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Abstract

Electroencephalogram Brain Mapping for Revealing the Emotional Changes over the Brain Regions Using Entropy Biomarker †

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Developing a brain mapping for emotional changes over the brain regions remains a crucial goal for improving the process of emotional recognition. The EEGs of forty volunteer individuals were gotten while the individuals were shown seven, short video clips (i.e., anger, anxiety, disgust, happiness, sadness, surprise and neutral). The motivation of this work is twofold. First, it aims to propose the brain electrical activity mapping using the effectiveness of the multiscale fuzzy entropy () feature. Second, it aims to detect the optimal EEG channels for anger, anxiety, disgust, happiness, sadness, surprise and neutral emotional states over the brain regions (i.e., frontal, temporal, parietal and occipital) using the differential evolution-based channel selection algorithm (DEFS_Ch). The results revealed that the frontal region was statistically significant from temporal, parietal and occipital. Moreover, anger emotional state was significantly different from the other emotional states. Furthermore, the anger, sadness and anxiety were significantly different from disgust, happiness, surprise and neutral at the occipital region. For more inspection, DEFS_Ch algorithm has been used to select the most effective emotional channels over the brain regions, anger and anxiety were shared the channels in the frontal, temporal and occipital regions. Disgust was identified by the frontal, temporal, parietal and occipital channels. Sadness and disgust were identified by the channels from the frontal and temporal regions. Surprise and happiness were identified by the left frontal, parietal and occipital channels. Finally, the neutral emotional states were identified by the channels from the lateral regions of the brain particularly in right and left frontal and temporal regions. The main novelty of this study was in building up an EEG brain mapping over the brain regions for different emotional changes to help the clinician for improving the procedure of emotional recognition from the EEG signals.