

**NANYANG
TECHNOLOGICAL
UNIVERSITY**
SINGAPORE

SC2006 - Software Engineering

Lab 1 Deliverables

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Introduction to Application and Target Users

SignBridge - Bridging Deaf to the World

Communication barriers between deaf and hearing individuals often lead to misunderstandings due to the limited understanding of sign language. Existing translation solutions are often inaccurate or lack essential features. This app addresses these challenges by offering real-time sign language translation, pre-recorded video analysis, and text-to-sign conversion. With advanced moderation tools to ensure accuracy and prevent misuse, it supports multiple sign languages, enhancing accessibility for deaf individuals, educators, healthcare professionals, and service workers in various social and professional settings.

Target Users

1. Deaf and Hard of Hearing Individuals

In Singapore, it's estimated that approximately 500,000 individuals experience some degree of hearing loss, accounting for about 8.4% of the population. Among the 5,400 individuals registered with the Singapore Association for the Deaf (SADeaf), about one-third are proficient in sign language.

2. Family Members and Friends

Relatives and friends of deaf individuals often seek effective ways to communicate.

3. Educators and Students

Teachers, interpreters, and students in educational institutions can utilize the app for instructional purposes, enhancing the learning experience for both sign language users and learners.

1. Functional requirements and non-functional requirements

A. Functional Requirements

1. **The app shall allow Admins to perform administrative tasks**
 - 1.1. **If there is usage misconduct or violation of terms, the app shall allow Admins to take necessary actions against users.**
 - 1.1.1. If a user uploads inappropriate content (e.g., offensive gestures, harmful signs), the app shall allow Admins to remove the content.
 - 1.1.2. If a user repeatedly violates community guidelines, the app shall allow Admins to ban the user from the platform.
 - 1.1.3. If a user attempts to misuse live translation for non-sign language gestures, the app shall flag the user for review.
 - 1.2. **If there are inaccurate or misleading translations, the app shall allow Admins to review and correct them.**
 - 1.2.1. If a reported translation error is confirmed, the app shall allow Admins to update the translation dataset.
 - 1.2.2. If a translation request includes inappropriate words, the app shall allow Admins to reject or filter the content.
 - 1.3. **The app shall allow Admins to monitor and improve language translation accuracy.**
 - 1.3.1. If a specific sign language translation receives multiple negative reports, the app shall notify Admins for verification.
 - 1.3.2. If a newly added sign language has low accuracy, Admins shall be able to disable it temporarily.
2. **The app shall allow Consumers to perform user-specific tasks**
 - 2.1. **Live Video Translation**
 - 2.1.1. **When a consumer selects the "Live Translate" option, the app shall begin real-time sign language interpretation.**
 - 2.1.1.1. The system shall activate the device camera to capture live sign language gestures.
 - 2.1.1.2. The system shall process the captured gestures and convert them into text/audio output in real-time.
 - 2.1.1.3. If the lighting conditions are poor, the system shall display a warning message recommending better lighting.
 - 2.1.1.4. If multiple signers are detected, the system shall prompt the user to focus on one individual for better accuracy.
 - 2.1.2. **If the consumer pauses the live translation, the system shall allow them to review the translated content.**
 - 2.1.2.1. Users shall be able to edit or modify the translated text before resuming.
 - 2.1.2.2. Users shall have the option to save or discard translations.

2.1.3. If the video quality is poor, the system shall notify the consumer and provide resolution options.

2.1.3.1. Users shall be able to adjust resolution settings (480p, 720p, 1080p).

2.1.3.2. If the frame rate is too low, the system shall prompt users to increase it for better translation accuracy.

2.2. Pre-Recorded Video Upload

2.2.1. The app shall allow consumers to upload pre-recorded videos for translation.

2.2.1.1. Users shall be able to upload videos from local storage or cloud services (e.g., Google Drive, iCloud).

2.2.1.2. The system shall support common video formats (MP4, MOV, AVI).

2.2.1.3. If an unsupported video format is detected, the system shall prompt the user to convert the file.

2.2.1.4. Users shall have the option to preview uploaded videos before starting translation.

2.2.2. When a consumer submits a pre-recorded video, the system shall process it for sign language recognition.

2.2.2.1. The system shall analyze gestures in the video and generate corresponding text/audio output.

2.2.2.2. If gestures are unclear due to video quality, the system shall provide an option to enhance clarity.

2.2.2.3. If translation accuracy is low, the system shall allow users to manually correct misinterpreted words.

2.3. Text-to-Sign Conversion

2.3.1. When a consumer enters text into the app, the system shall generate sign language translation.

2.3.1.1. Users shall be able to type or paste text into a dedicated input field.

2.3.1.2. Users shall be able to import text from supported file formats (TXT, DOCX).

2.3.1.3. If the input text contains complex or technical terms, the system shall provide alternative sign representations

2.3.2. The system shall generate animated sign language gestures based on the input text.

2.3.2.1. Users shall be able to choose between different sign language avatars.

2.3.2.2. The system shall provide an option to adjust animation speed (slow, normal, fast).

2.3.2.3. The system shall highlight each word as it is translated into sign language.

2.4. Language Selection

2.4.1. The app shall support multiple sign languages.

2.4.1.1. Users shall be able to select a preferred sign language from a predefined list.

2.4.1.2. The system shall provide language descriptions (e.g., ASL, BSL, regional dialects).

2.4.1.3. If a language is unavailable, users shall be able to request it.

2.4.2. When a new sign language is added, the system shall notify users.

2.4.2.1. Users shall be able to enable automatic notifications for language updates.

B. Non-Functional Requirements

1. Customizable User Interface

1.1. Theme Customization

- 1.1.1. Users can choose from various color themes (light, dark, high contrast).
- 1.1.2. Users can create and save custom color palettes.

1.2. Layout Customization

- 1.2.1. Users can rearrange or resize UI elements (e.g., buttons, menus).
- 1.2.2. Users can save multiple layout profiles (e.g., "Minimalist," "Accessibility Mode").

2. Performance

2.1. Low Latency

- 2.1.1. Video-to-text translation must process within <2 seconds for videos under 30 seconds.
- 2.1.2. Text-to-sign animation must render within <1 second after input submission.

2.2. Resource Optimization

- 2.2.1. The app must use $\leq 15\%$ CPU and $\leq 20\%$ GPU during real-time translation.
- 2.2.2. Offline mode reduces latency by caching frequently used translation models.

3. Text Handling

3.1. Export Options

- 3.1.1. Translated text can be copied to the clipboard with one click.
- 3.1.2. Users can export text as TXT, PDF, or share via email/social media.

4. Translation History

4.1. Log Management

- 4.1.1. The app retains translation history for 30 days by default.
- 4.1.2. Users can search/filter logs by date, input type (video/text), or target language.

4.2. Data Security

- 4.2.1. History logs are encrypted locally and during cloud sync (if enabled).
- 4.2.2. Users can permanently delete individual logs or clear all history.

5. Usability

5.1. Accessibility

- 5.1.1. The interface supports screen readers (e.g., VoiceOver, TalkBack).
- 5.1.2. Gesture controls (e.g., swipe to navigate) are customizable for users with motor impairments.

5.2. Onboarding

- 5.2.1. A guided tutorial explains core features (video recording, text input, history access).
- 5.2.2. Tooltips appear for advanced features during first-time use.

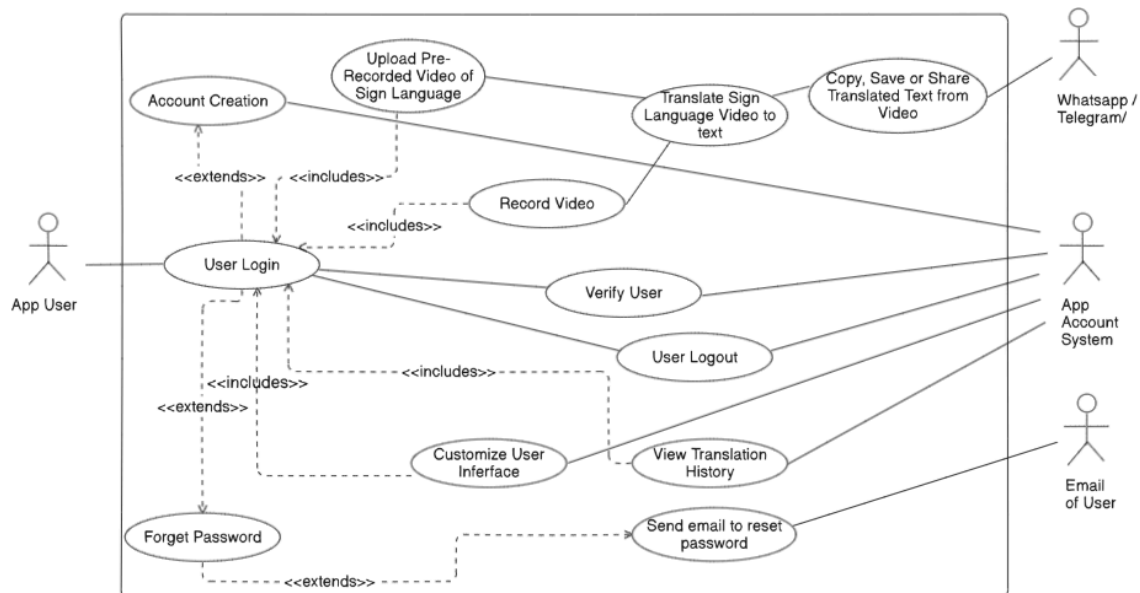
2. Data Dictionary

Term	Definition
Account	A registered user's personal profile associated with an application. It may include personal information including but not limited to contact details and email address.
Admin	A user with special administrative privileges who oversees the operation and function of an application
Application	A software programme downloaded onto the User's mobile application. Certain system permission such as storage access or camera and microphone access may be needed to perform some functionalities of the application
Server	A Cloud Server where all data possessed by all owners of accounts of our App is stored
Customer Service Support	A team of administrators available during business hours, contactable via email; present to assist Users with any problems or receive feedback regarding the application and their experience
Home Page	The main page of the application, where a user can access all functions of the application, including the settings, post login.
User	Persons who physically use our application
Translation history	A log of past translations, up to 30 days, stored locally for user reference.
Video Quality	The level of resolution of a video, dictated by the number of pixels used in the video, thereby affecting how realistic the video looks and how much storage space it

	requires
Recognised Hand Gestures	This represents the combination of multiple gesture characteristics, including handshape, movement, orientation, location, and non-manual signals (such as facial expressions), used to interpret a sign accurately.
Confidence Score	Accuracy level of recognized hand gestures
Review	To bring attention to at a later date, by any relevant party, likely for the purpose of feedback or modification
User Interface	The screen of the application shown to the user; that which the user interacts with, includes but is not limited to: login UI, HomePage UI etc.

3. Use Case Diagram and Use Case Model

A. Use Case Diagram



B. Use Case Descriptions

Use Case ID:	1.1		
Use Case Name:	User Account Creation		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	User opens the app for the first time and creates an account
Preconditions:	<ul style="list-style-type: none">User opens the AppUser has not created an account
Postconditions:	N/A
Priority:	High ▾

Frequency of Use:	N/A
Flow of Events:	<ul style="list-style-type: none"> • User selects the option “Create an account” on the Login UI • User is brought to the Account creation UI • User enters details entailing, UserID, Password & Email • User confirms the details for the account and presses “Create Account” • Details are saved to the server and a account is created with the enter prior tagged to the account • User is brought back to the login UI and a message “Account successfully created” is prompted
Alternative Flows:	<ul style="list-style-type: none"> • User enters a UserID already in use - a message “UserID is already in use, please enter a different UserID” is prompted to the user and the UserID portion is highlighted in red until it is changed • User enters a Password not within the requirements - a message “Password has to contain Min 6 Chars, with at least 1 Upper, Lower Case & Special Char” is prompted to the user and the Password portion is highlighted in red until it is changed • User enters a Email already in use - a message “Email is already in use, please use a different email” is prompted to the user and the Email portion is highlighted in red until it is changed
Exceptions:	N/A
Includes:	N/A
Special Requirements:	N/A
Assumptions:	N/A
Notes and Issues:	N/A

Use Case ID:	1.2		
Use Case Name:	Log in to user account		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	User enter login details entailing UserID & Password to login to their individual account
Preconditions:	N/A
Postconditions:	N/A
Priority:	Critical ▾
Frequency of Use:	N/A
Flow of Events:	<ul style="list-style-type: none"> • User opens the App • User is brought to the Login UI • User enters their UserID and Password • User presses the login button • App displays the home page for the UI
Alternative Flows:	<ul style="list-style-type: none"> • Login process fails - Either the UserID or the Password is invalid, prompts the user that either details are incorrect and to try again

Exceptions:	N/A
Includes:	N/A
Special Requirements:	N/A
Assumptions:	N/A
Notes and Issues:	N/A

Use Case ID:	1.3		
Use Case Name:	Forget Password		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	User forgets their password
Preconditions:	<ul style="list-style-type: none"> User must be logged out. User must already have an account that is registered with the app.
Postconditions:	NA
Priority:	Critical ▾
Frequency of Use:	NA
Flow of Events:	<ul style="list-style-type: none"> User wishes to log in. User inputs username and password. User's inputs either an incorrect username or password. User is informed that their entry is wrong User clicked the 'forgot password' button. User enters their username; if they do not remember their username, User will enter their email address.

	<ul style="list-style-type: none"> • If either of the aforementioned are registered with the system, the email address associated will receive an email that contains the user's username and password. • User will then log in using their recovered username and password.
Alternative Flows:	<ul style="list-style-type: none"> • Unable to recall Username or Email address - If the User is unable to recall both their Username and Email Address associated with their account, they can either try multiple times, entering different possible combinations of Usernames or Email Addresses. Otherwise, they will have to get in touch with the Administrators of the app.
Exceptions:	NA
Includes:	NA
Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA

Use Case ID:	1.4		
Use Case Name:	Log out of user account		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	User logs out of their account
Preconditions:	<ul style="list-style-type: none"> • User must be logged in • User's personal information and preferences are saved and stored securely within the cloud.
Postconditions:	NA
Priority:	Critical ▾
Frequency of Use:	NA

Flow of Events:	<ul style="list-style-type: none"> • When User is done using the application, instead of staying logged in, they choose to log out for safety reasons. • User clicks ‘log out’. • User is logged out of their account, with their personal information, settings and preferences saved. • User is brought back to the login UI and a message “Logout successfully” is prompted.
Alternative Flows:	<ul style="list-style-type: none"> • Action Fails - If the app is unable to log the User out, it should explicitly tell the User that log out was unsuccessful and to retry or seek help.
Exceptions:	NA
Includes:	NA
Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA

Use Case ID:	2.1		
Use Case Name:	Record and Translate Live Sign Language Video		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	Record a live video and receive ideally real-time translation in the selected target language
Preconditions:	<ul style="list-style-type: none"> • User must be logged in • Camera and microphone permissions must be granted by the user. • Target language has been selected.
Postconditions:	N/A
Priority:	Critical ▾
Frequency of Use:	N/A
Flow of Events:	<ol style="list-style-type: none"> 1. User launches the app and navigates to the “Live video translation feature. 2. The app presents the live camera feed. 3. The user initiates recording by pressing the “Record” button. 4. The user performs sign language gestures. 5. The app processes the live video using AI/neural network models and translates the gestures into text. 6. The translated text is displayed on the screen with options to copy, save, or share.
Alternative Flows:	A1: Poor video quality / Unrecognized Gestures - If the app cannot interpret the gestures , an error message is displayed.

	<p>A2: Connection Issues - App notifies user of connection problems and tries to reconnect.</p> <p>A3: Distance - If phone is too far away from screen, the app should request viewer to move closer to the screen if possible</p>
Exceptions:	N/A
Includes:	N/A
Special Requirements:	N/A
Assumptions:	N/A
Notes and Issues:	N/A

Use Case ID:	2.2		
Use Case Name:	Upload Pre-Recorded Video for Translation		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	Upload a pre-recorded video containing sign language gestures and receive translated output.
Preconditions:	<ul style="list-style-type: none"> User must be logged in User has at least one pre-recorded video file stored in the device. App has access to storage and gallery.
Postconditions:	NA
Priority:	High ▾
Frequency of Use:	NA
Flow of Events:	<ul style="list-style-type: none"> The user navigates to the “Upload Video” section of the app. The user selects a video file from the device storage. The user chooses the target translation language from the predefined list. The app processes the video file using its AI engine and converts the gestures into text. The translated text is displayed on the screen along with options to copy, save, or share
Alternative Flows:	<ul style="list-style-type: none"> Unsupported Video format - app prompts the user to select a different file Processing Error - If translation fails , the app informs the user and the developer and suggests troubleshooting steps.
Exceptions:	NA
Includes:	NA

Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA

Use Case ID:	2.3		
Use Case Name:	Copy , Save or Share Translated Text		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	Perform actions on the translated text for further use
Preconditions:	<ul style="list-style-type: none"> User must be logged in A translated text output is available from a recent translation
Postconditions:	NA
Priority:	Medium ▾
Frequency of Use:	NA
Flow of Events:	<ul style="list-style-type: none"> After the translation is displayed, the user is presented with action buttons (Copy, Save, Share). The user selects one of the options: <ul style="list-style-type: none"> Copy: The text is copied to the device's clipboard. Save: The text is saved to a designated storage area or personal library within the app. Share: A share dialog opens, allowing the user to send the text via messaging apps, email, or social media.
Alternative Flows:	<ul style="list-style-type: none"> Action Fails - If the app is unable to complete the chosen action (saving fails due to storage permissions), it informs the user and provides guidance on how to resolve the issue
Exceptions:	NA
Includes:	NA
Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA


Use Case ID:	2.4		
Use Case Name:	View Translation History		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	Access and review past translation records
Preconditions:	<ul style="list-style-type: none"> User must be logged in. The app has stored translation history from previous sessions.
Postconditions:	NA
Priority:	Medium ▾
Frequency of Use:	NA
Flow of Events:	<ul style="list-style-type: none"> User navigates to “history” section of the app The App retrieves and displays a list of past translation entries , including the date , time , and translation type (live or uploaded). User can select a specific entry to view details and copy/share/delete the entry.
Alternative Flows:	<ul style="list-style-type: none"> No Translation History Available - If no history exists , the app displays a message indicating that no translations have been recorded yet
Exceptions:	NA
Includes:	NA
Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA

Use Case ID:	3.1		
Use Case Name:	Customize User Interface		
Created By:	User	Last Updated By:	
Date Created:		Date Last Updated:	

Actor:	User
Description:	Personalize the app's theme and layout to suit the user's preferences
Preconditions:	<ul style="list-style-type: none"> User must be logged in
Postconditions:	NA
Priority:	Low ▾
Frequency of Use:	NA
Flow of Events:	<ul style="list-style-type: none"> User navigates to the "Settings" section of the app. UI displays customization options. User selects the desired options and applies the changes. The App updates the UI and refreshes.
Alternative Flows:	<ul style="list-style-type: none"> Invalid Customization Option User cancels customization process
Exceptions:	NA
Includes:	NA
Special Requirements:	NA
Assumptions:	NA
Notes and Issues:	NA

4. User Interface



Sign Up

Name

Olivia Wilson

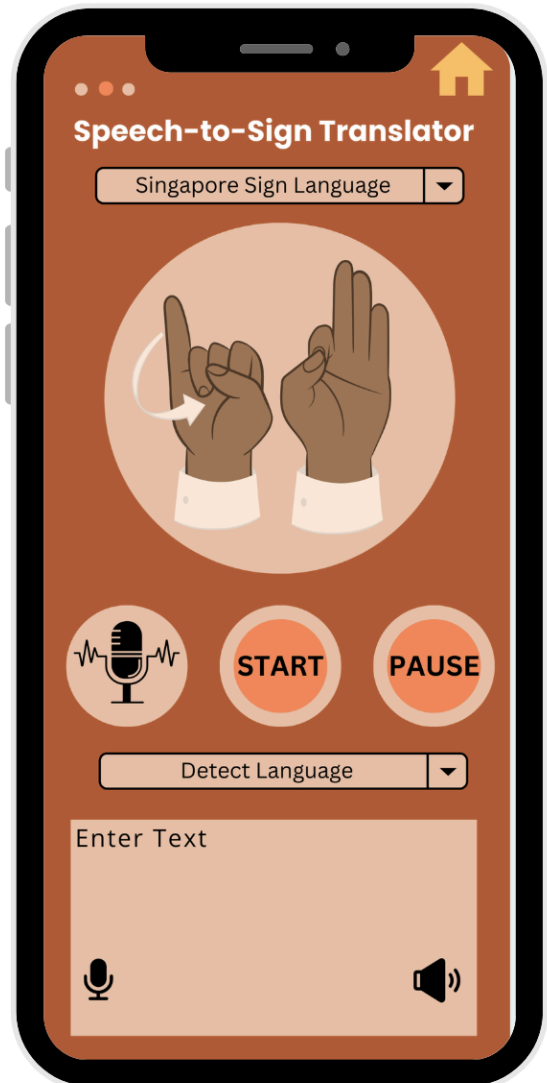
Email

hello@reallygreatsite.com

Password

Next

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12:12



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