IDENTIFICATION OF STRESSFUL EVENTS USING WAVELET TRANSFORM AND MULTILAYER FEED-FORWARD NETWORK

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ABSTRACT

A method of computerized detection of the effect of heat stress on sleep electroencephalogram (EEG) has been investigated and tested on prerecorded data of the EEG of rats. Due to exposure to high environmental heat, alterations in transients while awake, slow wave sleep (SWS), and rapid eye movement (REM) sleep stages have been studied using continuous wavelet transform (CWT) method. After two hour long EEG recordings of young healthy rats, EEG data representing three sleep states was visually selected and further subdivided into two seconds long epochs. After extracting features in terms of wavelet coefficients for all the epochs, multilayer perceptron neural network (MLPNN) has been used to detect changes in the vigilance state of the subjects exposed to high environmental heat stress. It revealed that, the classifications of wavelet coefficients of EEG signals in acute as well as chronic heat conditions along with the control data show the overall accuracy as 94.5% in SWS, 91.75% in REM sleep and 91.75% in the awake state. The results of the performance of artificial neural network (ANN) in acute heat stress conditions indicate that, in four hours, following acute exposure to high environmental heat, significant changes in the EEG detected in the first hour were reversed or tended to move towards the normal.

KEYWORDS: EEG, Rat, Sleep, Wavelet transform, MLPNN, ANN