Social Messaging Application with Translation and Speech-to-Text Transformation

Kang Qin Yip[1], Pey Yun Goh[1,*], Lee Ying Chong[1]

[1] Faculty of Information Science and Technology, Multimedia University, Melaka, Malaysia

corresponding author: (pygoh@mmu.edu.my; ORCiD: 0000-0003-2060-3223)

Abstract - Unlike traditional SMS or MMS, messaging apps offer a broader range of data transmission capabilities. The application utilizes a WIFI or internet connection and enables users to exchange information through various means such as text, voice, and multimedia files. However, popular messaging applications such as WeChat, Telegram, and WhatsApp have limitations in language translation and file uploading size. Thus, this project aims to address these limitations by developing a social messaging application that serves as a comprehensive communication tool. The application will facilitate both written and verbal communication by providing translation services for various languages, including voice messages. The proposed application intends to act as a versatile platform, functioning as a translator while enabling seamless communication between users in different languages. Translation accuracy and BLEU metric are applied to evaluate the efficacy of the enhanced social messaging application. The proposed application is able to translate voice and written messages into another language with the help of Google translation API as well as Speech to text API. The BLEU average score between English and Malay is 0.94 but the translation between Malay and Chinese is 0.82, Chinese and English is 0.70. Though not perfect, the proposed application can enhance the current social messaging application with the speech-to-text feature and message translation feature. Last but not least, a concluding remark is provided to further improve the application in future.

Keywords—Language translation, Social messaging, Speech-to-text, Communication application, Message translation

I. INTRODUCTION

Social messaging applications have become essential in our daily lives [1], facilitating seamless information exchange through smartphones via WIFI or internet connections. Initially designed for private communication, these apps offer features like encryption [2], broadcast messaging [3], and chatbots [4]. Their popularity stems from convenient auto-backup for chat history transfer, audio/video calls, real-time location sharing, and easy multimedia file uploads [5].

However, language translation limitations exist. Popular social messaging applications such as WeChat and Telegram [6] offer translation capabilities for written messages in different languages, enabling users to communicate across language barriers. The option to automatically translate audio messages from other languages into English is absent from these apps, though. A similar limitation applies to WhatsApp, where translation features are absent for both written and voice messages, unless users rely on external aids such as Google Translate.

Voice communications without translation increase the risk of misunderstandings and breakdowns in comprehension [7], especially if neither the sender nor the recipient speaks English well. This limitation becomes a significant obstacle, as voice messages often carry nuances and emotions that written text may not fully convey. Consequently, reliance on manual translation aids or language proficiency becomes necessary to avoid misleading information.

Communication breakdowns resulting from the inability to accurately translate both written and voice messages can have adverse effects on task performance and achievement [8-10]. When misunderstandings occur, the intended objectives may be compromised, causing delays, errors, or reduced productivity in professional settings. Similarly, in personal conversations, the inability to comprehend voice messages in different languages can hinder the development of relationships and limit meaningful interactions [11-12]. In order to address the limitation of the existing messaging applications, this project aims to develop a social messaging application with two primary objectives: 1) Enable translation between different languages and English; 2) transform voice messages to written messages and enable translation.

The first objective is to create a messaging app that can seamlessly translate written messages from various languages into English. Additionally, it should support translation from English to other languages. This functionality will facilitate effective communication between users who speak different languages, eliminating language barriers and promoting understanding.

The second objective involves developing the capability to convert voice messages into written messages within the messaging app. This transformation will allow users to conveniently read and comprehend voice messages. Furthermore, the application will incorporate translation features to automatically translate voice messages into other languages, promoting inclusive communication and fostering connections across linguistic boundaries.

The sections in this paper are organized with the following sequence. Literature review of the famous messaging application is presented in Literature Review. System design which involves the proposed elements of the messing application is explained in System Design of the Proposed Solution. Implementation of the proposed solution is described and illustrated with figures in System Implementation. Last but not least, the paper concludes with a remark about the limitation and future enhancement of the proposed solution.

II. LITERATURE REVIEW

There are two sub sections in the review. Existing messaging applications are reviewed in and existing plugin for messaging translation and speech-to-text are included in Related Plugin.

A. Existing Messaging Applications

A few existing and famous messaging applications, i.e. WhatsApp, WeChat and Telegram are studied and revised. The strengths and weaknesses of these messaging applications are identified.

WhatsApp was initially founded by Jan Koum and Brian Acton in 2009 and joined Facebook in year 2014 [13]. It has more than 1.5 billion users all around the world. WhatsApp offers convenient and versatile file sharing capabilities, allowing users to send documents, pictures, videos, current location, audio, and contact numbers easily. The application supports video and voice calls, enabling real-time communication with the person where the users are chatting with, providing the flexibility to have voice or video conversations at the user convenience. WhatsApp lacks built-in language translation features. The automated translation of texts written in languages other than English is not a capability that WhatsApp has built-in. Users are forced to rely on third-party translation services like Google Translate in order to translate communications into different languages.

WeChat was initiated by Allen Zhang and then further improved by Tencent Guangzhou Research and Project center in year 2010 [14-15]. This messaging application offers the ability to scan QR codes to access other websites, unlike WhatsApp and Telegram, which only allow scanning QR codes for their respective web services. This feature provides greater flexibility in navigating to different sites. WeChat users have the convenience of utilizing an integrated translation tool that facilitates the translation of messages written in languages other than English or any other language of their preference. By employing this feature, users can effortlessly translate their WeChat conversations into English or their desired language. However, WeChat does not provide real-time status information about the reader, such as

their online or offline status. WeChat does not transform voice messages into text and there is no translation for voice messages.

Another famous messaging application is Telegram. Telegram was introduced in 2013 by the Durov brothers, Nikolai and Pavel, who had previously founded the Russian social network VK [16]. For Telegram, users may translate messages written in several languages into English or other languages they want using Telegram's built-in translation tool. It distinguishes itself from WhatsApp, which is devoid of an automated translation option, with this feature. Telegram provides unlimited storage and securely stores all data in the cloud, ensuring that users have ample space for storing their messages, media, and files. The application does not provide real-time status information about the reader, such as their online or offline status. To receive messages and check the reader's status, users need to open the app. Telegram has a feature that automatically adds all unknown telephone numbers in a specific country to the application, regardless of whether the user is using the application or not. This can result in an extensive contact list and potential privacy concerns. Similar like WeChat, Telegram does not provide features which transform voice message into text and no translation of voice messages.

The comparisons among the famous messaging application and the proposed messaging application are presented in Table 1. Referring to Table 1, all the messaging application consists of all the common features such as video or voice calls, document sharing, video and image sharing, audio file sharing, contact sharing, location sharing, one-to-one chatting rooms, group chatting rooms, adding group admins, and creating new one-to-one chatting rooms. WhatsApp lacks a direct translation feature for written messages, both Telegram and WeChat offer this functionality. Surprisingly, none of the reviewed applications, including WhatsApp, Telegram, and WeChat, provide the ability to translate voice messages. In Malaysia, where multiple ethnicities and languages coexist [17], translation capabilities would greatly enhance communication among individuals unfamiliar with each other's languages. This serves as the motivation behind the proposed application's inclusion of translation features for both written and voice messages.

Table 1. Comparison among the Reviewed Messaging Application and the Proposed Application

Apps	Basic Features	Enhance Features		
	Video or Voice Call, Documents, Video, Images, Audio, Contact, Location, Group Video or Voice Call, Status, one to one chatting room, Group chatting room, Adding Group Admin into group chat, creating a new one to one chatting room	Translation of written messages and voice messages	Translation of voice messages	Transformation of voice to text
WhatsApp	✓	X	X	X
Telegram	✓	✓	X	X
WeChat	✓	✓	X	X
Proposed App	✓	✓	✓	✓

B. Related Plugins

Additional plugins offer a variety of services, including social media integration, speech-to-text conversion, text translation and so on. Third-party plugins are to improve user and to increase the usefulness of certain services. In this section, three translator API from IBM, Microsoft and DeepL and one speech-to-text API are reviewed.

IBM Watson Language Translator API, a service offered by IBM Watson. Developers may translate text or documents across languages using this API, which is focused especially on translation services. Developers may simply include translation functions into their apps using the IBM Watson Language Translator API, making them more usable and accessible to audiences that speak different languages. The benefits of utilizing this plugin API include its robust machine learning algorithms that provide precise and dependable translations, support for a broad range of languages, and capacity to handle both small-scale document translations and large-scale translations. However, there may be drawbacks such as the expenses associated with utilizing the API, potential restrictions in the accuracy of translation for certain language pairings or texts relevant to a given domain, and the requirement to address data privacy and security issues while using the API.

The Microsoft Translator API is a service offered by Microsoft that gives developers the ability to include translation features into their apps. Developers may translate text, documents, and web pages between multiple languages using this API, which focuses on translation services. With the help of the Microsoft Translator API, programmers may quickly add multilingual functionality to their apps, increasing the usability and accessibility of such applications for a worldwide user base. This plugin API has several benefits, including the ability to handle a large number of languages, the availability of pre-trained language models, and the capacity to make use of Microsoft's cutting-edge machine learning algorithms for precise translations. To further increase its utility, the API also offers functions like language identification and transliteration. The expenses associated with utilizing the API, possible restrictions in the accuracy of translation for certain language pairings or specialized areas, and the necessity to address data privacy and security issues while using the API are some potential drawbacks to consider.

A well-known provider of machine translation services, DeepL offers the DeepL API. Developers may include machine translation capabilities into their apps with the help of this API, which focuses on offering high-quality translation services. Developers can quickly translate text between different languages using DeepL's API, which takes use of the company's cutting-edge neural machine translation technology. The benefits of utilising this plugin API include its remarkable translation quality, which frequently exceeds competing machine translation systems, its support for a large number of language pairings, and its ability to handle complicated texts proficiently. The API also provides simple integration choices and an intuitive user interface.

The text-to-speech service Amazon Polly API is offered by Amazon Web Services (AWS). It gives programmers the ability to use cutting-edge neural network algorithms to translate text into realistic speech. Despite not focusing on translation or speech-to-text conversion, Amazon Polly API has a wide variety of functionalities. These include the capacity to produce speech in real-time or save it for later use, support for numerous languages and voices, and adjustable speech settings. The benefits of using Amazon Polly API include its high-quality and natural-sounding voice output, simple interaction with several apps and platforms, and the scalability provided by AWS infrastructure. It gives programmers strong tools to improve voice-based interactions, accessibility, and user experiences. There are, however, certain possible negatives to consider. These include the price of using the API, as Amazon Polly has a pay-as-you-go business model, and the requirement to perform text preprocessing and formatting before feeding it into the API.

In conclusion, users need to install this API into the devices in order to use their services. This will take extra storage from the mobile devices. However, the proposed application includes the translation and speech-to-text as part of the features without the need to install third party plugin.

III. SYSTEM DESIGN OF THE PROPOSED SOLUTION

In this section is where the design of the proposal application is being used as a blueprint before the implementation process begin. This includes, use case diagram, content diagram, data flow diagram and activity diagram.

Figure 1 is the use case diagram. There are five main features. First feature is the sign-in. Users provide their phone numbers to create a permanent account. An OTP code is sent for verification, and once successfully validated, the account is established.
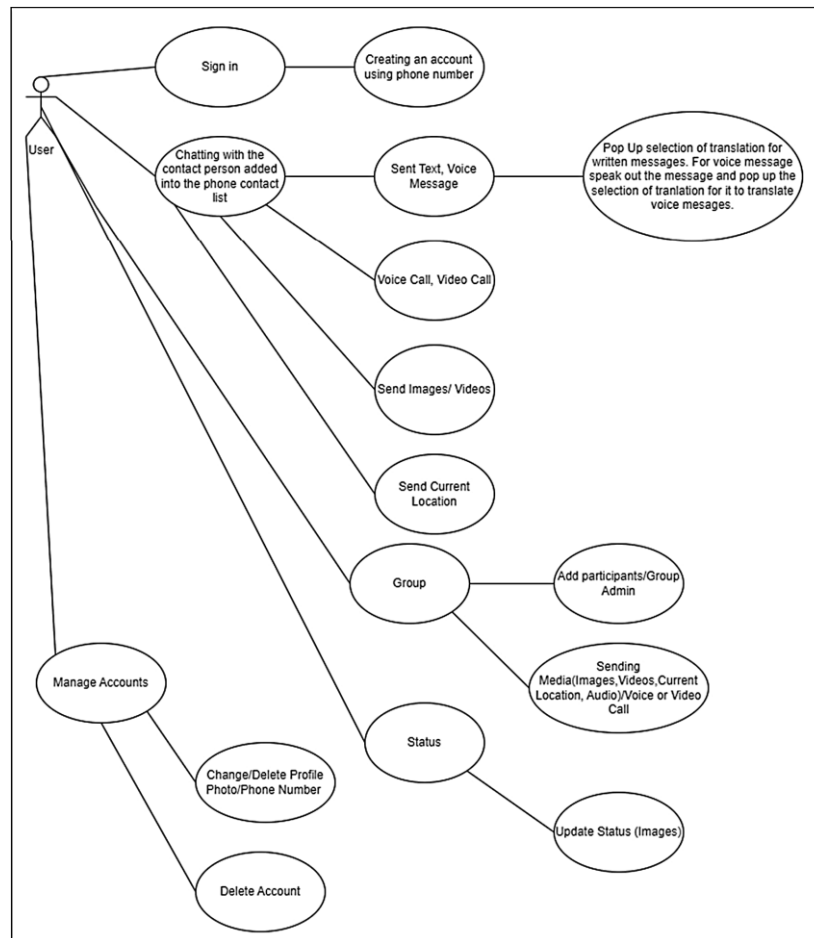
Figure 1. Use case diagram

Second feature is labelled as chatting with the contact person added in the phone contact list. This is a one-to-one chat. Users can send images, documents, and share locations. They can also make voice and video calls. The messaging application offers translation functions for written and voice messages, allowing users to translate messages and transcribe voice communications.

Third feature is the Group which referring to group chat feature. With this feature, users can initiate group conversations and invite others to join. Group participants can share images, documents, location, and initiate group voice or video calls. The group admin can assign additional admins and invite more members.

Feature Status enables users to alter their status by submitting images that other people can view. Last but not least, the feature for account management, i.e. change/delete profile and phone number and delete account. Users can update their phone numbers or terminating accounts. Users can also modify their account information, including name, about section, and profile pictures, as desired.

Based on the use case diagram, a data flow diagram is developed to further identify the flow of data between users and the application. The flow of data is illustrated in Figure 2. Data flow diagram provides an overview of the main processes and data flow in the social translator messaging application. It includes registration, login, written/voice messages, person-to-person calls, files/media sharing, and account management. Users provide their phone numbers during the sign-in procedure to create accounts, which are then verified using an OTP code. In one-to-one chats, users can exchange written or voice messages and choose to translate them. They can also make voice or video calls, and the status of the calls is displayed. Users can send files, media, and their location in one-to-one conversations, and they receive confirmation when the sending is successful.

Group conversations support chat rooms, message translation, and content sharing. Users can update their status with an image and manage their account settings, including phone number, profile picture, name, or delete their account. Feedback is provided for account modifications.
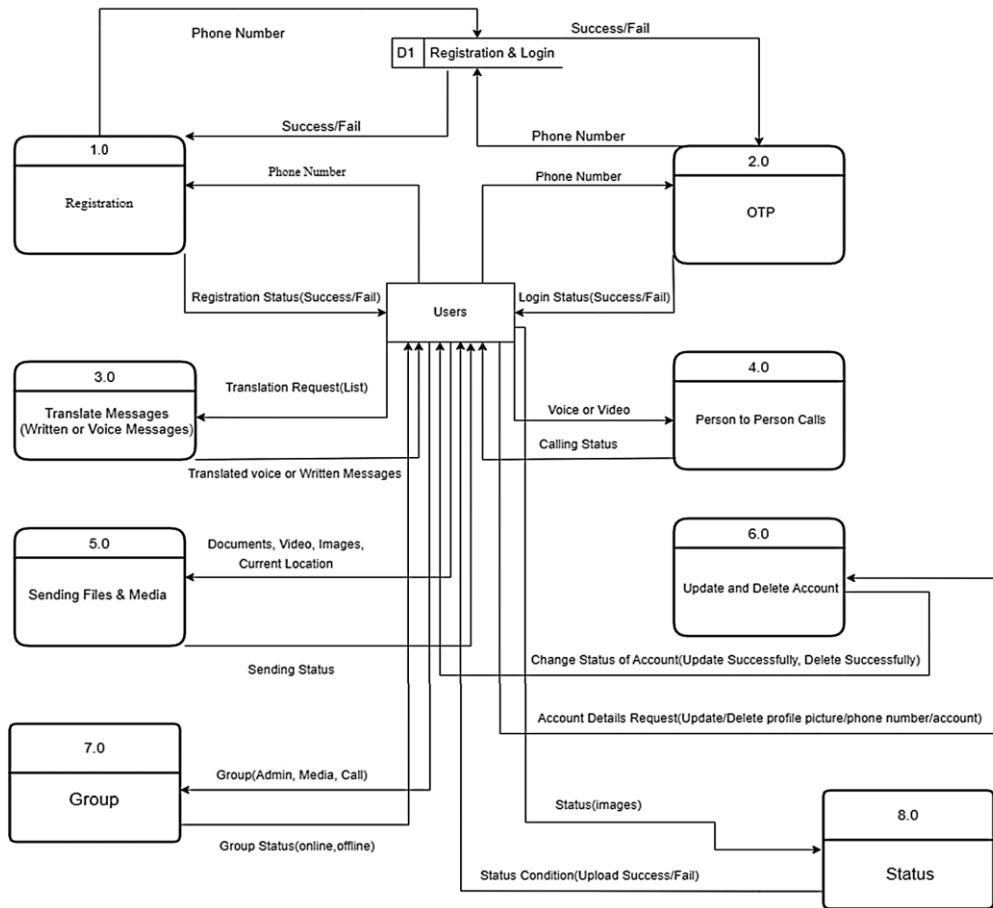

Figure 2. Data flow diagram

An activity diagram (refer Figure 3) is produced to illustrate the flow of users' operations, data and activities that happen in the messaging application. Activities such as registration status, calling status, sending status, update account status, group chat status and change of status profile will have two possible outcomes, either success or fail.
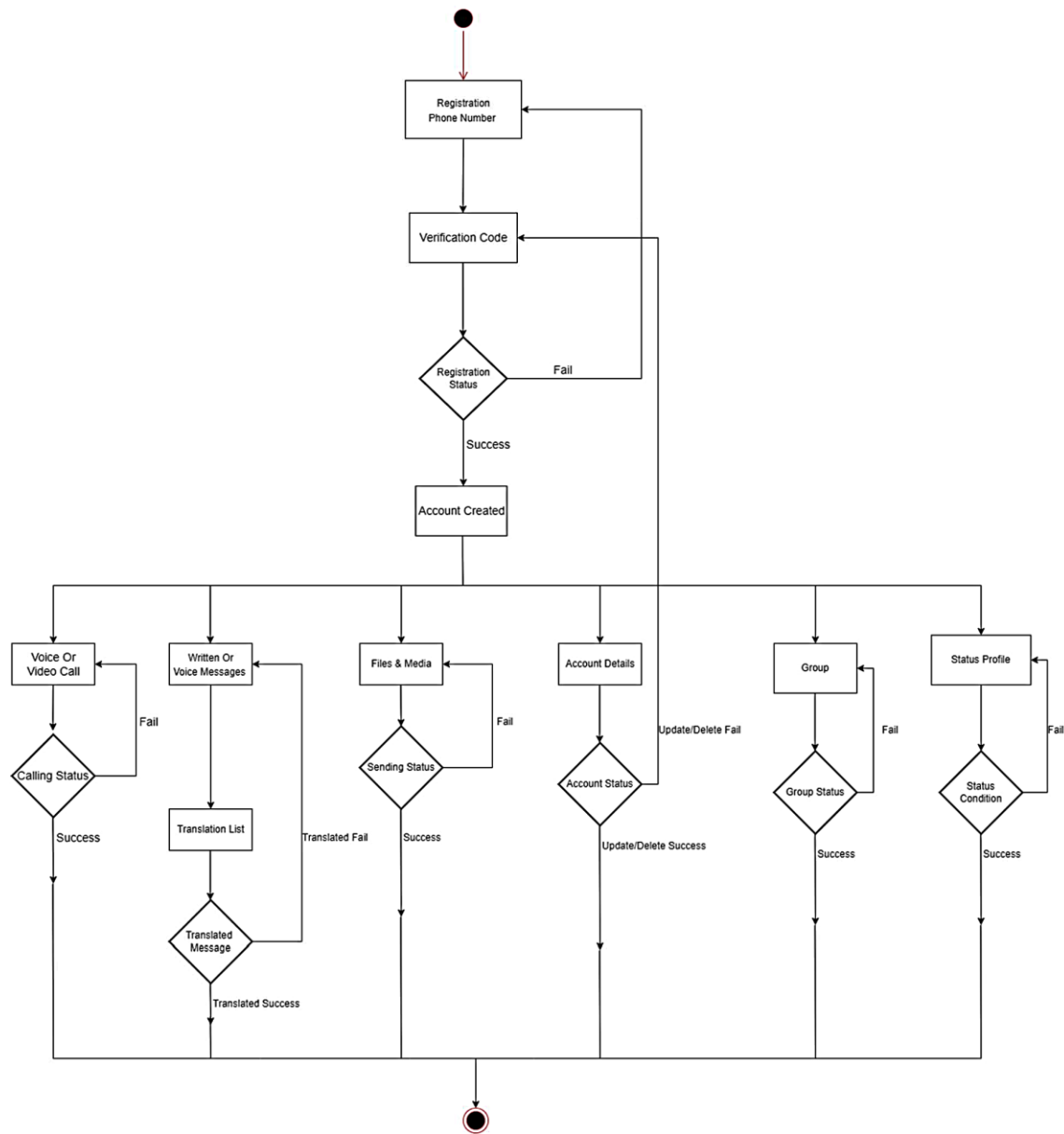
Figure 3. Activity diagram

Figure 4 and Figure 5 show the UML diagram of the backend process of the translation process of written message as well as speech to text and translation of the voice message. Not only that, it also shows what the class involve as well as their relationship for each class. For the written message process, when users request for text translation, the showPopup function will pop the translation list from the languageCode. Once the type of language is selected, the information will be sent to the LanguageAdapter. Besides that, the onDailogItemClick() function will be activated and the selected text from languageCode is retrieved and displayed in another language. For the speech to text as well as translation of voice message process, before the users speak, they need to select the language from the languageCode using function transletImg OnClickListener. After that, the SpeechRecognizer and RecognitionListener will be activated and the users can begin to speak out the message. Then, the voice message will be converted into text according to the selected language. Translation to another language can be done after the speech is transformed into text. In other words, the translation process is exactly the same as the process in translating the written message.

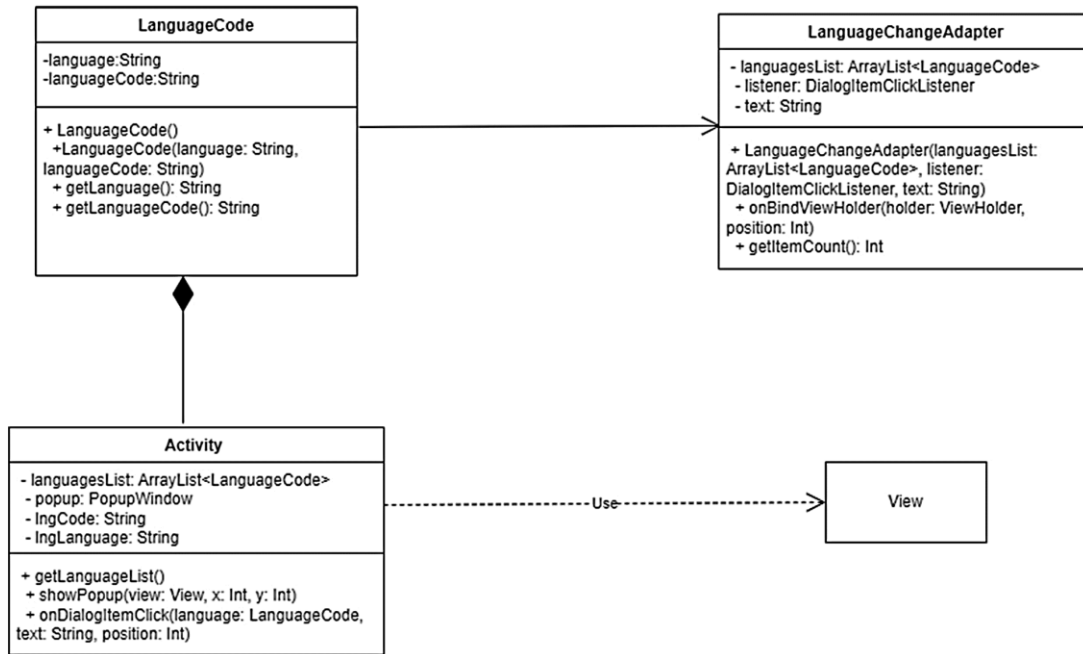## Translation Process of Written Message

Figure 4. UML diagram of translation process of written message

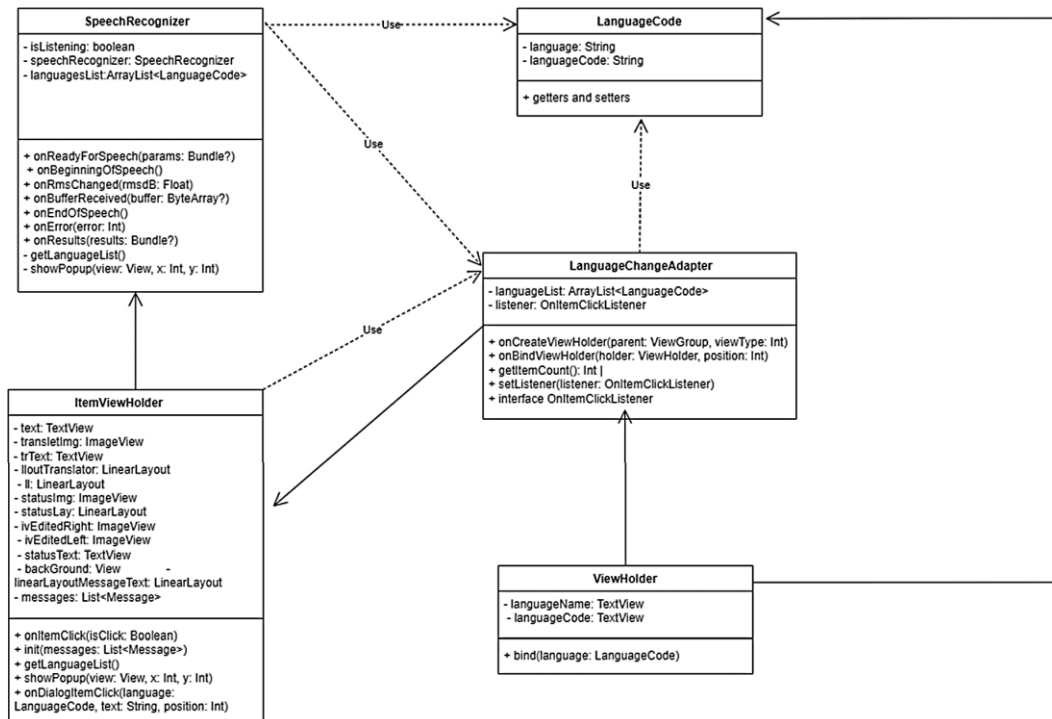Speech to Text and translation of the transform voice messages process

Figure 5. UML diagram of speech to text and translation of the message

IV. SYSTEM IMPLEMENTATION

A. Basic Features and Account Setting

Basic features of the messaging application are included and reported in this section. For first time user, registration is needed. This is common for all messaging application. The registration and login process of the proposal application is depicted in Figure 6(a). Once users install and run the application, a login page is shown. Users must enter their cell phone number and the relevant country code. After inputting the phone number and clicking the submit/continue button, the application will verify the validity of the phone number by sending a one-time password (OTP) code (refer Figure 6(b)) to the user's mobile device. Once users confirm the correctness of their phone number, the registration process of the proposed messaging application is done. Home page (refer Figure 6(c)) after users complete the registration process in the application. On this page, users can see a list of their previous chats within the application. Additionally, they can add new chats based on the contacts in their device's contact list. Users can also add new status updates, view call history, and create group chats within the application. Besides this, users can change their status through uploading new image.

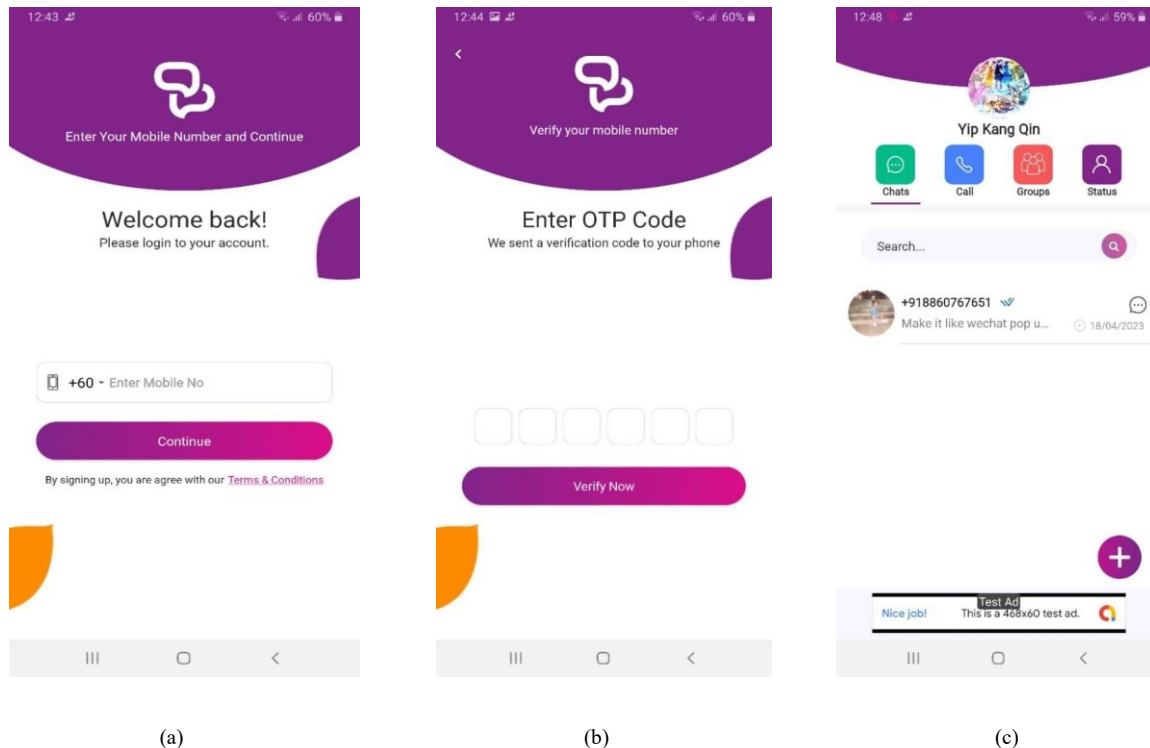(a)   (b)   (c)

Figure 6. Basic features (a) Login page; (b) OTP to verify phone number; (c) Home page.

Account setting is included in the system development where users can perform various actions related to their account (see Figure 7(a)). They can access their account details, delete their account, view terms and conditions, privacy policy, and adjust the app theme. Figure 7(b) displays the edit profile details page in the proposal application. Users have the option to modify their account information. By selecting the edit account details option, users can make changes to their profile picture, name, and about section. The account information will be immediately updated with the most recent changes made by the users after clicking the update button. Figure 7(c) illustrates the functionality of updating the phone number and deleting the account in the application. Users have the option to update their phone number and delete their account simultaneously. A confirmation notice will send to users to confirm the new phone number and account cancellation will show up once users enter the new phone number and click the "Change Phone Number" button. Upon confirmation, the application will redirect users to the OTP verification page to obtain a new verification code for the updated phone number. This allows users to use the updated phone number for communication.
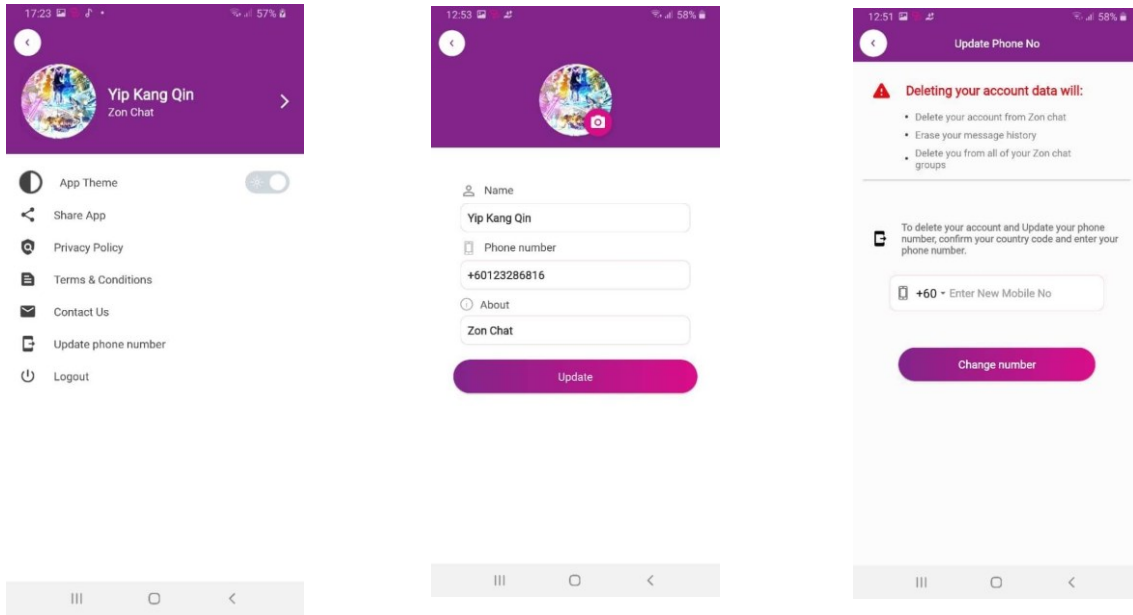
(a)　　　　　　　　　　　　　　　　(b)　　　　　　　　　　　　　　　　(c)

Figure 7. Account setting (a) Features for account setting; (b) Edit profile; (c) Update phone number and delete account.

B. Messaging Features

In this application, users can choose to have individual chat (or known as one-to-one conversation) or group chat. Figure 8 depicts the one-to-one conversation chatting room where users engage in conversations with specific recipients using the application. Within this personal chatting room, users can send written and voice messages to the recipient. Furthermore, they can share their current location, videos, images, audio, and contact information with the recipient. Additionally, users have the capability to make voice and video calls to the recipient they are chatting with, as well as perform actions such as copying previous messages, forwarding messages, and deleting written and voice messages.

Figure 8. Account one-to-one conversation room

Figure 9 illustrates the group chat functionality of the proposed application. Users have the option to start group conversations and include friends and family members. Within the group chat, users can send media files, initiate group voice or video calls (see Figure 8(a)), and add new participants to the group (see Figure 8(b)). The user who creates the group chat also has the authority to assign other users as group admins.

(a)   (b)
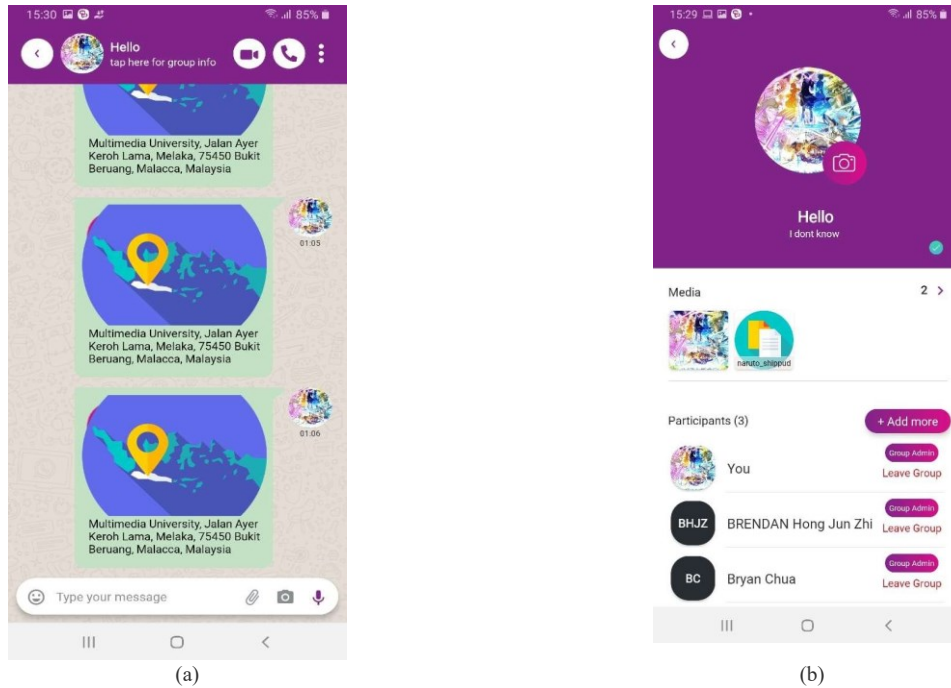
Figure 9. Group chat (a) Sharing location in group; (b) Add participants for group chat

Call history is included in the proposed application (see Figure 10). This feature allows users to view their previous call history, including both voice and video calls, made with the recipient during their one-to-one conversations within the application.
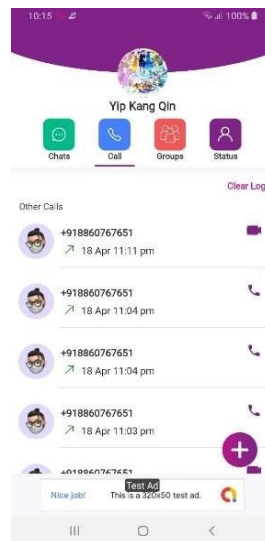

Figure 10. Call history

C. Message Translation and Speech to Text Function

The main aim for this project is to improve the current messaging application with these two features, i.e. message translation and speech to text function. Figure11(a) depicts a unique feature (the one in the red circle) within the one-to-one conversation chatting room of the proposal application. Users and recipients engaged in a conversation can utilize a translation function to translate messages written in different languages. The choice of languages includes English, Malay, Chinese Japanese and Mandarin (see Figure 11(b)). Both the sender and the recipient can choose the type of language where a drop-down list is shown when they click the translation feature. A translation sample is provided in Figure 12 where (a) shows the original message in English and (b) shows the translation result in Malay. Both original message and translated message are shown in the chatting room.

Figure 11. Translation feature and available languages for translation

(a)   (b)
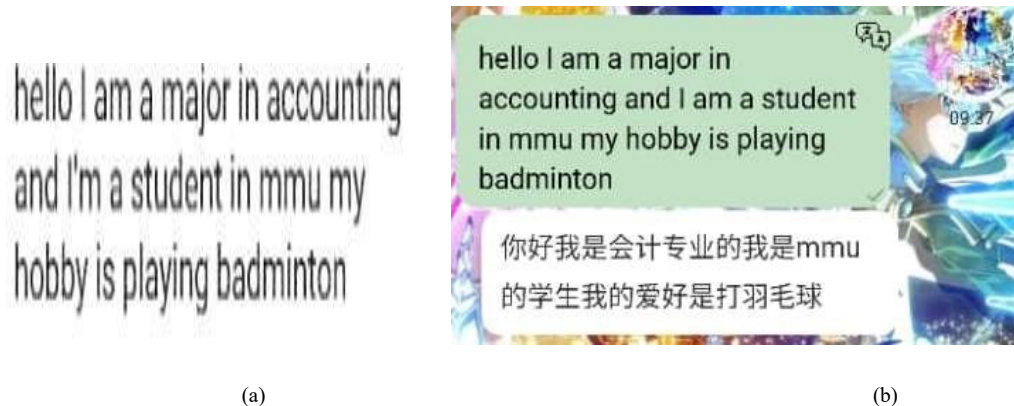
Figure 12. Translation sample (a) Message in English; (b) Translated message from English to Chinese

Another interesting feature is speech to text function. However, this feature is still having limitation in terms of conversion. Sometimes it can get all the voice message well transform into text but sometimes it may fail. As such, a simple analysis is run to identify the accuracy of this feature. Sentences with total number of words from 5 to 10 are applied to test the accuracy of speech to text function. Two different tests are applied. In test 1, similar sentences are repeatedly speaking for 10 times. The second test is using distinct sentences. In other words, each sentence with similar number of words is different from one another. For e.g., there are five different sentences and each sentence is speaking one time. The accuracy of each transformation is recorded and the average of the accuracy is recorded. Following are the formulas that we use to obtain the accuracy and average accuracy. The percentage of accuracy (Acc) is obtained through total number of correct words being transformed, i.e. n divided by total number of words, i.e. N and multiply with 100:

$$\frac{n}{N} * 100 \tag{1}$$

The formula for the average of the accuracy is sum all the percentage of accuracy (i.e. 10 for test 1, 5 for test 2) and divided by total number of accuracies. In test 1, the sentences use to identify the accuracy of speech to text are

presented in Table 2. In this test, each sentence is repeat 10 times and the accuracy of speech to text is recorded in Table 3.

Based on the results of test 1, the average of accuracy for each row (the number of words with 5, 6 7, 8 and 9) is 90%, 80%, 84%, 100%, 93% and 100% respectively. Although not all with 100% but the minimum achievement is 80% and maximum achievement is 100%. From all the results, the lowest accuracy is obtained when a sentence has 6 words.

Table 2. Sentences for Test 1

No of Words	Sentence Use
5	I am now in campus.
6	The boy runs to the park.
7	My cat eats tuna, chicken, and salmon.
8	We will have a party on Saturday night.
9	I eat a big orange and a red apple.
10	I will not be able to go to work today.

Table 3. Percentage of Acc in Test 1

No of words	Acc 1	Acc 2	Acc 3	Acc 4	Acc 5	Acc 6	Acc 7	Acc 8	Acc 9	Acc 10
5	100.00	100.00	80.00	80.00	80.00	80.00	100.00	100.00	100.00	80.00
6	83.33	83.33	66.67	66.67	83.33	66.67	83.33	83.33	83.33	100.00
7	71.43	100.00	100.00	100.00	85.71	85.71	57.14	85.71	71.43	85.71
8	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
9	55.56	77.78	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
10	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The sentences of test 2 are presented in Table 4. The accuracy of each sentence is shown in Table 5. The average accuracy for each row is 92%, 87%, 91%, 100%, 91% and 100% respectively. When each sentence is distinct, the achievement in the accuracy is hitting 80% and above, where this result is having not much different from the result in test 1.

In order to further verify the performance of the translation, we apply the Bi-Lingual Evaluation Understudy (BLEU) metric where machine translation is evaluated with human-generated translation. The calculation is ratio of the covered machine translated words divided by the total number of machines translated words [18]. The ratio of covered machine translated words are referred to the human expected translation result (for sentences with more than one possible result, we named the sentences as reference (Re) 1, 2 and 3. For e.g. in Table 7, the English sentence is "I am now in campus", and reference sentence is "Saya kini berada di kampus". The ratio of coverage for "Saya" is 1 in the reference sentence and 1 is the machine translated sentence. Thus, it is counted as 1 in the covered ratio. When the BLEU score is 1 it means the translated sentences well covered the necessary words in the human expected translation sentences. In this study, the evaluation involves only Malay, Chinese and English due to the lack of expert translator in Japanese and Korean language.

Table 4. Sentences for Test 2

5 words	6 words
I am now in campus.	The boy runs to the park.
The cat is very naughty.	I am playing in the snow.
The girl ate her breakfast.	The cat is orange in color.
Rachel drinks some orange juice.	I will not see her today.
The cat sleeps whole day.	Peter and Jane make a snowman.
7 words	**8 words**
My cat eats tuna, chicken, and salmon.	We will have a party on Saturday night.
Alex ran across the field towards home.	He and I are in the same class.
Do not wash the knives and forks.	My teacher told me to lower my voice.
Why did you break the glass door?	They like to watch movies on Saturday night.
I do not like to eat orange.	My family is taking a trip next week.
9 words	**10 words**
We will travel to Melbourne early in the morning.	I am studying in Multimedia University and majoring in AI.
I eat a big orange and a red apple.	I will not be able to go to work today.
The moment we live, the moment we are in.	A dishwasher can help you save a lot of effort.
Please write a correct sentence with the words given.	He stays with his grandmother when his parent is working.
Do you know how to play violin and piano?	Martin is smart and he will definitely win the game.

Table 5. Percentage of Acc in Test 2

No of words	Acc 1	Acc 2	Acc 3	Acc 4	Acc 5
5	80.00	100.00	100.00	80.00	100.00
6	100.00	100.00	66.67	100.00	66.67
7	100.00	85.71	71.43	100.00	100.00
8	100.00	100.00	100.00	100.00	100.00
9	100.00	100.00	77.78	77.78	100.00
10	100.00	100.00	100.00	100.00	100.00

The evaluation results show the precision of translation from English to Chinese, English to Malay, Malay to English, Malay to Chinese, Chinese to English, and Chinese to Malay (see Table 6 – 11). The average results of each translation are 0.80 (English to Chinese), 0.98 (English to Malay), 0.89 (Malay to English), 0.84 (Malay to Chinese), 0.60 (Chinese to English), 0.79 (Chinese to Malay) respectively. The worst translation result is from Chinese to English. The result from English to Chinese and Chinese to Malay is not good too. The average translation BLEU score between English and Chinese is 0.70 (i.e. (0.60+0.80)/2) whereas between Malay and Chinese is 0.82. Best result is obtained when translate from English to Malay and Malay to English with the average BLEU score is 0.94. This may be due to

both languages are involving alphabet based but Chinese is different. Improvement may be needed to consider different Chinese words in different context and the grammar pattern of Chinese sentences.

Table 6. Translation from English to Chinese Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
Rachel drinks some orange juice.	雷切尔喝了一些橙汁。	雷强喝了一些城市	5/8=0.63
Peter and Jane make a snowman.	彼得和珍堆了一个雪人。	彼得和解对了一个雪人	7/10=0.70
Do not wash the knives and forks.	请勿清洗刀叉。	请勿吸起刀叉	4/6=0.67
They like to watch movies on Saturday night.	他们喜欢在星期六晚上看电影。	他们喜欢在星期六晚上看电影	13/13=1.00
Do you know how to play violin and piano?	你知道如何拉小提琴和钢琴吗？	你知道如何拉纤体骑和钢琴吗	10/13=0.77
Martin is smart and he will definitely win the game.	马丁很聪明，他一定会赢得比赛。	马丁很聪明他一定会赢得比赛	13/13=1.00

Table 7. Translation from English to Malay Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
I am now in campus.	Saya kini berada di kampus.	Saya kini berada di kampus.	5/5 = 1.00
The boy run to the park.	Budak itu berlari ke taman.	Budak itu berlari ke taman.	5/5=1.00
My cat eats tuna, chicken, and salmon.	Kucing saya makan tuna, ayam, dan salmon.	Kucing saya makan tuna, ayam, dan salmon.	7/7=1.00
We will have a party on Saturday night.	Re1: Kami akan mengadakan pesta pada Sabtu malam. Re2: Kami akan mengadakan parti pada Sabtu malam.	Kami akan mengadakan majlis pada malam Sabtu.	6/7=0.86
I eat a big orange and a red apple.	Saya makan sebiji oren besar dan sebiji epal merah.	Saya makan sebiji oren besar dan epah merah	8/8=1.00
I will not be able to go to work today.	Saya tidak akan dapat pergi bekerja hari ini.	Saya tidak akan dapat pergi bekerja hari ini	8/8=1.00

Table 8. Translation from Malay to English Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
Saya kini berada di kampus.	I am now in campus.	I am now on campus	4/5=1.00
Budak itu berlari ke taman.	The boy run to the park.	The boy ran to the garden	4/6=0.67
Kucing saya makan tuna, ayam, dan salmon.	My cat eats tuna, chicken, and salmon.	My cat eats tuna chicken and Seven	6/7=0.86
Kami akan mengadakan pesta pada Sabtu malam.	We will have a party on Saturday night.	We will have a party on Saturday night.	8/8=1.00
Saya makan sebiji oren besar dan sebiji epal merah.	I eat a big orange and a red apple.	I ate a big orange and a red apple	8/9=0.89
Saya tidak akan dapat pergi bekerja hari ini.	I will not be able to go to work today.	I won't to be able to go to work today	8/10=0.80

Table 9. Translation from Malay to Chinese Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
Saya kini berada di kampus.	Re1: 我现在在校园里。 Re2: 我现在在学院里。	我现在在学院里	5/7 = 1.00
Budak itu berlari ke taman.	那个男孩跑到公园。	男孩抱到公园	5/6 = 0.83
Kucing saya makan tuna, ayam, dan salmon.	我的猫吃金枪鱼、鸡肉和鲑鱼。	我的猫至今去于肌肉和鲑鱼	7/12=0.58
Kami akan mengadakan pesta pada Sabtu malam.	星期六晚上我们将举行一个聚会。	星期六晚上我们先住进一个最会	10/14=0.71
Saya makan sebiji oren besar dan sebiji epal merah.	我吃了一个大橙子和一个红苹果。	我吃了一个大橙子和一个红苹果	14/14=1.00
Saya tidak akan dapat pergi bekerja hari ini.	我今天无法去上班。	我今天无法去上班	8/8=1.00

Table 10. Translation from Chinese to English Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
我现在在校园里。	Re1: I am now in campus. Re2: I'm now in campus.	i'm on campus now	3/4=0.75
男孩跑到公园。	The boy run to the park.	boy running to the park	4/5=0.80
我的猫吃金枪鱼、鸡肉和鲑鱼。	My cat eats tuna, chicken, and salmon.	My pussy so far seen in muscle and salmon	3/9=0.33
星期六晚上我们将举行一个聚会。	Re1: We will have a gathering on Saturday night. Re2: We will have a party on Saturday night.	Saturday night we hold a party	5/6=0.83
我吃了一个大橙子和一个红苹果。	I eat a big orange and a red apple.	I ate a big orange and a red apple	8/9=0.89
我今天无法去上班。	I will not be able to go to work today.	I can't go to work today	5/6=0.83

Table 11. Translation from Chinese to Malay Sentences

Sentence Use	Human expected translation	Machine translation result	BLEU metric
我现在在校园里。	Saya berada di kampus sekarang.	saya di kolej sekarang	3/4=0.75
男孩跑到公园。	Budak lelaki itu berlari ke taman.	budak lelaki berlari ke taman	5/5=1.00
我的猫吃金枪鱼、鸡肉和鲑鱼。	Kucing saya makan tuna, ayam dan salmon.	Tatu rambut saya berdasarkan otot dan salmon	2/7=0.29
星期六晚上我们将举行一个聚会。	Kami akan mengadakan pesta pada malam Sabtu.	Sabtu malam kami mengadakan mesyuarat susulan	4/6=0.67
我吃了一个大橙子和一个红苹果。	Saya makan sebiji oren besar dan sebiji epal merah.	Saya makan sebiji oren besar dan sebiji epal merah.	9/9=1.00
我今天无法去上班。	Saya tidak boleh pergi bekerja hari ini.	Saya tidak boleh pergi bekerja hari ini.	7/7=1.00

V. CONCLUSION

Current proposed application has achieved the objectives where it can translate messages into five difference languages. Users can choose the language easily during their conversation. Another feature, i.e. speech to text function allow users to use voice message and transform it into text when they are in a hurry or when they are not good in typing messages. Such a feature allows the recipients able to read the text where privacy is protected (listening to voice message may accidentally heard by the third party). However, there is still room for improvement as the speech to text accuracy is not always 100%. The other limitation of this application includes end-to-end encryption, where users' privacy may be at risk and currently, this application is only applicable to android users and the translation results is having room for improvement. In future, speech-to-text function and translation of sentences can be further improved, such as include the translation of mix languages that is commonly known as "Rojak" in Malaysia, include

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end-to-end encryption, sentiment analysis with machine learning [19-20], and the application should be extended to iOS users. As professional language experts are not available for Japanese and Korean language, the translation of these languages can be carried out in future.

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AUTHOR CONTRIBUTIONS

Kang Qin Yip: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Validation, Visualization, Writing – Original Draft Preparation;
Pey Yun Goh: Conceptualization, Project Administration, Resources, Supervision, Writing – Review & Editing;
Lee Ying Chong: Writing – Review & Editing

CONFLICT OF INTERESTS

No conflict of interests was disclosed.

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