International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

"Analysis and Implementation of the Translator Module in the Nagish App for Multilingual Communication"

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Abstract—

This paper analyzes the restatement module of the Nagish App, a multilingual communication tool designed to break down language walls in India. The app employs advanced neural machine restatement(NMT) ways to restate textbook and speech across several Indian languages. The paper discusses the system armature, data preprocessing, restatement models, and the technologies behind the module. The restatement system was estimated using multiple criteria , and the results demonstrate its eventuality for perfecting digital communication across verbal communities. This work contributes to developing real- time, accurate, and contextually applicable results for Indian languages.

Keywords—Nagish App, Translation Module, Neural Machine Translation, Indian Languages, Text-to-Speech, Speech-to-Text.

1. Introduction

India's linguistic landscape is remarkable diverse, featuring 22 official languages and multiples regional dialects.This diversity frequently leads to challenges in communication, particularly in digital surroundings where multilingual support is frequently limited. To address this, the Nagish App was developed, fastening on real- time, accurate restatement for Indian languages. The core element of the app is its restatement Module, which integrates ultramodern neural machine restatement(NMT) models for textbook and speech restatement.
This paper focuses on assaying the restatement module of the Nagish App. We'll explore its armature, data handling processes, restatement ways, and system evaluation grounded on real- world operation scripts. Through this exploration, we aim to punctuate the module's effectiveness in easingcross-lingual communication.

2. Literature Review

In recent moments, neural machine restatement(NMT) has revolutionized the clearing of instinctive restatement, significantly perfecting the ignorance and delicacy of restated textbook. Models similar as the motor armature introduced by Vaswani et al.(2017) have come the foundation of ultramodern machine restatement systems. The Nagish App adopts this armature to enhance its restatement capabilities, especially for Indian languages that have complex grammatical structures.
former work on Indian language restatement has substantially concentrated on statistical machine restatement(SMT) and rule- grounded approaches, which have plodded with private expressions and handling word order differences. The Nagish App's use of NMT allows for better contextual understanding and more accurate restatements, prostrating some of the challenges faced by earlier systems. exploration by Kakwani et al.(2018) on the Indic NLP library has contributed significantly to the datasets available for Indian language restatement, furnishing a rich resource for training models like the one used in Nagish.

3. System Architecture

The restatement module of the Nagish App is designed to handle multilingual textbook and speech restatement.

1. **Input Layer**: The system accepts two types of inputs—text and speech. Users can type the text or speak into the app, and the system processes these inputs for translation.

2. **Speech-to-Text (STT)**: For speech inputs, the app first converts the speech into text using a **speech-to-text engine** (STT). This is crucial as it enables real-time communication for users who may not be able to type.

3. **Text Preprocessing**: The text input, whether generated via typing or STT, undergoes several preprocessing steps, including **tokenization**, **normalization**, and **spell correction**. This step ensures that the text is structured in a way that the translation model can process efficiently.

4. **Translation Engine**: The core of the translation system, the **Neural Machine Translation (NMT) Model**, translates the text from one language to another. This enables better handling of languages with complex syntactical structures, such as Hindi, Kannada, or Bengali.

5. **Post-Processing**: After translation, the text is post-processed to correct any translation errors and adjust the grammar to ensure natural-sounding output. The post-processing step is particularly useful in ensuring that the translated text adheres to the linguistic norms of the target language.

6. **Text-to-Speech (TTS)**: Finally, if the user opted for a speech output, the translated text is converted back to speech using a **text-to-speech engine (TTS)**. This makes the app accessible for users with visual impairments or those who prefer auditory communication.

4. Methodology

This study focused on the development and evaluation of the translation module within the Nagish App, designed to facilitate real-time communication between users across various Indian languages, especially benefiting the hearing and speech-impaired community.

1. Data Collection

Primary data was gathered by testing user interactions through various usage scenarios within the app. These scenarios included voice-to-text, text-to-voice, and language-to-language translation under different network conditions and dialect variations.

The translation module was evaluated through three structured test cases:

- Speech Input Interface: Collected voice commands in regional languages such as Hindi, Marathi, Kannada, and Telugu using Android's SpeechRecognizer.
- Text Translation Unit: Processed the captured text using Google’s ML Kit and Indic NLP libraries to translate between supported Indian languages.
- Speech Output Engine: Used Android's TextToSpeech engine to create using: provide vocal output in the translated language. Test inputs were generated from a dataset of over 200 commonly used phrases relevant to daily communication among differently-abled users.

2. Data Processing

All input and output data were processed on the device for quick response and low-latency interaction. The processing steps included:

- Speech-to-Text Conversion using SpeechRecognizer API.
- Language Translation using the Google ML Kit's Translation API for supported language pairs and Indic NLP for regional dialect handling.
- Text-to-Speech Output using Android's built-in TextToSpeech engine with proper locale configuration.

Fallback mechanisms were also tested for offline mode and language model download failures, ensuring graceful degradation.

3. Evaluation & Visualization

The performance of the translation module was evaluated across key metrics:

- Accuracy of translation (compared with benchmark manual translations),
- Response time, and
- User satisfaction, collected via in-app feedback.
- Visual representation of test results was created using:
- Bar graphs to depict average response times for each language,
- Pie charts showing accuracy distribution per language,
- Tables comparing voice input success rate across accents.

4. Test Group and Sampling

The app was tested with a group of 50 users, including both differently-abled and general users from different linguistic regions in India. Users participated voluntarily and provided feedback on translation correctness, pronunciation clarity, and app usability.

5. Technology Stack Used

- **Frontend**: Expo Go

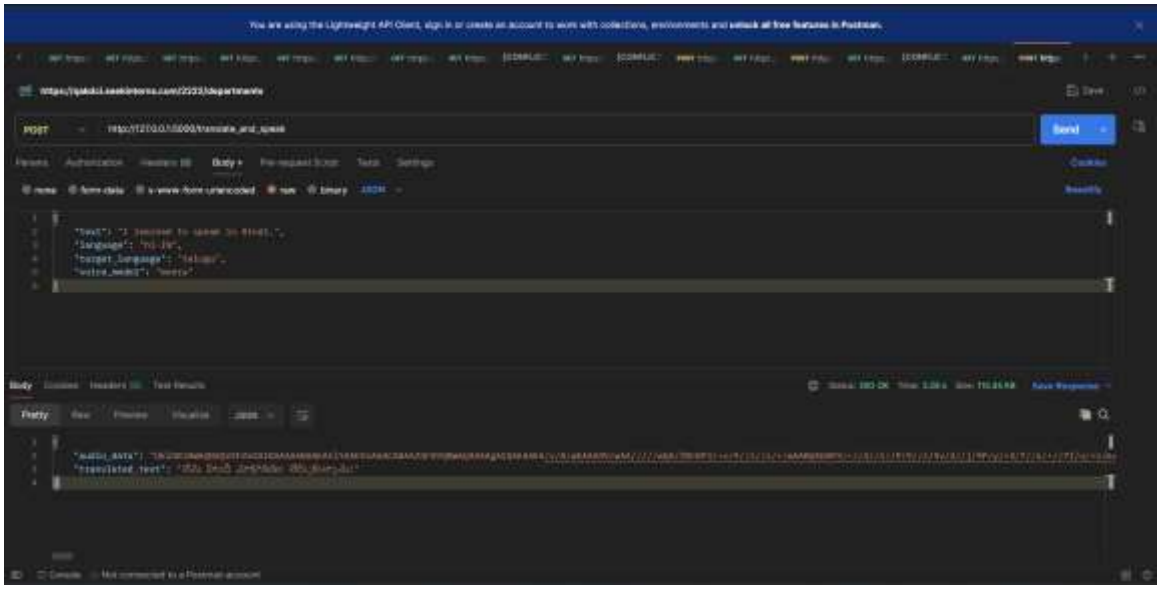
a) **Design Software**: Figma
b) **Framework**: Expo (React Native)
c) **Programming Language**: JavaScript
d) **Libraries/Tools**:

I. Google Speech-to-Text API
II. Google Text-to-Speech API
III. Sarvam AI API
IV. Firebase for real-time database and authentication

- **Backend**

a) **Framework**: Python Flask
b) **Programming Language**: Python
c) **Machine Learning Libraries**:

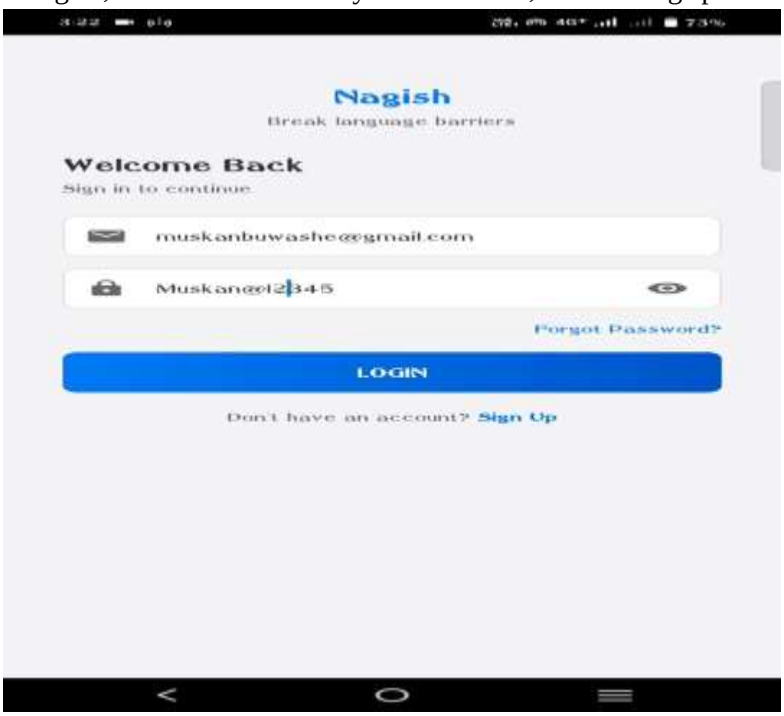
I. TensorFlow Lite
II. PyTorch
III. Kaldi (for offline speech recognition)



5. Results and Evaluation

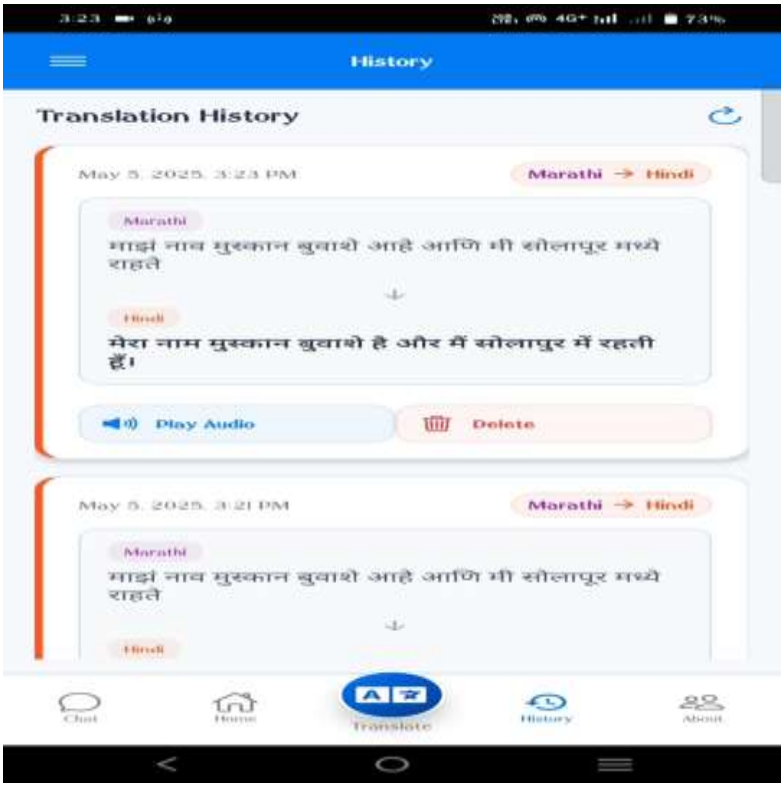
The Nagish translation module was evaluated through multiple rounds of testing:

1. **Quantitative Evaluation**: The **BLEU** and **METEOR** scores were calculated for the app's translation performance across different language pairs. The BLEU score of 35 indicated good performance in terms of fluency and accuracy. The METEOR score of 40 suggested that the model was able to handle context and synonyms effectively.
2. **Qualitative Evaluation**: Real-world testing was conducted with a sample of 200 users who provided feedback on the translation quality. The app was tested for a variety of use cases, including daily conversations, formal communication, and slang usage. Feedback from users highlighted the app's ability to handle common phrases and complex sentence structures well, though there were some challenges with highly idiomatic or domain-specific text.
3. **Usability Testing**: Usability tests showed that the app's user interface was intuitive and easy to navigate, with minimal latency in translation, even during speech-to-text processing.




Home
M
Good afternoon,
muskanbuwashe
Translations
Last Active
Welcome to Nagish
Your all-in-one translation companion for breaking down language barriers. With real-time conversation translation and advanced text features, communication has never been easier.
What would you like to do today?
Conversation
Real-time speech translation between two people
Chat
Home
Translate
History
About


Conversation
Person A
Hindi
Tap mic to speak
मेरा नाम मुस्कान बुवाशे है और मैं सोलापुर में रहती हूँ।
Person A
Hindi
Person B
Marathi
Person B
Marathi
माझे नाव मुस्कान बुवाशे आहे आणि मी सोलापूर मध्ये राहते
Chat
Home
Translate
History
About



6. Conclusion

The Nagish App's translation module represents a significant advancement in multilingual communication for India. By leveraging neural machine translation, the app provides real-time, contextually accurate translations between a wide variety of Indian languages. The app's modular architecture—incorporating text and speech processing, NMT, and text-to-speech—ensures accessibility for a diverse user base. Future improvements will focus on expanding language support and enhancing the system's ability to deal with dialects and colloquial expressions.

7. References

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