Recognizing Human Emotions Through Body Posture Dynamics Using Deep Neural Networks

Arunnehru Jawaharlalnehru,Thalapathiraj Sambandham, Dhanasekar R

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ABSTRACT

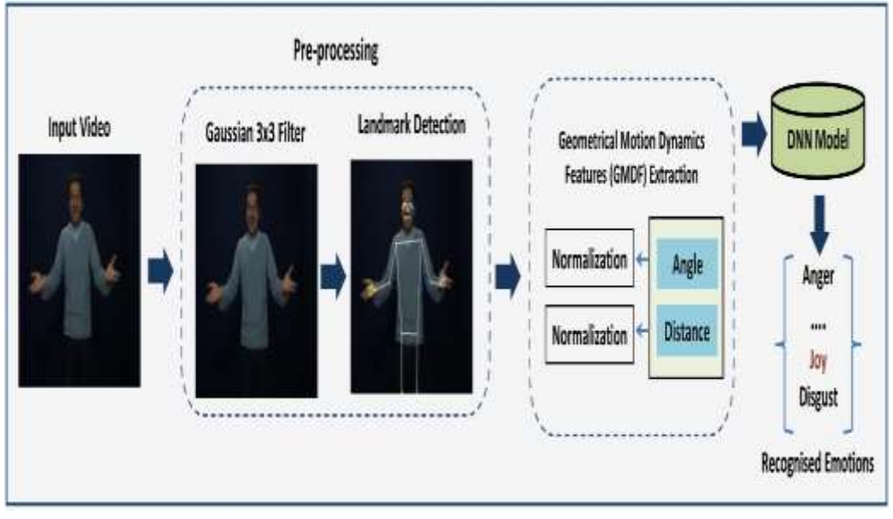
✓Body posture dynamics have garnered significant attention in recent years due to their critical role in understanding the emotional states conveyed through human movements during social interactions.

✓Emotions are typically expressed through facial expressions, voice, gait, posture, and overall body dynamics. Among these, body posture provides subtle yet essential cues about emotional states.

✓However, predicting an individual's gait and posture dynamics poses challenges, given the complexity of human body movement, which involves numerous degrees of freedom compared to facial expressions. Moreover, unlike static facial expressions, body dynamics are inherently fluid and continuously evolving.

✓This paper presents an effective method for recognizing 17 micro-emotions by analyzing kinematic features from the GEMEP dataset using video-based motion capture. We specifically focus on upper body posture dynamics (skeleton points and angle), capturing movement patterns and their dynamic range over time. Our approach addresses the complexity of recognizing emotions from posture and gait by focusing on key elements of kinematic gesture analysis. The experimental results demonstrate the effectiveness of the proposed model, achieving a high accuracy rate of 96.34% on the GEMEP dataset using a deep neural network (DNN). These findings highlight the potential for our model to advance posture-based emotion recognition, particularly in applications where human body dynamics are key indicators of emotional states.

METHODOLOGY



CONCLUSION

✓This paper presents a robust method for recognizing 17 micro-emotions by analyzing kinematic features of body movements from the GEMEP dataset, focusing on upper body posture dynamics, including skeleton points and angles.

✓Our approach, grounded in kinematic gesture analysis, specifically addresses the challenges of capturing the fluid, evolving nature of body dynamics. By employing a deep neural network (DNN), our model achieves high recognition accuracy, with results showing a mean accuracy of 93.76% for distance features and 91.22% for angle features, particularly excelling in recognizing emotions like 'tenderness' and 'anxiety.' Evaluated on MATLAB 2019b with rigorous training and testing splits, our DNN model demonstrated superior performance metrics across accuracy, precision, recall, and F-measure.

✓The effectiveness of our model signifies the potential of using posture-based analysis in emotion recognition applications, especially where body dynamics play a central role in conveying emotional cues.

✓The comparative analysis with other methods, including those based on spatio-temporal interest points and pose net models, indicates that our Geometrical Motion Dynamics Features (GMDF)-based approach achieves improved accuracy.