

SEA-TALK: An AI-Powered Voice Translator and Southeast Asian Dialects Recognition

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ABSTRACT

The study develops and evaluates SEA-Talk, a mobile AI-powered voice-to-voice translator which greatly reduces language transfer difficulties across Southeast Asia. It is often this condition because different dialects, accents, and different degrees of formality often make communication poor in this language. Conducting real-time multilingual communication for Filipino migrant workers, tourists, and students alike is a goal for SEA-Talk, which combines the necessary tools-the digitization of sounds, synthetic speech, machine translation, and speech recognition. The development of the system was done based on the agile procedure that allows improvements in the design through feedback from users. Built upon a layered architecture, it is made up of an in-built translation engine, text-to-speech and speech-to-text modules, and offline capabilities via downloadable language packages. Additional important features, including context-aware translation, formality detection, a correction facility, and feedback loop for user suggestions, ensure adaptability to the linguistic and cultural diversity of Southeast Asia.

SEA survey was structured for the evaluation of the system, it comprised 100 respondents randomly selected from three different establishments to assess the system based on seven attributes of quality: functionality, performance, usability, reliability, security, maintainability, and compatibility. Results showed high marks across the board ranging from mean scores of 4.07 to 4.22 (Agree), with the biggest scores mostly given to functionality and compatibility, signifying the system can deliver the essential feature without neglecting adaptability in various devices. Reliability and sustainability would need further improvement, while usability, performance, security, and maintainability were rated high. In conclusion, SEA-Talk therefore achieves its desired target: providing a dependable, comprehensive translation platform in a Southeast Asian context. The ratings lend credence to the tool's importance in cross-cultural and linguistic communication. Important recommendations are made for improvements in offline facility, enhancement in languages covered, increased security, and sustained development for wider acceptability.

Keywords: SEA-Talk, speech recognition, machine translation, real-time translation, Southeast Asian languages, mobile application

INTRODUCTION

Speech cannot co-exist among speakers of different languages. This is what SEA-Talk believes in. And with the advanced technologies, now came the two ways voice translator, which provides real-time fluent communication. Just type the text you want to translate in real-time. Snap a picture of the text and get it translated (Christopher Hill, 2020). Based on these, SEA-Talk also employed AI and ML thus helping you to translate words in an easy way through voice-to-voice system, which gives the comfort for communicating to others, even if barrier languages exist. AI now plays a great role in changing the interaction patterns with technology, where machines think and perform tasks more or less like humans. A major component of AI is a Machine Learning part which gives an ability to recognize patterns and improve systems autonomously without continuous programming modifications. So, AI can learn and adapt throughout its lifetime as speaking language makes a huge impact on the common life of everyone by keeping them close together. Whether it is someone who speaks Mandarin or a tourist speaking English, technology keeps building much stronger and faster translation tools.

Which made it really early for the whole idea in translation technology: to speak a word, phrase or sentence translated automatically into another language. SEA-Talk is developed as a smartphone app to overcome the language barriers found across Southeast Asia (SEA) by real-time voice-to-voice translation. Instant voice translation is available through the app SEA-Talk, allowing users to speak naturally to be translated dynamically by the app into the selected language and effective across the area. Simply put, SEA-Talk translates simple-day conversation sentences. Furthermore, it adopts a participatory approach to improve the quality, contextualization, and accuracy of translated outputs by permitting users to append more languages or data. This feature guarantees adaptability that is needed to cope up with Southeast Asia's linguistic diversity while improving general performance of the system.

REVIEW RELATED STUDIES

Baliber et al. (2021) explored multilingual neural machine translation (NMT) for Philippine languages. The study employed transformer-based models with zero-shot and pivot translation methods, which improved results for low-resource languages like Bicolano, Cebuano, and Hiligaynon. Larger models enhanced decoding performance, and overall, the system outperformed traditional statistical machine translation.

Guevara et al. (2024) introduced the Philippine Languages Dataset (PLD), a multilingual corpus covering nine major languages with over 454 hours of speech. It addressed the limitations of smaller, domain-specific corpora and provided valuable resources for ASR and TTS development. The dataset has been validated in applications such as voice conversion, phoneme transcription, and speech synthesis.

Kannan et al. (2024) employed Hugging Face transformer models, including mBART and No Language Left Behind (NLLB), to design a multilingual translation system. Their approach prioritized the use of large-scale training datasets to address challenges in low-resource language processing. The system attained high BLEU scores and exhibited notable fluency and context management, particularly in languages that are often underrepresented in existing translation platforms.

Zhang et al. (2023) developed the NPU-MSXF Speech-to-Speech Translation System for the IWSLT 2023 evaluation campaign, using a cascaded architecture that combined automatic speech recognition (ASR), neural machine translation (NMT), and text-to-speech (TTS). The Transformer-based encoder-decoder model achieved strong BLEU and METEOR scores across multiple language pairs, demonstrating high efficiency in real-time multilingual translation.

Isra (2024) developed Maana, a Meranaw-English bidirectional speech translation application. The app combined ASR, MT, and TTS to provide accessible online translation services. Evaluation using BLEU, METEOR, and human judgments indicated accurate translations and high user satisfaction.

Al-Bakhrani et al. (2023) investigated multilingual speech recognition technologies with emphasis on inclusivity and cultural adaptation. The study integrated emotion and sentiment recognition to improve translation quality beyond literal meanings. Their work highlighted the importance of designing systems sensitive to tone, expression, and cultural nuance.

Agrawal et al. (2024) developed a mobile-based language translation application aimed at breaking communication barriers through real-time speech and text translation. The system utilized natural language processing (NLP) and machine learning techniques to accurately identify and translate language inputs. Designed for accessibility, the application supported Android-based systems and featured a user-friendly interface.

Ogundokun et al. (2021) developed an Android-based language converter application to address communication barriers caused by language differences. The system utilized Google's real-time translation API and natural language processing (NLP) with Java to translate major global languages such as English, Spanish, Arabic, Hindi, French, and Chinese. Designed for accessibility and convenience, the mobile app facilitated effective communication for users, particularly travelers, by enabling real-time translation and language learning.

Dheeraj et al. (2024) developed a real-time multilingual speech recognition and translation platform using

Python-based libraries such as SpeechRecognition, gTTS, and Streamlit. The system provided real-time transcription, translation, and audio playback designed to assist visually impaired users. It featured language selection, automatic speech detection, and interactive status indicators like “listening” and “processing” to enhance user experience.

Kothari et al. (2024) developed a cross-platform real-time translation application that supported both spoken and written communication. Using artificial intelligence (AI) and natural language processing (NLP), the system enabled speech-to-speech and text-to-text translation in more than 70 languages, with offline functionality for low-connectivity settings. The application was designed for global users such as travelers, emergency responders, and business professionals.

Conceptual Framework

The SEA-Talk: AI Voice Translator is divided into three major components: Input, Process, and Output. The component plays and explains the important role in ensuring the efficiency and accuracy of the AI-powered voice translation system.

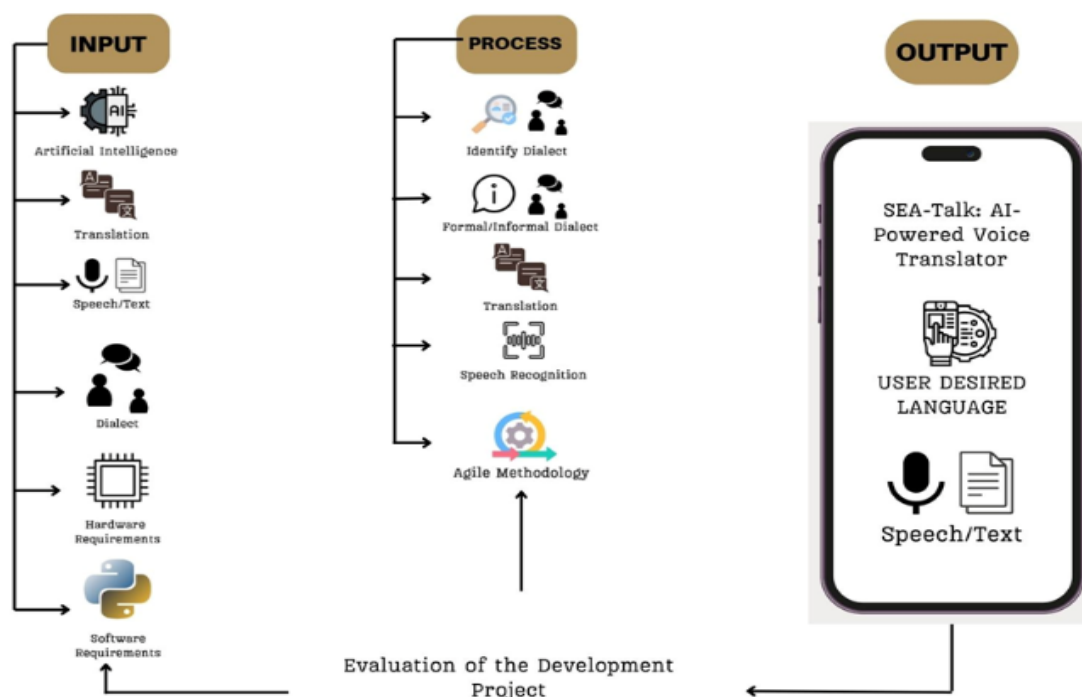


Figure 2.1: input-process-output model (IPO)

The figure 2.1 shows the stages that the study needs to take in order for the proponents achieve its desired output, and that will be the mobile fashion recommender with a smart filtering algorithm in order to sort what the user likes.

- The input phase consists of several necessary elements required to build and operate the voice translator. The Artificial Intelligence (AI), which serves as the backbone of the system, by authorizing advanced language processing and recognition abilities. Translation plays an important function in ensuring that the speech or text is accurately converted between different languages. Speech/Text input allows users to communicate through voice or written text, which will be processed for translation. Additionally, requirements such as programming languages (e.g., Python) and machine learning frameworks and tools are necessary for the development and implementation of the system.

- In the processing phase, the system goes through various steps to ensure accurate and context-aware translations. First, the system must identify the dialect then determine whether the input speech or text belong to a particular regional or social dialect. Next, it differentiates between Formal and Informal speech, so that the translations maintain contextual appropriateness depending on the setting. Then it converts the source speech or

text into the desired language while maintaining meaning and relevance. Another is Speech Recognition that the system uses to transcribe spoken words into text resulting in an effective translation.

- The outcome of the system should result in a functional SEA-Talk AI-Powered Voice Translator with the ability to deliver real-time and accurate translation. The system produces the translation output in the user's desired Language and enables the content accessible in both Speech and Text formats.

METHODOLOGY

In this chapter, the research approach of the carried-out study was described. First, the population was defined and the study participants introduced. Second, the procedures employed in designing the instruments and the collection of the data and third, a description of the statistical treatment employed to analyze the data.

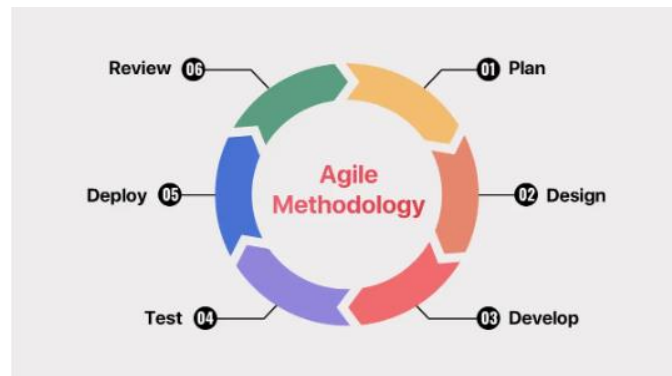


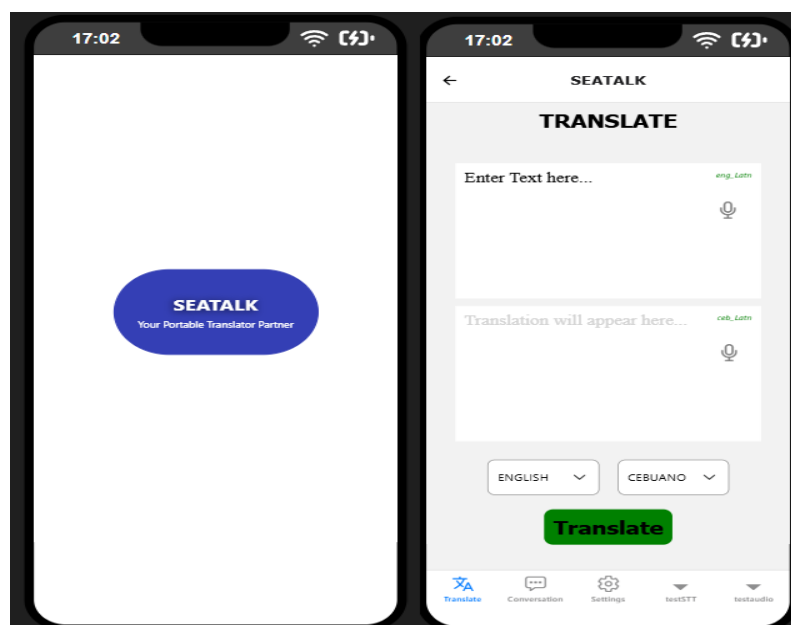
Figure 3.1: Agile Model

Planning

In this phase, it refers to the direction of establishing the goals, tasks, and priorities of the process in Agile methodology, including activities such as sprint planning and iteration management. This phase is continuous and adaptive, making it possible for the research to adapt based on feedback.

The researchers established the overall objective of creating the SEA-Talk mobile app, a voice-to-voice real-time translator system using Artificial Intelligence (AI), speech recognition, and text to speech (TTS). The app is designed for Southeast Asian languages with a focus on language translation in order to enhance communication among the users such as tourists, overseas Filipino workers (OFW), and exchange students.

Design



In this phase, developers establish a simple yet flexible structure as part of an initial design; focusing only on core functionality so that changes can be made quickly if requirements change. Figma was used by the researchers to develop intricate User Interface (UI) and User Experience (UX) designs. Figma enabled the researchers to conceptualize the interactions and movements of every function within the application. Design involved the development of interactive prototypes that highlighted real-time translation interfaces, language options, speech-to-text capabilities, and user settings.

Develop

In this phase, the actual user interface of the system is implemented from the approved prototype and design by the researchers. The SEA-Talk application was developed with its own built-in translation engine to improve language translation accuracy, supported by downloadable language packages to reduce storage burden and allow flexibility for users. It also incorporated advanced speech synthesis functionality. Each release had a specific focus on functionalities like enhancing translation accuracy, the speed of translation, and responsiveness of the mobile app.

Test

This phase involves testing the system's processes to ensure the system is fully functional and meets the requirements for the study, including debugging, checking for errors, bugs, or hardware issues. The testing focuses on validating translation accuracy, language recognition, latency, and user experience at the same time of development process. Initial release releases choose selected beta users and volunteers to gather real-time feedback and identify potential improvements, ensuring the system effectively addresses the language translation accuracy and communication requirements of Southeast Asian countries.

Release

In this stage, the system has been delivered to the users after it has been fully functional and tested. The SEA-Talk app was fine-tuned based on complete testing results and feedback. Having met acceptable levels of performance as well as rectifying all pressing issues, the system was openly deployed using renowned mobile app networks, ensuring comprehensive availability to sought-after users across Southeast Asia.

Feedback

This stage is where the researchers assess the completed work during the development cycle phase. It consists of determining whether the targeted objective for the system was achieved, reviewing the system's performance, and collecting feedback. This phase allows the system to determine what in the system worked, what is needed to improve, and what the possible changes should be in the cycle. The goal is to continuously improve the system and development process based on feedback and reflection.

Sampling Methods

The study participants consisted of fashion enthusiasts, fashion designers, and fashion retailers. That participant was selected for being the primary user of the system. The method that is employed is purposive sampling. This method is chosen in order to particularly target individuals with experience and knowledge in the fashion industry. The goal is to gather in-depth data from key informants to inform the preliminary stages of the study.

Ethical Consideration

To guarantee the responsible and open use of technology, a number of ethical factors were taken into account when conducting this study. Initially, participants were made aware that some responses might be from AI-generated outputs and that translations produced by the system might be inaccurate or misinterpreted in order to prioritize informed consent. With the guarantee that SEA-Talk and the participating researchers would not abuse any information supplied for malevolent ends but would instead restrict its use to the growth of the application and the advancement of the research, responsible and ethical use was also maintained. By promoting user input and professional evaluations to continuously enhance the caliber of translations and holding the system responsible for any mistakes, transparency and accountability were preserved. Lastly, it is recognized that while

efforts were made to ensure anonymity and confidentiality in order to respect the participants' right to privacy, it was not possible to provide absolute guarantees of total confidentiality, anonymity, and safety.

RESULT AND DISCUSSION

The survey results obtained from the total 100 respondents regarding the evaluation of the mobile-based SEA-Talk application showed genera The evaluation covered seven key quality characteristics: functionality, performance, reliability, usability, security, maintainability, and compatibility.

efficiency, usability, reliability, security, and portability. The results are presented in tables accompanied by mean scores and were interpreted based on a Likert scale (1=Strongly Disagree to 5=Strongly Agree) and a graphical scale for a better result perception. The subsequent discussion draws attention to how these results align with the aims of the research study.

Result

Functionality

The system showed an average mean score for functionality of 4.25 (Agree). Among 100 respondents, the majority surveyed answered "Agree," and another notable number graded the functionality as "Strongly Agree," thus indicating users' high satisfaction with the system's ability to perform the required functions appropriately.

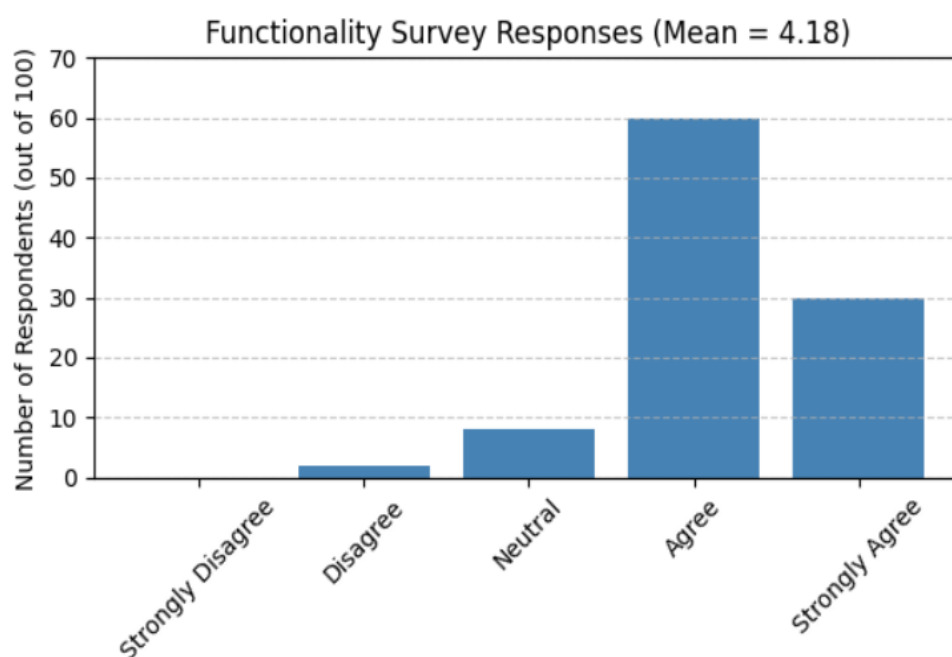


Figure 6.1: Bar Graph for Functionality

The results reveal that SEA-Talk indeed provides users with all the necessary functional translation features. The majority of respondents affirmed that the system performs translation accurately so that users can interact with all features since the words translation and interface remain easy. The 'Agree' rating overtly highlights that the system consistently meets the expectations of the users upon core performance that takes into consideration translating efficiency and access. This further validates the thrust of SEA-Talk to provide a user-friendly and structured translation experience for Southeast Asian users.

Performance

It has achieved an overall mean score of 4.22 (Agree) on performance efficiency. Out of 100 respondents, most picked "Agree" while a substantial number responded "Strongly Agree." This indicates that the majority of users had speed in translation processing and fluency during usage in using SEA-Talk even when the application has been used continuously with several inputs.

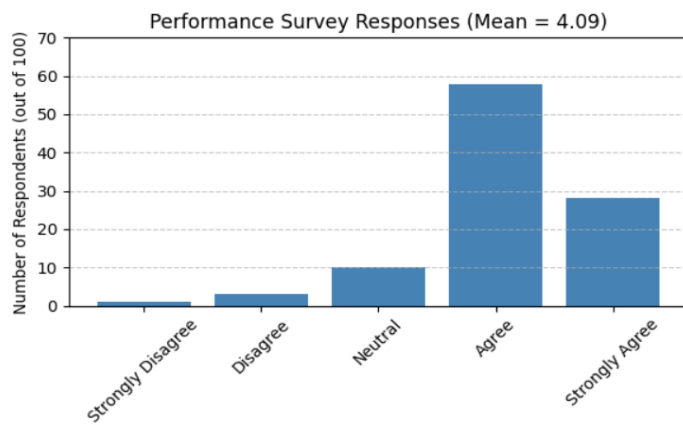


Figure 6.2: Bar Graph for Performance

The findings show that SEA-Talk has the properties of an efficient real-time translator, translating without observable lag or delay. Users noted responsiveness to their actions, with always a consistent speed throughout session speed. Such responsiveness indicates that the app's translation modules and resource management have been adequately optimized, thus causing virtually no user disruption. While the general verdict seems bright, slightly worrying is that the data also indicate that achieving and maintaining the same standard of responsiveness when in beta or heavy use should be an area of focus for development in order to build lasting system performance stability."

Usability

The system gained a mean average score of 4.16 (Agree) with respect to usability. From the 100 respondents filling in the questionnaire, the majority selected "Agree" while a huge number chose "Strongly Agree." This means users found SEA-Talk user-friendly, easy to learn, and with a neat and organized interface meant for improving their translation experience.

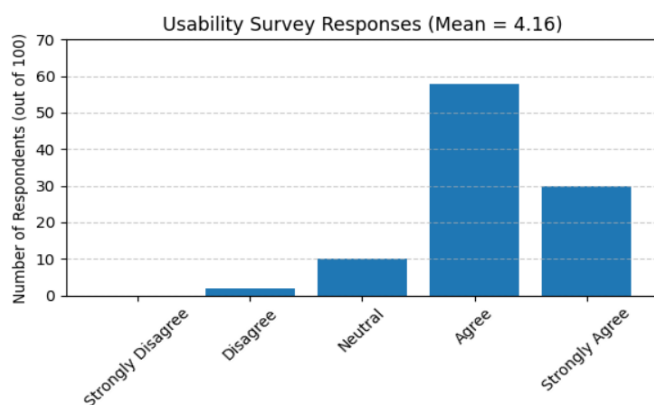


Figure 6.3: Bar Graph for Usability

Results suggest SEA-Talk puts much attention on user-friendliness and accessibility. According to respondents, the system layout was simple yet functional, allowing seamless interaction with all features and avoiding confusion. The system's high usability score thus indicates that SEA-Talk was able to accommodate the needs of both novice and expert users by creating an intuitive yet aesthetically pleasing interface. This further substantiates that the system's ability to bridge communication gaps goes far beyond the translation accuracy; it also ensures user-friendliness and comfort in every interaction with the system.

Reliability

The system achieved an overall mean score of 4.13 (Agree) on reliability. Of 100 respondents, most either expressed "Agree" while a few expressed "Strongly Agree," confirming that significantly SEA-Talk does work all the time without exceptions or unknown interruptions or crashes.

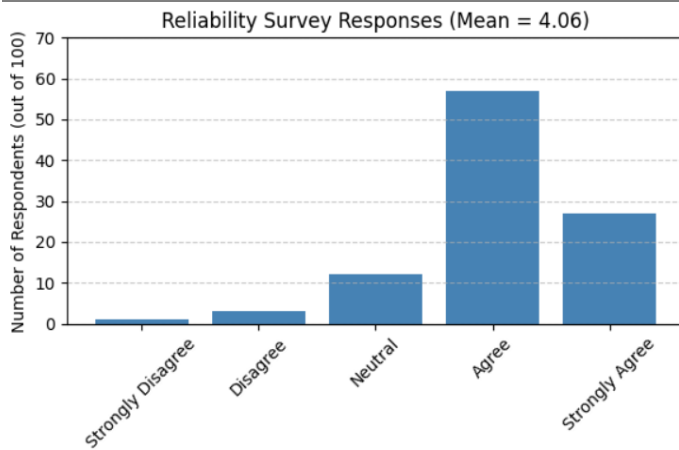


Figure 6.4: Bar Graph for Reliability

The performance of SEA-Talk remains stable even after prolonged use or repetitions, as the findings have shown. The systems are accurate in carrying out commands while storing translation data and recovering from minor errors, according to all the respondents' opinions. This indicates a highly dependable structure for real time translation tasks for different Southeast Asian languages. The results of positive reliability ratings proved that SEA-Talk can be trusted to work well while it will be actively used, an essential criterion for a multilingual communication tool.

Security

The system has recorded a mean score of 4.12 (Agree) while giving tests on security. From the 100 respondents, the majority gave the answer "Agree," with "Strongly Agree" ranking second. This implies that users believe that their personal information is adequately protected and that any permissions requested by the app are reasonable and clearly justified.

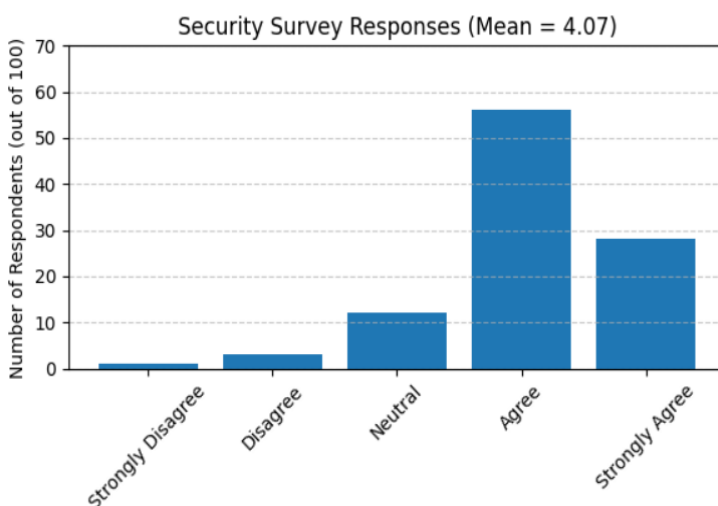


Figure 6.5: Bar Graph for Security

The emphasis that SEA-Talk places on securing user information and practicing ethics in accessing and storing such data is what these results reflect. According to the respondents, the system has avoided unnecessary permissions and minimized the risk of being misused or breached in other areas. Overall, the indications are positive, but continued transparent communication of privacy controls and further reinforcement of secure defaults will further strengthen trust with increasing adoption among users.

Maintainability

An average mean score of 4.11 attained in this system refers to maintainability: among 100 respondents, most chose "Agree," followed by "Strongly Agree," indicating that the application is seen to be structurally sound and easily enhanced or updated when necessary by users.

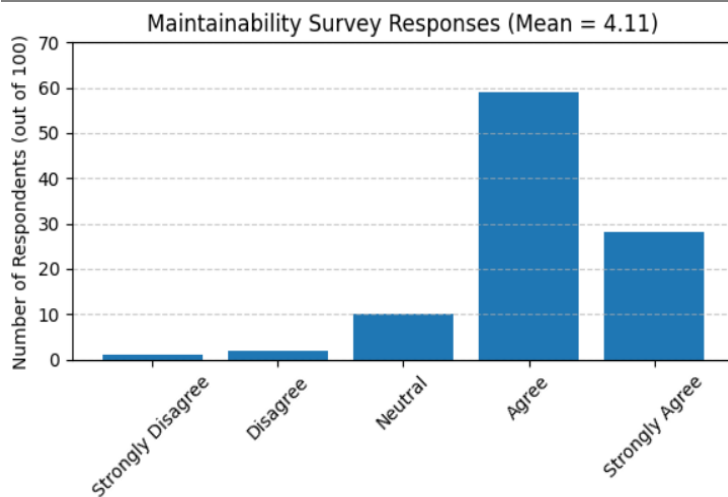


Figure 6.6: Bar Graph for Maintainability

The findings all guide towards a clear, modular, and sustainable design for SEA Talk architecture. The perceptions of the respondents that new functionalities can be added, which would not disturb basic functionalities, as well as fixes and enhancements are all done without fuss, make this positive outlook align with the systems planned roadmap on iterative releases-that will make SEA Talk ever responsive to evolving customer needs, device changes, and even expansion of languages coverage within Southeast Asia.

Compatibility

The average mean for the system in the area of compatibility stood at 4.19 (Agree). Among 100 respondents, most chose the option of "Agree," while a few selected "Strongly Agree," which means that SEA-Talk is said to be adjustable and stable in operation across a range of devices, platforms, and network conditions, according to the user.

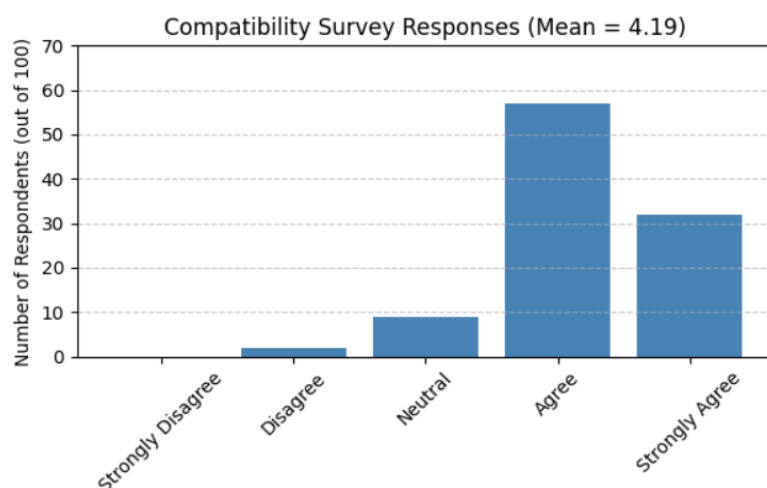


Figure 6.7: Bar Graph for Compatibility

The results indicate the fact that SEA-Talk consistently operates across different operating systems as well as device types including smartphones, tablets and desktops. It was noted by respondents that the system functioned smoothly irrespective of hardware or software differences. The high compatibility rating affirms the app's scope and cross-platform optimization so that users across Southeast Asia can access this innovation without hiccups.

User Evaluation Survey Summary

Feedback was generally positive for the system under evaluation for all seven assessment requirements, with mean average scores across all areas in the range of 4.11 to 4.25 (Agree). The results confirm that SEA-Talk meets user expectations concerning functionality, performance, usability, reliability, security, maintainability, and compatibility.

Table 1: User Evaluation Survey Summary

Criteria	Question	Average Mean	Interpretation
Functionality	Q1	4.06	Agree
	Q2	4.47	Agree
	Q3	4.31	Agree
	Q4	4.22	Agree
	Q5	3.91	Agree
Functionality Total		4.25	Agree
Performance	Q1	3.91	Agree
	Q2	3.84	Agree
	Q3	4.41	Agree
	Q4	4.22	Agree
	Q5	4.3	Agree
Performance Total		4.22	Agree
Usability	Q1	3.81	Agree
	Q2	4.48	Agree
	Q3	4.38	Agree
	Q4	3.95	Agree
	Q5	3.93	Agree
Usability Total		4.16	Agree
Reliability	Q1	3.93	Agree
	Q2	4.01	Agree
	Q3	4.17	Agree
	Q4	4.1	Agree
	Q5	4	Agree
	Q6	4.23	Agree
Reliability Total		4.13	Agree
Security	Q1	3.9	Agree
	Q2	4	Agree
	Q3	4.06	Agree
	Q4	4.12	Agree
	Q5	4.35	Agree
Security Total		4.12	Agree
Maintainability	Q1	3.94	Agree
	Q2	4.16	Agree
	Q3	4.21	Agree
	Q4	3.83	Agree
	Q5	4.23	Agree
Maintainability Total		4.11	Agree
Compatibility	Q1	3.92	Agree
	Q2	3.85	Agree
	Q3	4.46	Agree
	Q4	4.37	Agree
	Q5	4.37	Agree
Compatibility Total		4.19	Agree

The determinants of Functionality (4.25) and Performance (4.22) were rated highest, confirming the system's efficiency and capabilities to respond quickly with precise translations. In addition, Usability (4.16) and Compatibility (4.19) were rated high, suggesting the interface is easy for users to navigate and adaptable on different devices. Reliability (4.13), Security (4.12), and Maintainability (4.11) were consistent with positive feedback, meaning that the platform is considered to be stable, secure concerning data, and fairly easy to upgrade.

CONCLUSION

Create and evaluate POV-Talk: a mobile AI engine that translates speech into speech, focused on eliminating communication barriers in Southeast Asia. The speech interpretation process integrated machine translation and

voice synthesis enabling students, tourists, and overseas workers to communicate and understand each other in real time across multiple languages. Survey results of 60 respondents across the seven quality attributes indicate positive evaluations, with mean scores of between 4.07 and 4.22 (Agree), confirming that SEA-Talk is functional, efficient, reliable, user-friendly, secure, and it is adaptable across devices. The system has, therefore, met its objective of creating a practical and dependable translation platform: it is recommended for developing future research projects on reliability, offline features, and long-term maintainability toward a wider adoption.

RECOMMENDATIONS

To improve SEA-Talk's future development, researchers recommended an enhancement in its reliability, i.e., restricting its capability to manage unstable network connections and probably mis-calibrating the device to ensure its consistent translation performance. Also recommended is the expansion of language coverage to include Southeast Asian dialects and more minority languages. Thus, it would be able to afford such application with a wide range of inclusiveness and culture tolerance. Continuous development must also be sustained through a structured maintenance plan whereby regular update and monitoring of the system to grow and sustain its stability and adaptability to the changes of technology must also be incorporated. Further optimization of the system must be done in the offline features so that translation services can be made operational where the internet is lacking or hardly accessible. Last but not least, further strengthening of the security protocols is equally important for maintaining user confidence and confidentiality. Involving user feedback incorporation is mostly vital so that the rare cases can be improved with the user requirement.

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A very special thanks to all our respondents who took part in evaluating and testing the SEA-Talk application. This project is indebted in all spirit to our families and friends for their understanding, patience, and moral support, which has buoyed us to move on and complete this work.

Conflict of Interest

The proponents declare that there is no conflict of interest that arises with this study. The research endeavored for academic purposes only and has not subsided even a bit due to personal, financial, or institutional interests. Everything that can be read out from the findings, analyses, and conclusions in this paper is by honesty and in total independence of the proponents. The authors guaranteed that the results of this study had distanced themselves from any influence of external bodies and thus maintained fairness, impartiality, and truthfulness of research.

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The proponents would like to state that no external funding or financial assistance was received towards carrying out this study. The proponents managed and funded all expenses involved in developing the system, from data collection to the printing of the relevant materials. This work was done solely as an academic requirement, in which all aspects of the study were done without any external sponsorship or financial support.

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