Hand Landmark-based Approach to Enhance Sinhala Sign Language Gesture Recognition

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Abstract

Sign language serves as a significant mode of communication for individuals with hearing impairments, facilitating their interaction and integration within society. In the context of Sri Lanka, where Sri Lankan sign language is prevalent, effective communication between deaf individuals and the hearing population becomes predominant. This study proposes a novel approach to Sri Lankan sign language recognition by leveraging hand landmarks in combination with a Feedforward neural network. Most of the approaches for gesture recognition are based on object detection which leads to requirement of large training datasets and classic image processing techniques to classify the image data is often unreliable with gesture recognition. In this approach minimized the data set by extracting 21 hand landmark coordinates by using a robust pre-trained 'Media-Pipe Hands Model', the model has proven performance and is reliable in accurately tracking the multiple hands and making landmark predictions. Thorough experimentation and evaluation were conducted to establish the effectiveness of the proposed approach performance compared to other state-of-the-art sign language recognition techniques, demonstrating competitive outcomes. The research analyzed and discussed various factors like network architecture, training data size, and hand landmark representation, ensuring the approach's validity and efficiency. The outcomes of this study are applicable to real-world scenarios, including communication aids, educational tools, and human-computer interaction systems for the deaf community in Sri Lanka. By highlighting the integration of hand landmark data and advanced machine learning techniques, the research extends its relevance beyond Sri Lankan sign language to the broader domain of sign language recognition. Ultimately, this research contributes to inclusivity, accessibility, and effective communication for the hearing-impaired population.

Keywords: Sinhala sign language, gesture recognition, machine learning, prediction