DHWANI - A VIDEO CONFERENCING UTILITY WITH SIGN LANGUAGE CONVERSION FOR DEAF AND DUMB

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Keywords:

Sign Language, Mediapipe, Gesture Recognition, Deep Learning, Communication Accessibility.

Introduction:

Communication barriers between hearing-impaired individuals and the rest of society remain a significant issue. Sign language serves as a bridge, but not everyone is fluent in it. To address this gap, our project focuses on real-time sign language recognition using computer vision and machine learning. We use Mediapipe to detect hand landmarks and employ a trained machine learning model to classify hand gestures. The system provides instant feedback, enhancing accessibility and interaction for hearing-impaired individuals.

Objectives:

1. To detect and track hand landmarks in real-time using Mediapipe.
2. To collect and preprocess sign language data using hand landmarks.
3. To train a machine learning model for gesture recognition.
4. To build a user-friendly interface for translating signs into text.

Methodology:

1. Data Collection: Created a dataset of sign language gestures using OpenCV and Mediapipe, capturing both single and dual hand signs.
2. Preprocessing: Extracted hand landmarks and normalized them for consistent input to the model.
3. Model Training: Trained a neural network classifier (using scikit-learn or TensorFlow/Keras) to recognize signs.
4. Real-time Prediction: Used live webcam feed to detect and classify hand gestures in real-time, displaying recognized gestures as text.
5. Tools Used: Python, OpenCV, Mediapipe, scikit-learn/TensorFlow, NumPy, HTML, CSS.

Result and Conclusion:

In conclusion, the project successfully recognizes various sign language gestures with high accuracy. The system performs well under good lighting conditions and consistent gesture positioning. It bridges communication barriers by translating hand gestures into readable text. The use of Mediapipe ensures efficient hand tracking, and the machine learning model delivers reliable predictions.

Project Outcome & Industry Relevance:

This solution has potential applications in real-time communication, education tools for learning sign language, and integration with video calling platforms. It offers an accessible and affordable solution for aiding hearing-impaired communication.

Working Model vs. Simulation/Study:

The project includes a working model using a webcam-based interface that detects, classifies, and displays sign language gestures in real-time.

Project Outcomes and Learnings:

1. Developed skills in computer vision and gesture recognition.

2. Gained experience in real-time system development and data preprocessing.
3. Learned to integrate machine learning models into interactive applications.

Future Scope:

The future scope of this project includes:

1. Expand the gesture dataset to include more complex and sentence-level signs.
2. Integrate the system into real-time video calling apps for subtitle generation.
3. Add support for dynamic signs (continuous hand motion).
4. Improve accuracy using deep learning models like CNN+LSTM for sequence prediction.
5. Deploy the solution on mobile platforms for wider accessibility.