PROJECT REFERENCE NUMBER: 46S_BE_1885

TITLE: TECHNICAL TERM SIGN LANGUAGE DETECTION FOR DEAF AND DUMB

COLLEGE NAME AND DEPARTMENT: Alva's Institute of Engineering and Technology and Department of Computer Science and Engineering

PROJECT GUIDE:

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INTRODUCTION:

Sign language recognition using LSTM and MediaPipe is an innovative approach to bridge the communication gap between sign language users and non-sign language users. It combines the power of deep learning and computer vision techniques to accurately detect and decipher sign language motions. Unlike other techniques, this method utilises LSTM (Long Short-Term Memory) networks, a type of recurrent neural network specifically designed to process sequential data. The integration of MediaPipe provides a robust set of tools and pipelines for real-time motion tracking and analysis, enabling the precise tracking of hand, arm, and facial expressions of sign language users. By leveraging LSTM and MediaPipe, the system can capture the intricate and dynamic nature of sign language motions, including the nuances conveyed through facial expressions. This allows for more accurate recognition and translation of sign language into spoken or written language, facilitating effective communication between sign language users and non-sign language users. Compared to traditional techniques for sign language recognition, which often rely on rule-based or template matching approaches, LSTM and MediaPipe offer several advantages. Firstly, LSTM networks can capture long-term dependencies in sequential data. This enables the system to recognize complex sign language gestures and sequences. Secondly, MediaPipe provides a

comprehensive framework for real-time motion tracking, offering precise tracking of hand and facial movements. This level of detail improves the accuracy and robustness of the sign language recognition system, even in varying lighting conditions or different camera angles.

OBJECTIVES:

The objectives of sign language recognition using LSTM and MediaPipe can be summarised as follows:

- Accurate Gesture Detection: The primary objective is to develop a system that can accurately detect and recognize sign language gestures and motions,the system aims to capture the intricate details of hand, arm, and facial movements involved in sign language communication.

- Real-Time Recognition: Another key objective is to achieve real-time sign language recognition. The system is capable of processing in real-time, enabling seamless and instantaneous translation of sign language into written language.

- User-Friendly Interface: A crucial objective is to develop a user-friendly interface that facilitates easy interaction between sign language users and non-sign language users. The system should provide clear and intuitive visualisations or translations of sign language motions, making it accessible and understandable for both parties involved in the communication.

- Continuous Learning and Improvement: The system should have the capability to continuously learn and improve over time. By leveraging LSTM networks, the system can be trained on additional data, allowing it to adapt to individual users' signing styles and improve its recognition accuracy and performance over time.

- Enhancing Accessibility and Inclusivity: By enabling effective communication between sign language users and non-sign language users, the system aims to break down barriers and promote equal participation and understanding in various domains of life.

METHODOLOGY:

1. Data Collection: Gather a diverse dataset of sign language videos, capturing a wide range of gestures and expressions.
2. Pre-processing:Preprocess the video data by normalising, resizing, and extracting relevant features such as hand and facial keypoints.

3. LSTM Training:Train the LSTM network using the motion data, employing techniques like sequence padding, batching, and backpropagation through time to learn the temporal dependencies in sign language gestures.

4. Model Optimization: Optimise the LSTM model by tuning hyperparameters, adjusting the network architecture, and applying regularisation techniques to improve its performance.

5. Performance Evaluation:Conduct extensive performance evaluations and comparisons with existing sign language recognition approaches to measure the effectiveness and efficiency of the proposed methodology.

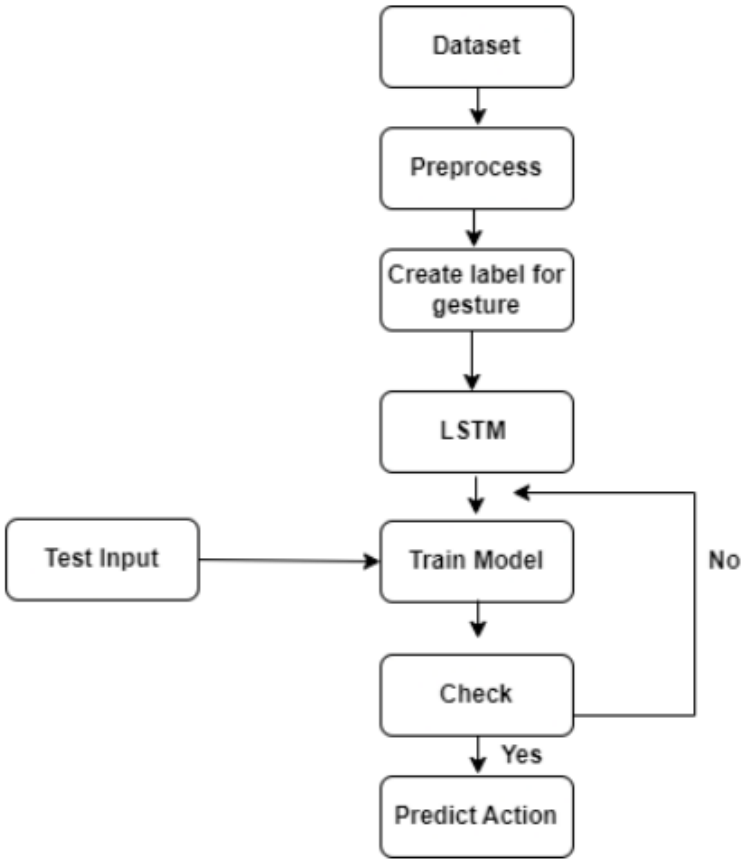


Figure 1: Flow diagram of working of project

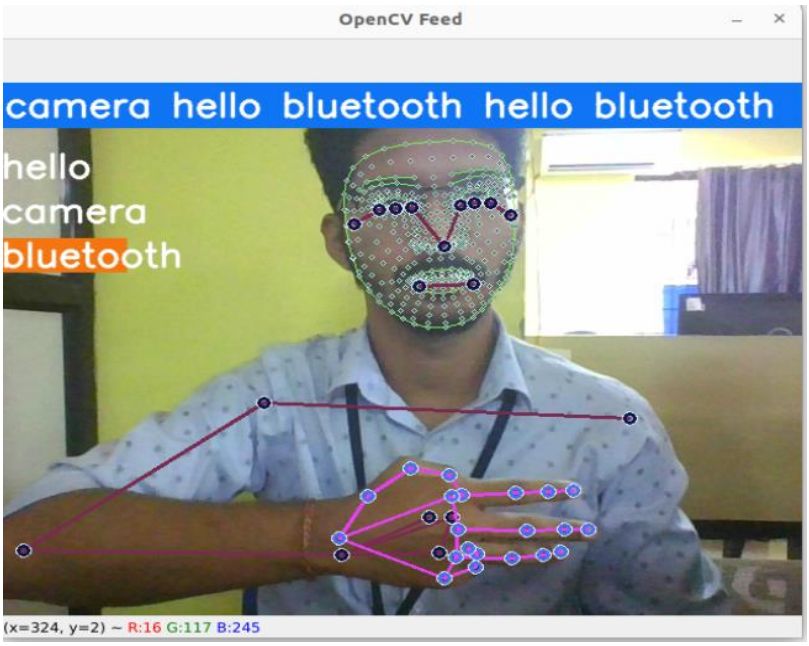
RESULT AND CONCLUSION:

The system tries to recognize gestures on real time which were previously trained accordingly using mediapipe which tracks the hand motion helping in recognizing actions.In conclusion, a sign language recognition system using MediaPipe and LSTM has shown promising results in accurately recognizing and translating sign language gestures into text or speech. The use of MediaPipe provides accurate hand and landmark tracking, which is crucial for recognizing and differentiating between different sign

language gestures. The use of LSTM helps in recognizing sequential patterns in sign language, leading to improved accuracy in recognizing gestures.

Figure 2: Recognizing ‘bluetooth’ gesture

Figure 2 showcases the recognition of the 'bluetooth' gesture. The image features a person with their arm extended straight, and their elbow kept in a straight position. The hand gesture specifically involves straightening three fingers while keeping the thumb and little finger folded outward. This configuration resembles the symbol commonly associated with the 'bluetooth' technology. The sign language



recognition system accurately identifies and interprets the 'bluetooth' gesture, facilitating communication and interaction using sign language.

THE INNOVATION OF THE PROJECT:

The project demonstrate the ease and user friendly operations that any common man can perform.While comparing with the previous projects on this topic, this project facilitates simple installation and easy understanding of the operations to sign the gesture.The low computing power training model eases the addition of user customisable gestures hence forgoing the conventional form.The aim of this project is to enhance user experience by giving them the opportunity to make their our customisable signs for specific words and lessen their burden from learning a the conventional sign language.The model facilitates high accuracy while comparing with the CNN.There is no requirement of any specialised hardware in order to capture the gestures.

FUTURE ENHANCEMENT:

1. Integration with larger sign language vocabulary: The current system may only recognize a limited set of sign language gestures. Enhancing the system to recognize a larger vocabulary of sign language gestures would make it more useful for real-world applications.

2. Real time translation: The current system can take some time to process and recognize a sign language gesture. Integrating real-time translation capabilities would make the system more useful.

3. Improved Accuracy: Although the current system has shown promising results in recognizing sign language gestures, it can still make errors, leading to incorrect translations. Enhancing the system's accuracy by fine-tuning the LSTM model or improving the MediaPipe pipeline could lead to improved results.

4. Incorporating facial expressions: Facial expressions play a crucial role in sign language communication. Incorporating facial expression recognition into the system could lead to improved accuracy and better translations of sign language gestures.

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