
CNN-LSTM based approach to predict the Sinhala alphabet letters based on the lip-movement of mute students

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School-age children with speech disorders have difficulties in communicating with others. They use sign language for communication purposes, but it takes time to understand, learn and provide the appropriate response. As a solution, teachers are using sign language along with lip reading to make interaction with speech-impaired students. The discussions with teachers revealed that it was very challenging and a tedious task to understand lip reading accurately. This research is carried out to understand and develop a solution to overcome a part of this communication challenge. During this study, a framework was developed by the researchers to assist the speech-impaired students using the lip-reading. It uses 60 Sinhala alphabet letters, for each letter 50 pronouncing lip-reading videos of speech-impaired students as input. The input video is then sent to a well-trained Sinhala alphabet recognition video classification model which use motions of lips, nose, chin, and cheeks. Then the model will predict the Sinhala alphabet letters based on the input. Convolutional Neural Network and Long Short-term Memory techniques have been used to build the framework. The framework provides 70% accuracy for the vowels in the Sinhala alphabet recognition. However, the accuracy decreases up to 60% with Velar and Retroflex alphabets. As an overall, this framework will support both teachers and students who are speech-impaired to communicate effectively and understand each other. Furthermore, the improved outcomes of the research will lead to fulfilling the communication gaps and it will become a great initiative for the community to connect with each other.

Keywords: CNN, Lip-Movement, LSTM, Mute Students, Video Processing

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