

ABSTRACT

Facial expressions are one of the most important forms of Non-verbal communication in daily social interactions. However for visually impaired people, understanding the other person's facial expressions is a challenge due to limited access to visual information. This can affect the quality of their communication and social participation. Therefore, there is a need for a technology solution that can help blind people to recognize facial expressions automatically and in real-time by considering possible conditions, such as poor lighting.

The proposed approach involves developing a facial expression recognition system based on Convolutional Neural Network (CNN) that is capable of functioning optimally under varying lighting conditions. Image quality enhancement with Contrast Limited Adaptive Histogram Equalization (CLAHE) technique is also used so that images with poor contrast can be overcome. The system is designed to recognize seven types of emotion namely Angry, Disgust, Fear, Happy, Surprise, Sad, and Neutral. In addition to the visual output, the system is also equipped with a voice output feature to convey the detection results, making it accessible for visually impaired individuals.

System evaluation was conducted using accuracy, precision, recall, f1-score, and confusion matrix metrics. Experimental results show that the application of CLAHE improves the performance of the model with an increase in the weighted average f1-score from 60% to 64%. The system was then deployed as a web application using Replit, which allows users to upload images or use the camera directly. With voice output, this system is expected to be an initial technology-based solution to support the needs of visually impaired people in understanding the facial expressions of those around them..

Keywords— CLAHE, CNN, facial expression detection, varying lighting conditions, visually impaired.