Chapter 18
Mobile Application–Based Sign Language Detector for Deaf People

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ABSTRACT

In everyday life, we use hand gestures for several activities, like calling someone or showing directions to somebody, and don't even realise or consciously acknowledge them as a part of life. But for people with hearing disabilities, efficiently contributing to society is a much more important part of their everyday routine. They are their major medium of communication and an incredible way for human communication. Vision-based hand gesture recognition procedures have many demonstrated advantages compared with conventional gadgets. In this chapter, the authors discuss various available products to predict what a user is trying to convey through hand gestures using American Sign Language (ASL). While being able to help deaf people, this chapter also focuses on the proposed method or tool that can also be used for the practice of ASL by regular people to learn and practice sign language. This concept can also be implemented in schools easily to design ASL into their curriculum.

INTRODUCTION

Around a billion individuals worldwide suffer from partial or total deafness and lack the means to adequately interact with one another. The lives of deaf individuals are fraught with difficulties, starting with communication difficulties, which are the source of all other problems with school, employment, job interviews, and social stigma. The most efficient way for people with hearing disabilities to communicate is through the use of Sign language. There are numerous standards in various nations, and sign language is far from being universal. Also, regional variances are unique (Moryossef et al, 2020). Due to the variations across areas and states, there are several instances of experienced interpreters using the incorrect terminology. This may not appear to be a major concern, yet it has led to misconceptions during trials or when patients visit a clinic, for example. One in four deaf people now leave their jobs because of prejudice as a result of social problems relating to deafness. Their inadequate communication is the primary cause of deaf people's continued social exclusion.

Due to ineffective communication, education is one of the biggest obstacles the deaf individuals must overcome. 98% of deaf people don't receive sign language instruction, thus they rely on it to communicate (Shah et al., 2021). One of the greatest worries for all NGOs and other communities is that this is one of the most difficult problems people have to deal with. This chapter discusses the proposed methodology that work as just a step in assisting good communication between hearing and hearing-impaired people.

American Sign Language (ASL) is by far the most common form, consisting of signs for the 26 alphabets, 10 digits and numerous gestures for phrases. The traditional method to approach this problem using machine learning is to use image segmentation techniques to identify signs (Sangeethalakshmi et al., 2021). This approach works by taking a frame from a camera and segmenting the hand region using techniques like thresholding, cascade filtering and greyscaling. This is passed on to convolutional neural networks which use filters to reduce the size of the images and classify them into classes/alphabets. In our approach, we will use landmarking models that track the motion of the user's hands relative to their face. The main points which will be tracked are the joints in the fingers, wrist and shoulders. Their relative position in the frame shall be tracked by noting their coordinates and normalising their values. This data will then be used to perform feature extraction to form the data which will be used by our deep learning model.

The following techniques are typically used to identify sign gestures:

The signer must wear a hardware glove while the hand movements are being recorded in this glove-based method.

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