prompted with options: "Voice Translation", "Text Translation", and "Video Translation".
- The user selects "Voice Translation" and records a message using the microphone feature.
- After recording, the system processes the message and displays the translated video on the screen.
- The user selects "Text Translation" and enters text to be translate into text area.
- After sending the text, the system processes the message and displays the translated video on the screen.
- The user selects "Video Transformation" and uploads video from device or record video via application.
- After sending the video, the system processes the message and displays the translated text on the screen.
- The user navigates to the "Translation History" section to review past translations.

- The user can see a list of their previous translations with timestamps.
- The user explores the "Settings" menu to personalize their experience.
- Options include adjusting themes, changing notification preferences, and modifying account details.
- After completing tasks, user clicks "Return to Menu" button and returns to main menu.
- User clicks "Logout" button and user securely logs out of the application.

3.5.2. Use Case Model

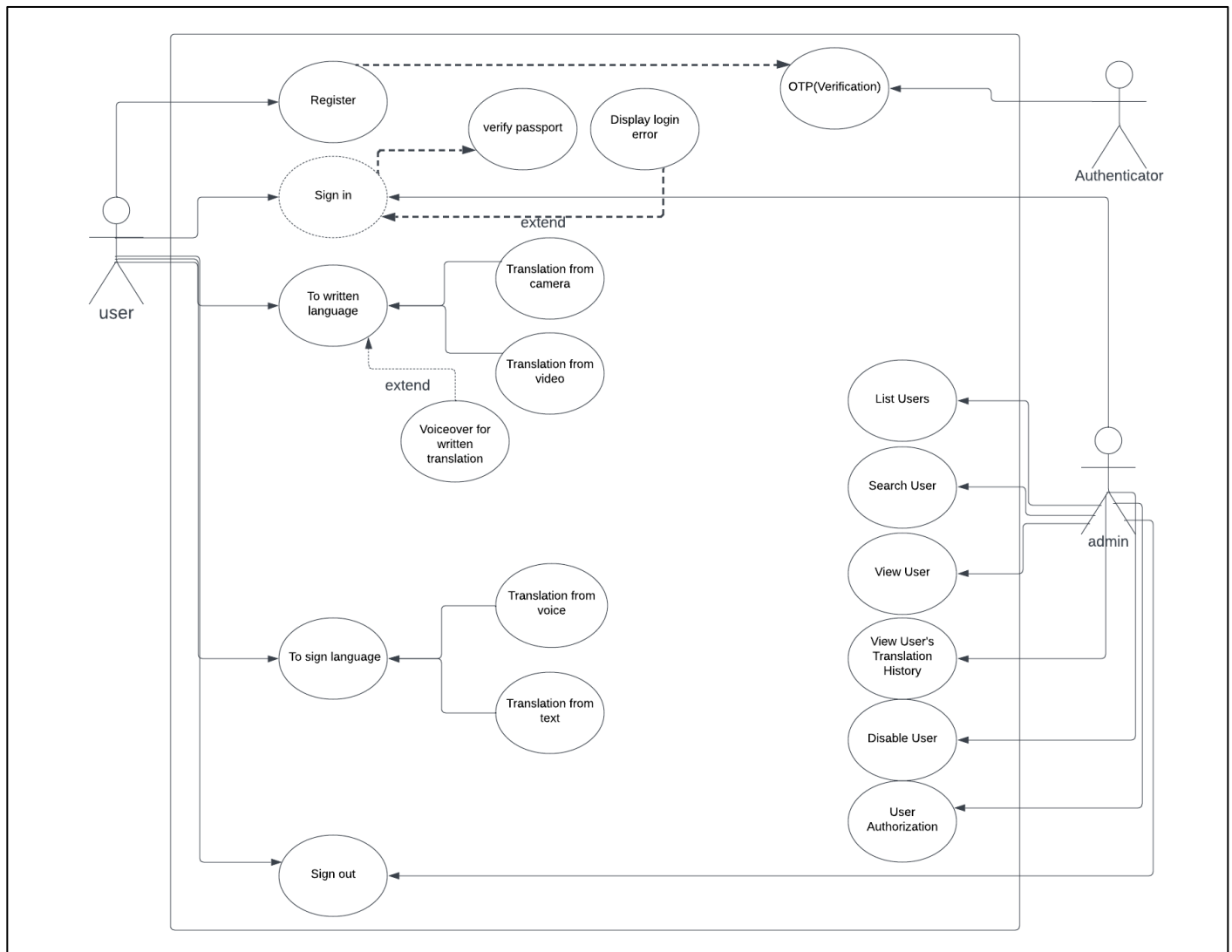


Figure 1 Use Case Diagram

3.5.3. Object and Class Model

Admin System Class Model

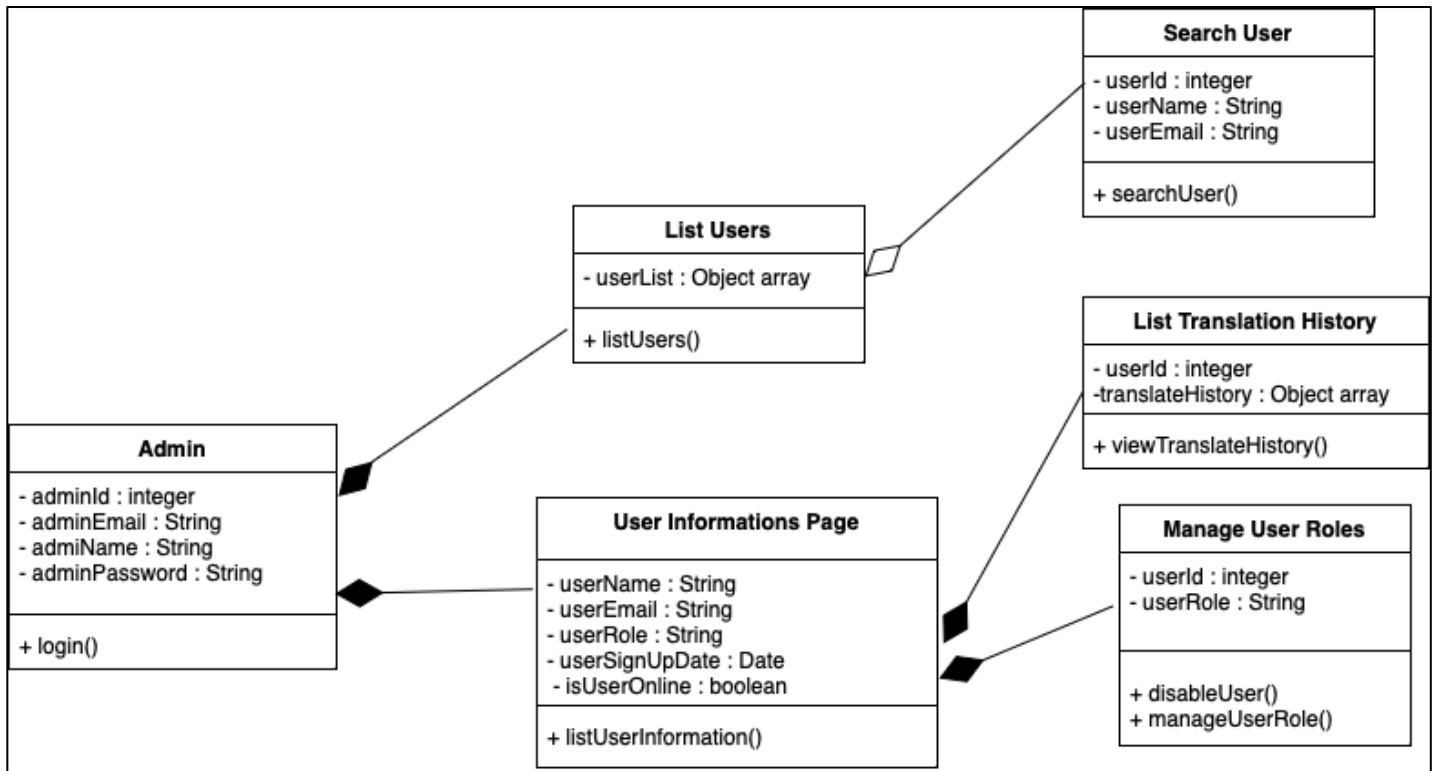


Figure 2 Object and Class Model for Admin System

User System Class Model

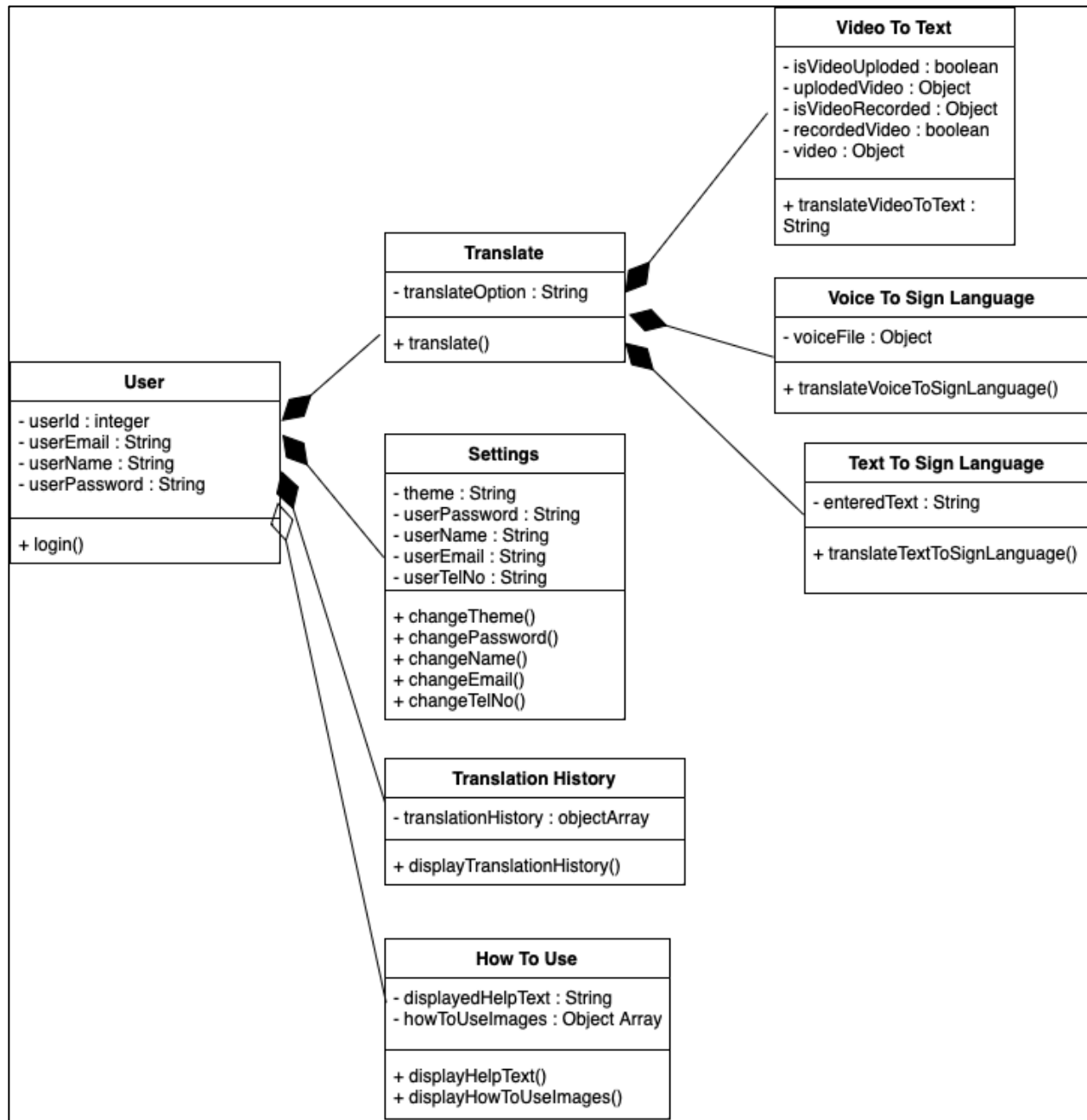


Figure 3 Object and Class Model for User System

3.5.4. Dynamic Models

Work Breakdown Structure

| | |
|-----------|-----------------------------------|
| 0 | SignLinga System |
| 0.1 | Sign in & Register |
| 0.1.1 | Sign in Page Module |
| 0.1.2 | Register Page Module |
| 0.2 | Home Page |
| 0.2.1 | Profile Settings |
| 0.2.2 | Translate |
| 0.2.3 | Previous Translates |
| 0.3 | Translate Module |
| 0.3.1 | Select Translate Type |
| 0.3.1.1 | Voice Translation |
| 0.3.1.2 | Text Translation |
| 0.3.1.3 | Video Translation |
| 0.3.1.3.1 | Record Translate Video |
| 0.4 | Convert Sing Language Module |
| 0.4.1 | Write with Voice |
| 0.4.2 | Write with Text |
| 0.5 | Convert From Sign Language Module |
| 0.5.1 | Upload Video |
| 0.5.2 | Record Video |
| 0.5.3 | Translate to Text |
| 0.5.4 | Translate to Text with Voice |
| 06 | Previous Translates Module |
| 0.6.1 | Select previous Translates |

| | |
|---------|-----------------------------|
| 0.7 | Instructions Module |
| 0.7.1 | Select Instructions |
| 0.7.2 | Select Instructions Topic |
| 0.8 | Settings Module |
| 0.8.1 | Select Setting Topics |
| 0.8.1.1 | Theme |
| 0.8.1.2 | User Password |
| 0.8.1.3 | Username |
| 0.8.1.4 | User Email |
| 0.8.1.5 | User Telephone |
| 0.9 | Change Password Module |
| 0.9.1 | Changing Current Password |
| 0.10 | Delete Account Module |
| 0.10.1 | Delete Existing Account |
| 0.11 | Sign Out Modlue |
| 1 | Admin System |
| 1.1 | Sign in Page Module |
| 1.2 | User Table Page Module |
| 1.2.1 | List All Users |
| 1.2.2 | Search Users |
| 1.2.3 | Manage User Role |
| 1.2.3.1 | Inspect Previous Translates |
| 1.2.4 | Add User |
| 1.2.5 | Edit User |
| 1.3 | Log Out Module |

State Diagrams

Admin System State Diagram

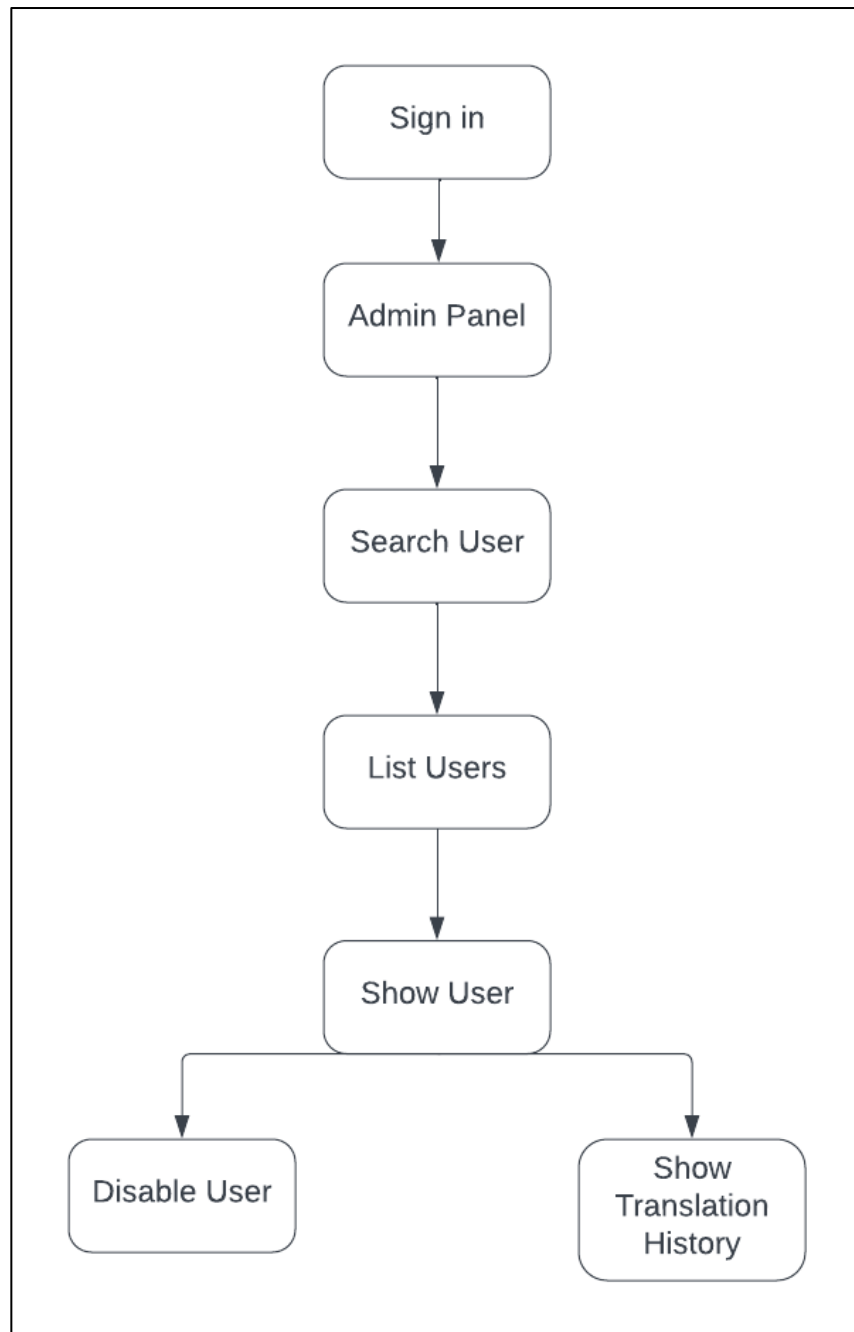


Figure 4 State Diagram for Admin System.

User System State Diagram

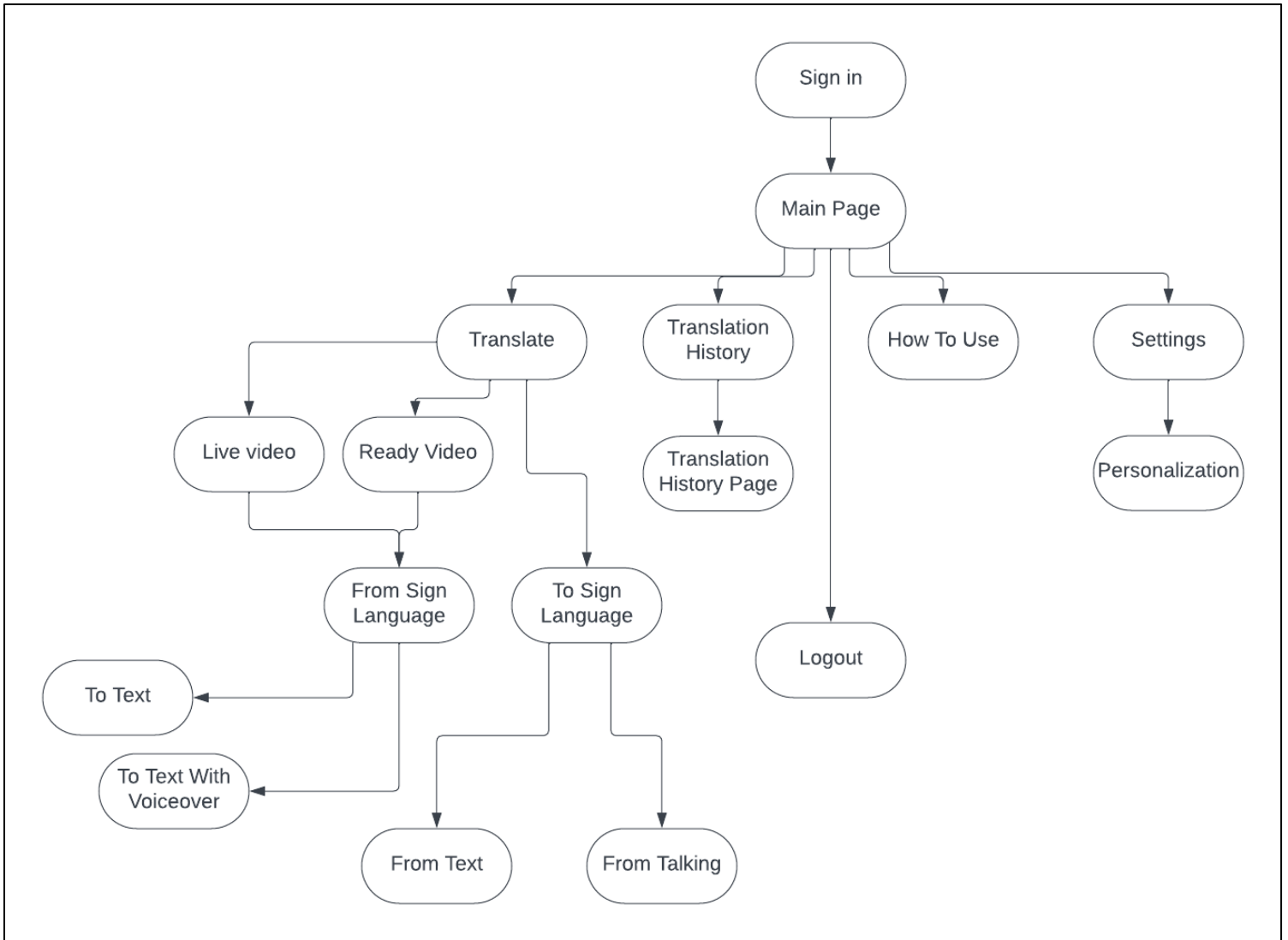


Figure 5 State Diagram for User System.

3.5.5. User interface - navigational paths and screen mock-ups

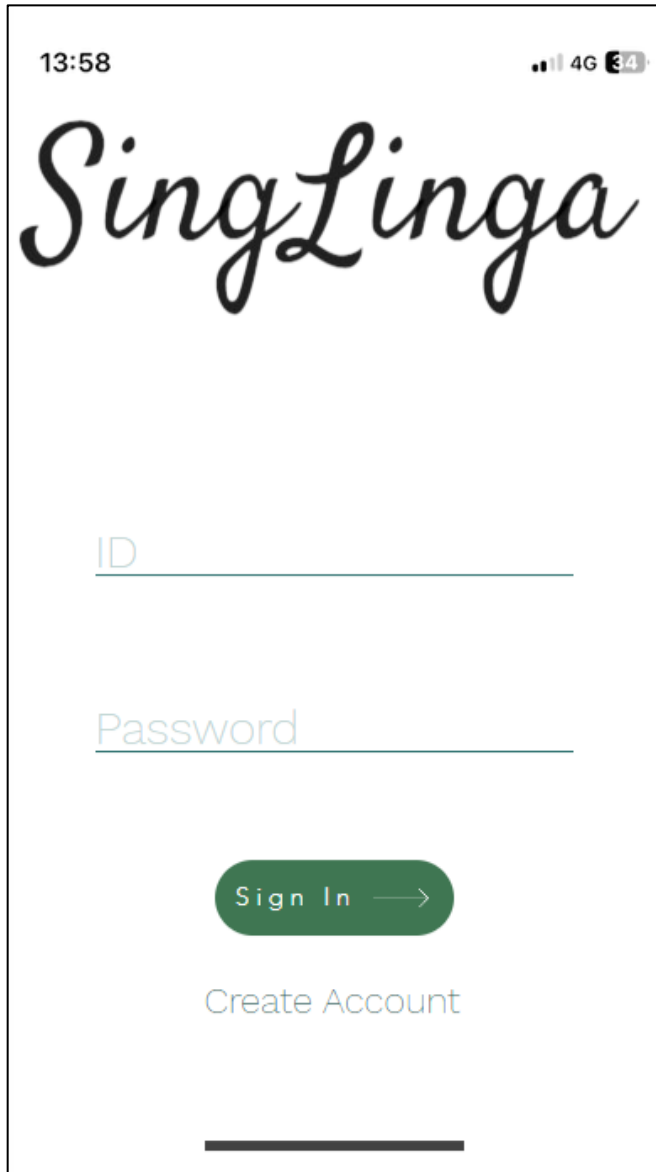


Figure 6 Mock-Up design for SignLinga login page



Figure 7 Mock-Up design for SignLinga translate page.

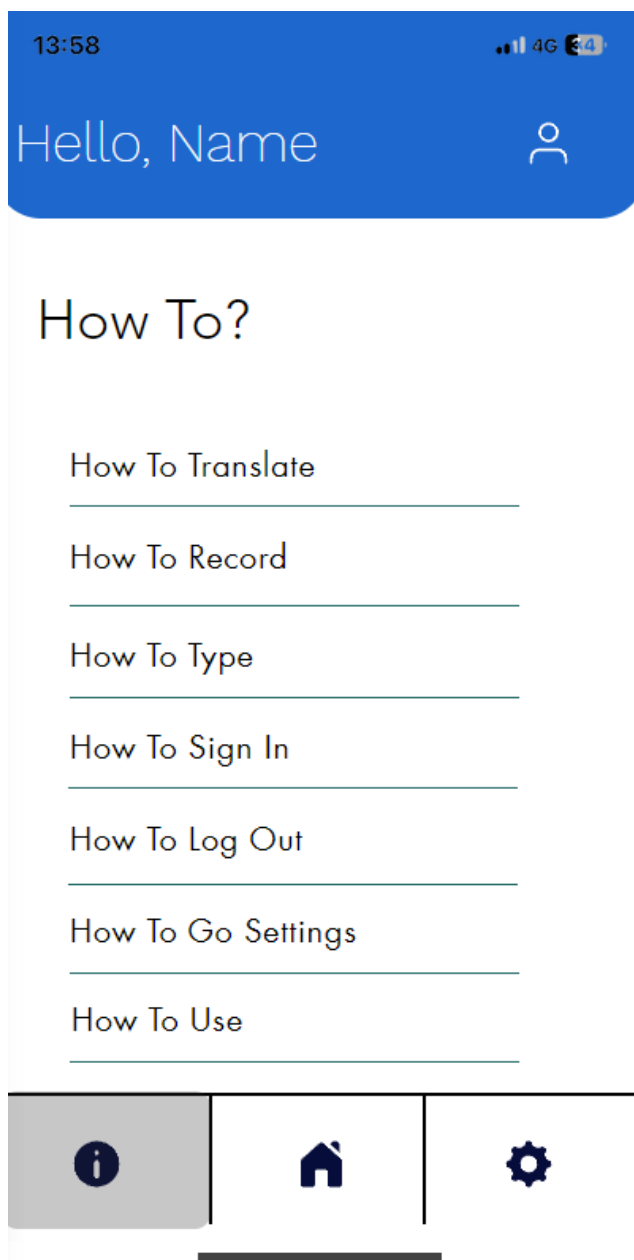


Figure 8 Mock-Up design for SignLinga "How To?" page.

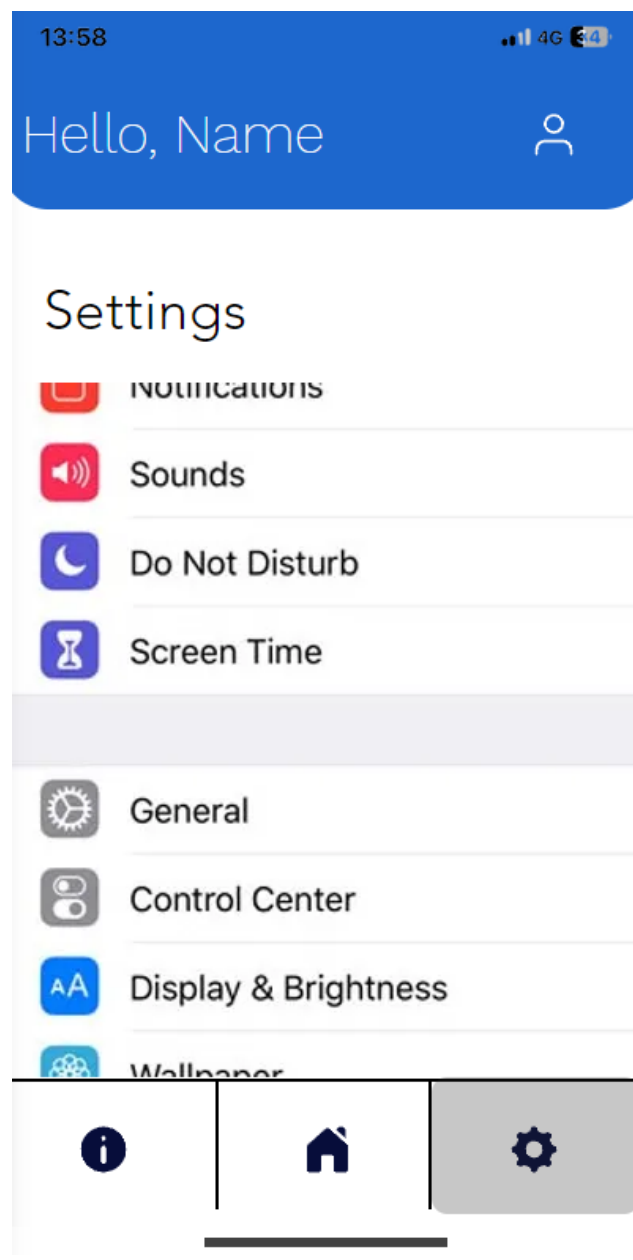


Figure 9 Mock-Up design for SignLinga settings page.

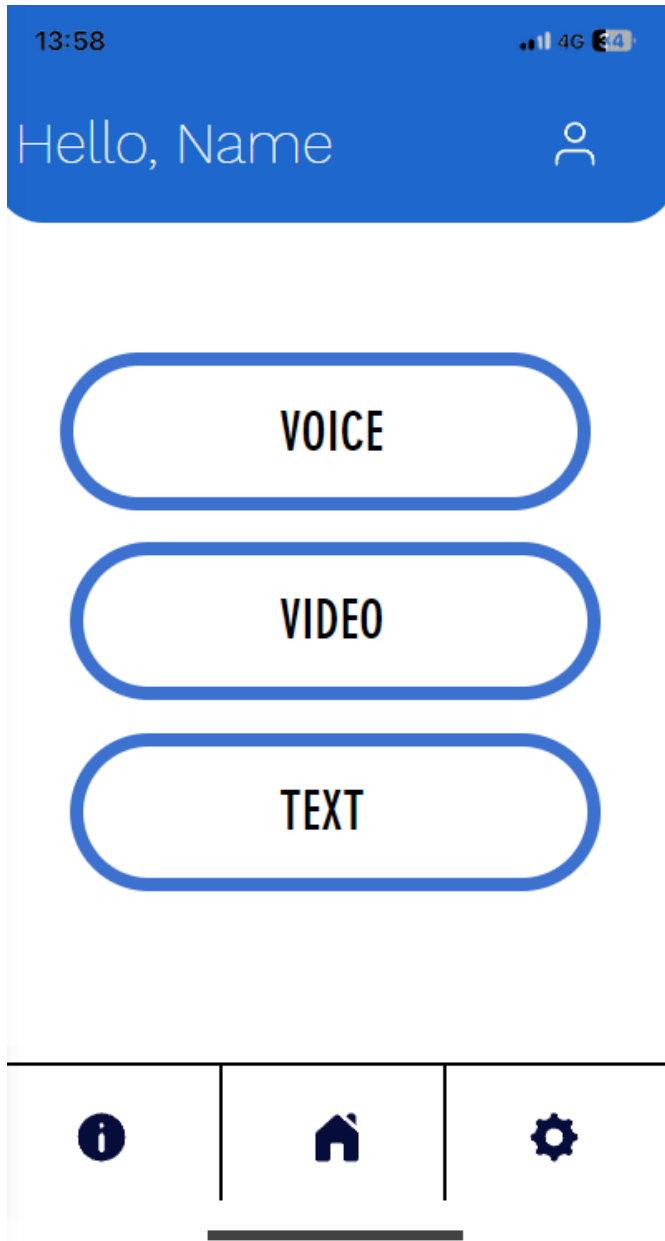


Figure 10 Mock-Up design for SignLinga translate options page.

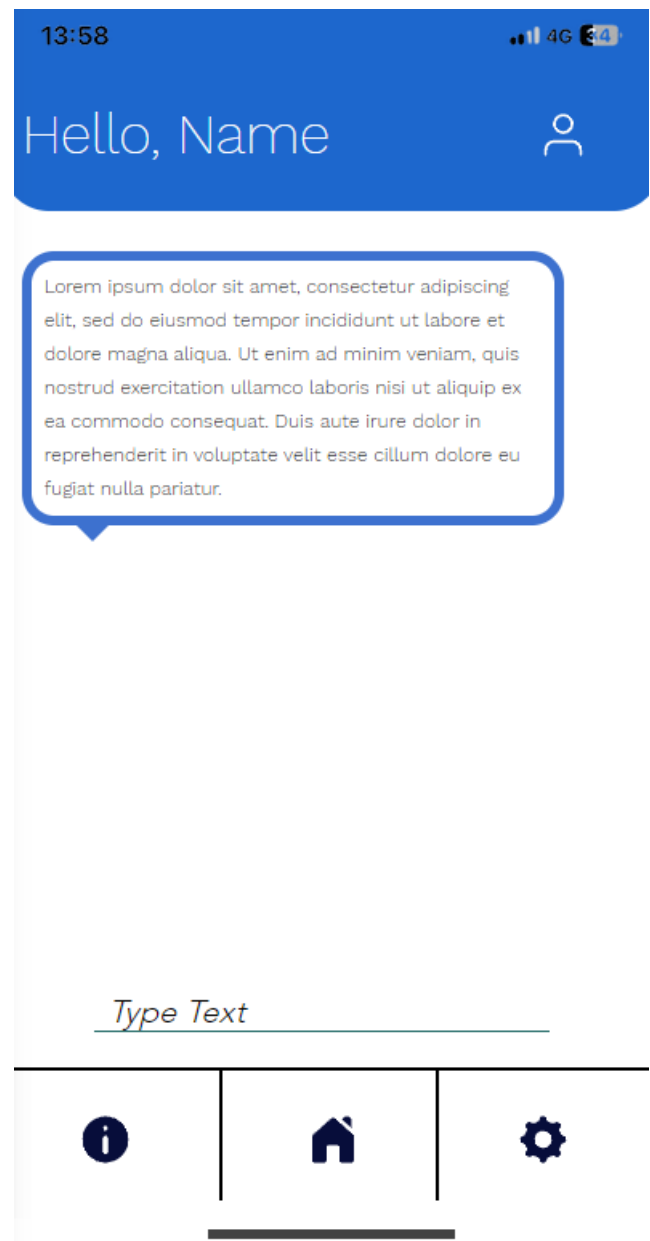


Figure 11 Mock-Up design for SignLinga text-to-sign language page.

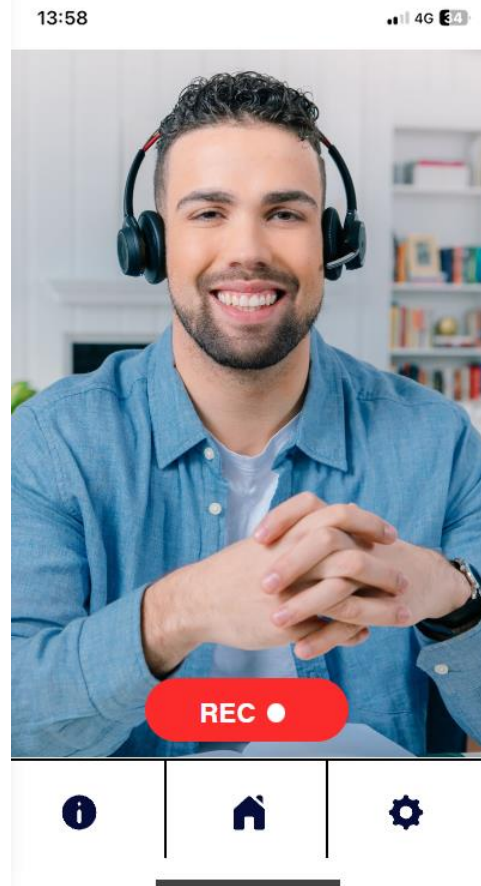


Figure 12 Mock-Up design for SignLinga sign language-to-text page.

4. Glossary

1. **Translation Application:** Refers to software developed to translate sign language into text. In this report, it denotes the application designed and developed for facilitate communication.
2. **User:** Individual who downloads and uses the application.
3. **Admin:** An administrator with higher authority within the application.
4. **Sign Language Translation:** The process of translating video-captured sign language gestures into textual representations.
5. **OTP (One-Time Password):** A temporary password that was created for the purpose of authentication. It is utilized during the user registration process in the context of the report.
6. **Translation History:** A function within the translation program that maintains track of previous translations a user has completed. It offers a list of translation activities arranged chronologically.
7. **Database:** A set of data that has been structured and arranged to make efficient management and retrieval possible. It keeps user accounts, translation data, and other important data relevant to the report.

8. **Admin System:** The administrative part of the translation program oversees handling user management, seeing translation history, and carrying out various administrative duties. Administrators use the admin system to log in and access privileged features.
9. **User System:** The user-facing component of the translation application where individuals register, log in, and utilize features such as sign language translation.
10. **Disable User:** The process of deactivating a user account in a translation application, either temporarily or permanently. Until their accounts are reactivated, disabled users are unable to access the application.
11. **User List:** A compiled list within the admin system displaying information about registered users. This list typically includes details such as usernames, email addresses, and other relevant user attributes.
12. **Use Management:** The group of features in the admin system that give administrators control over things associated to users, such as changing user roles, and disable user accounts.

5. References

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