BRAin State RECognition system (BRASREC) ΓÇô A pattern recognition system for affective brain state determination via real-time multimodality sensors

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Technology description

BRASREC is a medical device and signal processing system designed to determine relatively long-term affective brain states, such as degrees of alertness, interest, and even sadness/happiness, and in addition states indicative of transitions between brain states, such as surprise, insight, and elation, among others. The key advantage of this system is the signal processing algorithms enabling: a) real-time harnessing of signals from a single or multiple sensory modalities, and b) integration of a variety of unsupervised and supervised learning techniques to extract the maximally possible information from these signals. This combination of techniques supports a number of novel applications including but not limited to: ∩ü╢ Long-term affective evaluation, critical in the treatment of depression and other affective disorders ∩ü╢ Short-term affective evaluation to determine the reaction to a movie, a piece of music or advertisement ∩ü╢ Alertness assessment, crucial to determining performance on a physical or mental task ∩ü╢ Neurofeedback-based devices such as brain-machine (computer) interface, closed-loop neurostimulators triggering brain or other organ stimulation in response to a change in a brain state, among others. BRASREC can be used with a single or a combination of multi-modality sensor systems such as electroencephalography (EEG), electromyography (EMG), near-infrared spectroscopy (NIRS) and its functional modality (fNIR), galvanic skin response (GSR), implanted electrodes, and other assessment techniques. BRASREC works by first determining the attractors of the multi-modal set of signals, and reducing this set to a temporal window centering on the attractor, on the presumption that this represents the interesting subset of the data from a physiological, cognitive, and affective standpoint. Once this filtering action has taken place, the remaining data from the sensors is fed into a pattern recognition system, which applies a variety of correlation methods to determine the invariants of the aforementioned brain states.

Application area

∩ü╢ Long-term affective evaluation, critical in the treatment of depression and other affective disorders ∩ü╢ Short-term affective evaluation to determine the reaction to a movie, a piece of music or advertisement ∩ü╢ Alertness assessment, crucial to determining performance on a physical or mental task ∩ü╢ Neurofeedback-based devices such as brain-machine (computer) interface, closed-loop

neurostimulators triggering brain or other organ stimulation in response to a change in a brain state, among others.

Advantages

a) real-time harnessing of signals from a single or multiple sensory modalities
b) integration of a variety of unsupervised and supervised learning techniques to extract the maximally possible information from these signals.

Institution

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