

Emotion-to-Motion: A Wearable EEG–GSR Biofeedback System for Emotion-Aware Meditation

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Abstract:

This paper presents a wearable biofeedback system that translates internal emotional states into real-time visual and kinetic responses to support meditation and self-reflection. The experimental set-up integrates a consumer-grade EEG headband (Muse 2) with a wrist-worn galvanic skin response (GSR) device. During five-minute sessions, the system simultaneously records brainwave activity and skin conductance, performs basic signal cleaning, and extracts features related to arousal and relaxation over time. A machine learning model then classifies each time window into one of four affective categories: happy, angry, fearful, or neutral.

The classified states and raw signals are streamed to a web-based dashboard that provides live graphical visualisation. In parallel, each detected state is mapped to a short text prompt, which is rendered as a depth-map-inspired visual pattern. This visual layer drives an Arduino-based linear actuator that moves up or down according to the recognised emotion, closing the loop between physiological data, on-screen representation, and physical motion. A brief pilot test indicates that the system can operate reliably over full sessions and that the moving actuator helps participants notice and reflect on fluctuations in their emotional state. The paper details key hardware and software design decisions and discusses potential applications in interactive art, biofeedback training, meditation support, and emotionally responsive architectural or installation spaces.

Keywords:

About four key words or phrases in alphabetical order, separated by commas.