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Transign AI

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Abstract - The project "Speech to Sign Language Converter" presents a user-friendly and inclusive solution aimed at bridging communication gaps for the hearing-impaired. Utilizing advanced speech-to-text algorithms, natural language processing (NLP), and emotion recognition, the system converts spoken audio into Indian Sign Language (ISL) representations. A key feature is the integration of Google APIs to retrieve contextual images that enhance the expressiveness of the sign output. By embedding emotional cues within sign gestures, the system provides a more humanized and accurate communication experience. This paper outlines the technical framework, implementation methodology, and potential impact of this AI-powered assistive tool.

Keywords — Sign Language, Emotion Recognition, NLP, Google API, Speech to Text, Assistive Technology

I. INTRODUCTION

Communication is a fundamental human right, yet individuals with hearing or speech impairments often face barriers in expressing themselves effectively. This project proposes an AI-powered system that converts spoken language into animated Indian Sign Language (ISL), helping bridge the communication divide. In addition to basic conversion, emotion recognition and image augmentation via Google APIs enhance the contextual clarity of communication. The system is designed to be real- time, accessible, and adaptable to different users' needs, including varying dialects, tones, and speech patterns.

II. EXISTING SYSTEM

Currently available solutions such as interpreters, text-to-sign converters, or manual communication aids are limited in scope. Existing applications often require static sign libraries or are restricted to textual inputs. Devices like sensor gloves interpret hand gestures but do not convert spoken language. Real-time speech-to-sign tools lack emotional recognition and visual support, leading to ineffective communication. Moreover, most systems do not support ISL, making them less applicable to the Indian user base. These limitations necessitate an intelligent and responsive system that can address these gaps holistically.

III. IDEATION

The concept for this project emerged from the observed limitations in existing assistive technologies for the deaf and mute community. We aimed to build a solution that would:

- Enable real-time translation of spoken words into ISL using NLP techniques.
- Integrate emotion recognition to enhance expressiveness in communication.
- Use Google APIs to fetch relevant images that support and clarify gestures.
- Deliver an intuitive interface that is easy to use for both deaf and non-deaf users.
- Ensure accessibility, privacy, and scalability for deployment in diverse settings like schools, hospitals, and public services.

Innovative Features Include:

- **Speech-to-Text Conversion** using advanced APIs.
- **NLP Translation** to map text to ISL gestures.
- **Emotion Recognition** to detect tone and sentiment.
- **Google Image Integration** to support visual understanding.

Graphical Output through animated gestures or MP4 videos.
Technological Brainstorming:

1. **Natural Language Processing (NLP):**

NLP is used to process and understand the textual output of speech-to-text conversion.
Lemmatization and tokenization were discussed to help map words to ISL equivalents accurately.

Emotion Recognition:
Emotional tone plays a crucial role in human communication. By integrating sentiment

analysis, the system can embed facial expressions or gesture emphasis that mirror emotions such as happiness, anger, or surprise.

2. **Image-Based Assistance via Google APIs:**
For words or concepts that are difficult to represent using ISL, contextually relevant images are fetched dynamically through Google's Custom Search API, enhancing the clarity and depth of communication.

3. **Graphical Gesture Output (MP4 or GIF):**
Instead of static images, we ideated using MP4/GIF animations of sign gestures, creating a fluid and understandable communication stream.

4. **User Interface & Accessibility:**
The app is envisioned with both desktop and mobile access, incorporating voice input, volume control, theme switching, and accessibility settings to support diverse user groups.

5. **Scalability and Inclusivity:**
The model can be extended to support regional languages and dialects in the future. It can also integrate with educational platforms and public information kiosks for maximum impact.

6. **Ethical Design and Privacy:**
During ideation, considerations around data privacy, especially voice recordings and emotion profiling, were addressed. The system is designed to function locally or with encrypted API calls to ensure user confidentiality.

IV CONCLUSION

The proposed system significantly improves communication for people with hearing disabilities by providing a real-time, animated, and emotionally intelligent ISL output. With the inclusion of image support and emotional nuance, this model enhances understanding and empathy in comm unication. Designed with scalability in mind, the system is adaptable for integration into web platforms, educational tools, and healthcare systems. Future
enhancements may include expanding the ISL dictionary, incorporating regional languages, and improving gesture recognition through 3D avatars and AR.blending advanced technology with practical usability, Chief empowers teams

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