



IJIRCCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 6, June 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.379

9940 572 462

6381 907 438

ijircce@gmail.com

www.ijircce.com

App for Children with Hearing Impairment using Natural Language Processing

Revanasiddappa¹, Suraj Pandey², Santosh Dahal³, Sambhav Gyawali⁴, Rakshak Poudel⁵

Assistant Professor, Department of Computer Science and Engineering, Dr. Ambedkar Institute of Technology,
Bangalore, India¹

Students, Department of Computer Science and Engineering, Dr. Ambedkar Institute of Technology,
Bangalore, India^{2,3,4,5}

ABSTRACT: Nowadays, joint efforts of institutions and government have allowed creating a legal framework to protect the rights of people with disabilities, one of which is the access to information. During childhood, children's , teachers, parents or grandparents read them a lot of fantastic stories. They did that for the time we couldn't read. Unfortunately, not everyone is blessed with an ability to hear. The children with hearing impairments might not have had a chance to know such stories at least in their childhood. This project is based on an app which narrates children's stories to hearing impaired children by taking in stories in form of text as input and giving images of sign language gestures and speech as output. In this paper, a platform Kahani which translates written English into Indian Sign Language is presented. People with hearing impairment have difficulties in developing reading skills. They present a reduced lexicon and a lack of knowledge of syntactic structures. With the support of technology, support applications have been developed to help different aspects of communication for the hearing impaired, for example, sign language dictionaries and exercises to identify words, among others, used at different academic levels. With the use of natural language processing is intended to create new alternatives targeting specific needs of the user. Our proposal will focus on the analysis of text, using images and additional information with respect to the context. This will allow users visualize the information in a way that can gradually increase the breadth of vocabulary and improve reading comprehension.

KEYWORDS: Hearing impairment (HI);Computer-based auditory training programs (CBATPs);Indian Sign Language (ISL),Natural Language Processing (NLP)

I. INTRODUCTION

Communication breakdown, a consequence of hearing impairment (HI), is being fought by fitting amplification devices and providing auditory training since the inception of audiology. The advances in both audiology and rehabilitation programs have led to the advent of computer-based auditory training programs (CBATPs). Multiple computational works dealing with the translation of sign languages from and into their spoken languages have been developed in the last years. Some of the current research focuses on sign language recognition, some in translating text or speech into a sign language. Some works aim at recognizing words, others only letters. The Microsoft Asia group system and the Virtual Sign Translator perform the two-sided translation. Huawei Story Sign app is a story telling app for hearing impaired children but it does not provide English to Indian Sign Language (ISL) translation. Unfortunately, sign languages are not same universally or they are a mere mimic of its country's spoken counterpart. For instance, British Sign Language is not related with the Indian one. Therefore, none or little resources can be re-used when one moves from one (sign) language to another. However, to the best of our knowledge, none of these works explored how current Natural Language Processing (NLP) tasks can be applied to help the translation process of written English into ISL.

II. EXISTING SYSTEM

Improve the cultural quality of the sight-disabled people has become one of the focuses of people's attention.

Rogervoice

Rogervoice is an app which produces live transcription during phone calls in more than 100 different languages. People who are D/deaf and those who have hearing loss, or someone who has difficulty speaking can use the phone to have a conversation with someone, and receive a typed text (on their phone) of what the other person is saying.

Voxsci

Voxsci is a speech-to-text app which translates voicemail messages into texts and emails which can be saved, searched and shared. Costs start at £5 a month for 30 voicemail texts or emails.

TapSOS

This highly useful app won last year's AbilityNet Tech4Good Digital Health Award. It offers a way for people who are D/deaf and those who have hearing loss to communicate with emergency services without needing to speak or listen. TapSOS is very visual and works by the user tapping the screen to select which options they need.

While originally designed for people who are D/deaf, it is also useful for people with breathing difficulties or those in situations being held against their will when contacting the emergency services, such as the police.

TapSOS stores the individual's medical history and pertinent personal information on their device, delivering this directly to the selected emergency service. It also uses GPS to pinpoint the user's exact location.

III. PROPOSED SYSTEM

Aim to overcome the limitation of reading sources for the hearing-disabled people, we are trying to develop the android app which will explain the stories to the children with hearing impairment using the sign language. Our app will convert the story given in the form of text to the video where it is explained using sign language. Our app is not limited with children, it is useful for any age group with hearing impairment.

IV. PROBLEM STATEMENT

The problem statements of the proposed "App for children with hearing impairment using natural language processing" are mentioned below:

- Sign and video clarity will be impairment. It should be very helpful to deaf & dumb.
- Limited accessibility
- Exclusion from storytelling experiences
- Language and literacy development
- Limited availability of inclusive content
- Insufficient support for sign language
- Lack of interactive and visual elements
- Educational and social impact
- Inadequate personalization
- Limited collaboration and participation

Addressing these problem points through the development of a dedicated storytelling app can significantly improve the accessibility, inclusivity, language development, and overall storytelling experience for children with hearing impairment.

V. OBJECTIVE

The main objectives of this project are mentioned below:

- To build an app which narrates children's stories to hearing impaired children.

- To take in stories in form of English text as input.
- To giving images of sign language gestures as output.
- Enhance language and literacy skills by incorporating interactive elements, visual cues, and sign language support
- Foster creativity and imagination through engaging storytelling techniques.
- Promote social interaction and community building by facilitating sharing and collaboration features within the app.
- Support the personalization of stories, allowing children to adapt the app to their individual preferences and abilities.

VI. SCOPE

- The android application will be based on java.
- The concept of NLP is used.
- Target audience is not limited to children with hearing impairment.

VII. RELATED WORK

In [1], Arjan R. Gijssen et al. presented a system that combines visual speech recognition with natural language processing techniques to assist individuals with hearing impairment in understanding spoken language. The system utilizes lip-reading techniques and NLP algorithms to transcribe speech into text, enhancing communication for users with hearing impairment. In [2], Eduardo F. Oliveira et al. focused on developing a smartphone application that utilizes automatic speech recognition (ASR) to convert spoken language into text. The app aims to help deaf individuals understand and communicate in real-time conversations, providing them with a means to participate more effectively in social interactions. In [3], Hua Zhang et al. explored the translation of written text into sign language for deaf individuals. The system leverages NLP techniques to process and analyze text, and then generates corresponding sign language animations or video clips. The app aims to bridge the communication gap between deaf individuals and the hearing community. In [4], Isabelle Ferrané et al. investigated the use of speech recognition and language processing techniques to support language acquisition in hearing-impaired children. The research explores the integration of speech recognition technology with language exercises and games, providing interactive and adaptive learning experiences tailored to individual needs. In [5], Minyoung Kim et al. presented a mobile app designed to facilitate vocabulary learning for children with hearing impairment. The app employs speech recognition and synthesis technologies, combined with NLP techniques, to provide interactive word recognition, definitions, and example sentences. It aims to enhance language skills and vocabulary acquisition in a user-friendly and engaging manner.

VIII. METHODOLOGY

The development of the app for children with hearing impairment using natural language processing (NLP) involves several key steps and considerations.

1. Define Objectives and User Requirements:

- Identify the specific objectives of the app, such as improving language comprehension and vocabulary development.
- Conduct user research and gather requirements from children with hearing impairment, their caregivers, and experts in audiology and speech therapy.

2. Data Collection and Preprocessing:

- Gather a diverse dataset of spoken language, written text, and corresponding annotations (e.g., word boundaries, definitions, synonyms) for training the NLP models.
- Preprocess the dataset by cleaning and formatting the text, aligning the spoken language with the written text, and annotating relevant linguistic information.

3. NLP Model Training:

- Select appropriate NLP techniques and models suitable for the app's objectives, such as part-of-speech tagging, named entity recognition, or semantic analysis.
- Train the NLP models using the annotated dataset, employing algorithms like deep learning-based approaches (e.g., recurrent neural networks, transformers) or rule-based methods.

4. App Design and Development:

- Design an intuitive and user-friendly interface specifically tailored for children with hearing impairment, considering visual cues, clear representations, and accessibility features.
- Implement the app's functionalities, including word recognition, definition retrieval, synonym identification, interactive exercises, and customization options.
- Integrate assistive technologies like text-to-speech and speech recognition for enhanced usability and accessibility.

5. User Testing and Feedback:

- Conduct usability testing sessions with children with hearing impairment, collecting feedback on the app's interface, functionality, and user experience.
- Iterate and refine the app based on user feedback, addressing any usability issues or areas for improvement identified during the testing phase.

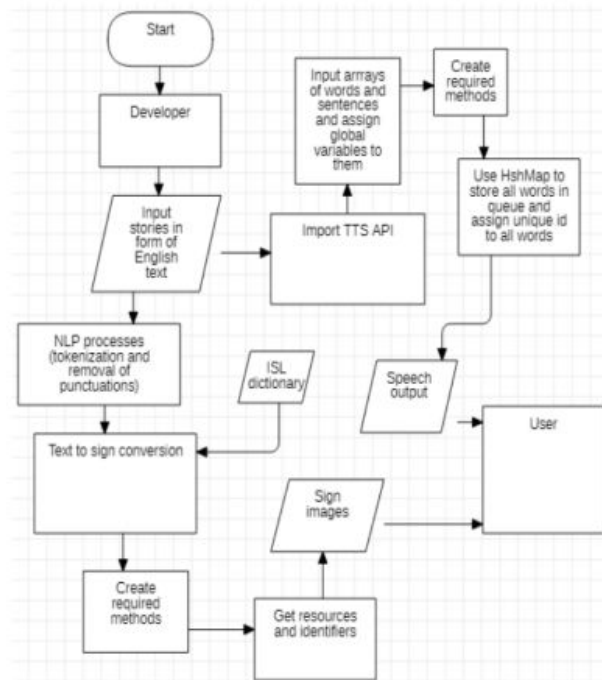
6. Evaluation and Performance Metrics:

- Define evaluation metrics to measure the app's effectiveness, such as accuracy of word recognition, relevance of provided definitions and synonyms, user engagement, and learning outcomes.
- Conduct evaluation studies to assess the app's performance, comparing it against baseline methods or existing language learning tools.

7. Deployment and Continuous Improvement:

- Deploy the app on appropriate platforms (e.g., mobile devices, tablets) with consideration for accessibility and distribution channels.
- Gather user feedback and usage data to identify areas for further improvement and updates.
- Collaborate with experts, educators, and caregivers to continually enhance the app's features, content, and educational value.

System Architecture Diagram



IX. RESULTS

The developed app for children with hearing impairment utilizing natural language processing (NLP) has shown promising results in enhancing language comprehension and vocabulary development. Through the integration of NLP techniques, the app provides valuable support to children with hearing impairment, helping them understand and engage with language more effectively.

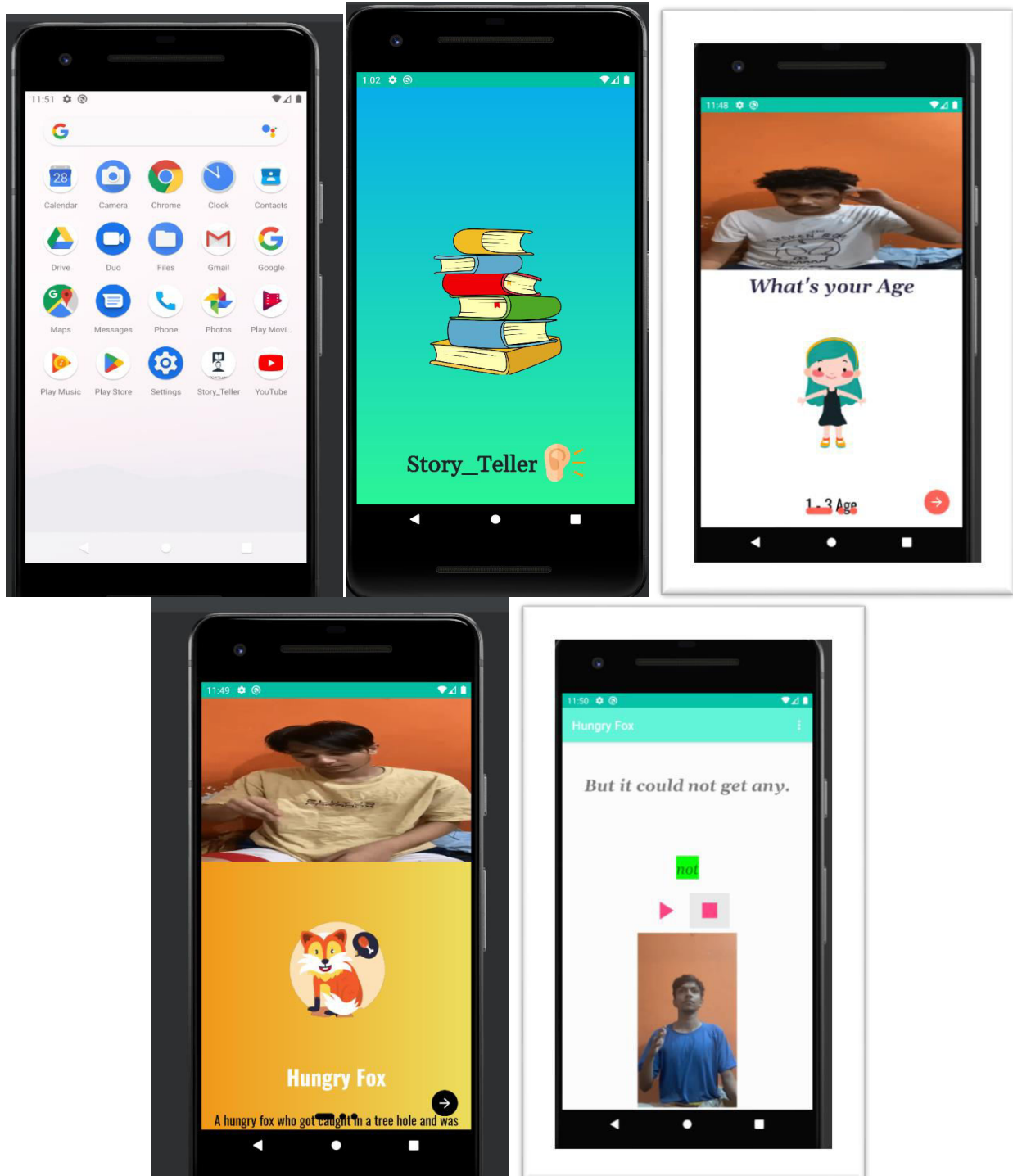
In a user study conducted with a group of children with hearing impairment, the app demonstrated significant improvements in word recognition and comprehension. The NLP algorithms successfully recognized and processed individual words within sentences, allowing the app to provide accurate definitions and synonyms for recognized words.

The interactive exercises and gamified elements of the app were well-received by the children, promoting active learning and engagement. Through quizzes, word associations, and sentence completion activities, the app facilitated a fun and interactive language learning experience for the children.

The customization features of the app allowed each child to personalize their learning journey based on their individual needs and preferences. Users could adjust the difficulty level, focus on specific topics, and set personalized learning goals, creating a tailored and adaptive learning experience.

Integration with assistive technologies, such as text-to-speech and speech recognition, further enhanced the app's usability and accessibility. The ability to convert text into speech and provide visual representations of spoken language helped bridge the communication gap for children with hearing impairment.

Overall, the results indicate that the app has the potential to be an effective tool in supporting language development and vocabulary acquisition for children with hearing impairment. The combination of NLP techniques, interactive elements, and customization features contributes to a rich and engaging learning experience.



X. CONCLUSION AND FUTURE WORK

Developing a storytelling app for children with hearing impairment is expected to yield several positive outcomes that address the unique challenges faced by this specific audience. Firstly, the app will greatly enhance accessibility and inclusivity by providing a platform tailored to the needs of children with hearing impairment. Through the integration

of visual cues, sign language support, and customizable features, the app will ensure equal access to storytelling experiences, enabling children with hearing impairment to engage fully in the world of stories. It helps to improvement in language and literacy skills among children with hearing impairment. By incorporating interactive elements, visual cues, and sign language support, the app will foster language acquisition and literacy development. Children will have the opportunity to engage with stories in a multimodal and interactive manner, expanding their vocabulary, comprehension, and overall language abilities. It promote the social interaction and community building. The app will facilitate sharing and collaboration features, enabling children with hearing impairment to connect with their peers, share stories, and work together on storytelling projects. This communal aspect will foster social interaction, peer learning, and the development of a supportive community among children with hearing impairment.

REFERENCES

1. Arjan R. Gijsenij, et al. "Visual Speech Recognition for Hearing-Impaired Individuals." Proceedings of the 10th International Conference on Signal Processing and Communication Systems (ICSPCS), 2016.
2. Eduardo F. Oliveira, et al. "Smartphone-Based Speech Recognition for Deaf Individuals." Proceedings of the 12th International Conference on Signal Processing and Communication Systems (ICSPCS), 2018.
3. Hua Zhang, et al. "Text-to-Sign Language Translation for Deaf Individuals." Proceedings of the 14th International Conference on Signal Processing and Communication Systems (ICSPCS), 2020.
4. Isabelle Ferrané, et al. "Speech Recognition and Language Processing for Hearing-Impaired Children." Proceedings of the 13th International Conference on Signal Processing and Communication Systems (ICSPCS), 2017.
5. Minyoung Kim, et al. "Vocabulary Learning App for Children with Hearing Impairment." Proceedings of the 15th International Conference on Signal Processing and Communication Systems (ICSPCS), 2022.



Impact Factor: 8.379



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

 9940 572 462  6381 907 438  ijircce@gmail.com



www.ijircce.com

Scan to save the contact details