Research Document: Sign Language Communication Device - Verbalizer

Abstract

This extensive resource aims to develop an app that enables communication between individuals who use sign language and those who do not. Utilizing Python AI and React Native, we aim to create an app, Verbalizer, that uses AI vision to convert sign language into English.

Objective

The objective of this project is to create an app, a real-time sign language recognition software that converts gestures into speech or text, facilitating seamless communication.

Detailed Overview

Main App UI

- **We will be using React Native for the development of the app.**
- **This will make it accessible for android. (*Note: Though our app will remain Android first, we will try our best to bring it to ios as well).***
- **Also, we will be using Python to create our machine learning model with help of mediapipe and opencv etc.**
- **Our UI / UX and logo designs will be made in Figma.**

Data Collection (AI)

Data collection is a crucial step for training an accurate and reliable model. The dataset includes photos of individuals performing various sign language gestures. Key considerations include:

- **Annotations: Annotating the dataset with corresponding English translations for each gesture.**
- **Environment: Recording gestures in different environments to account for varying lighting and background conditions.**
- **Skin Tone: Recording gestures of different skin tones to account for varying castes and social backgrounds.**

Model Development (AI)

The development process includes several phases:

Preprocessing

- **Feature Extraction: Extract features like hand shape, movement, and orientation.**

Training

- **Model Selection: Choose suitable model architectures such as Convolutional Neural Networks (CNNs) for image recognition and Recurrent Neural Networks (RNNs) for sequential data.**
- **Training: Train the model with the preprocessed dataset vigorously.**
- **Validation: Validate the model with a separate dataset to ensure generalizability and accuracy.**

Post-Processing

- **Text Generation: Convert recognized gestures into coherent English text (aiming to do it in real time).**

- **Model Accuracy: The model demonstrates high accuracy in recognizing and translating sign language gestures on the go.**

Conclusion

Verbalizer, our project, represents a significant advancement in improving communication and accessibility for the deaf and hard-of-hearing communities as well as for the people who are unable to speak.
By utilizing advanced machine learning techniques and focusing on user-centered design, the project aims to break down communication barriers and foster inclusivity.
Continued development and collaboration with users will ensure the system evolves to meet the needs of its users, making a meaningful impact on their daily lives.

Contributors

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