

Multimodal Emotion Evaluation: A Physiological Model for Cost-Effective Emotion Classification

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FIGURE 1
Multimodal emotion classification
workflow.

Emotional responses are associated with body alterations and are crucial to foster adaptive responses, well-being and survival. Emotion identification may improve peoples' emotion regulation strategies and interaction with multiple life contexts. Several studies have investigated emotion classification systems, but most of them are based on the analysis of isolated physiological signals. Understanding how informative the individual signals are and how their combination works allow to develop more cost-effective, informative, and objective systems for emotion detection, processing, and interpretation. In the present work, electrocardiogram (ECG), electromyogram (EMG) and electrodermal activity were processed in order to find a physiological model of emotions. Both unimodal and multimodal approach were used to analyze what signal, or combination of signals, may better describe an emotional response, using a sample of 55 healthy subjects. The system was evaluated considering: subject/

emotion independent, subject dependent/ emotion independent, subject/ emotion dependent conditions in a 30- and 60-seconds time frames. The method was divided in: signal preprocessing; feature extraction; classification using random forest and neural networks. Results suggest that the ECG signal is the most effective. The use of facial EMG in emotion is dependent on monitoring two (or more) muscles, allowing to identify facial expression changes by corresponding muscular contractions. Yet, the combination of all signals provides the best emotion identification performance, with all signals providing crucial information for the system. This physiological model of emotions has important research and clinical implications, by providing valuable information about the value and weight of physiological signals for emotional classification, which can critically drive effective evaluation, monitoring and intervention regarding emotional processing and regulation, considering multiple contexts.

