

Fuzzy Classifier for Mental Stress Estimation using ECG Statistical Parameters

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ABSTRACT

Mental stress is very common in today's human sensual/health state and contributes a lot in determining the condition of patient in either condition. The cause or source of mental stress is not very specific and can be sourced through any human activity that is not in favor of the person. The stress could be for short duration or can be prolonged for long terms. In medical terms, the mental stress primarily affect the heart rate or autonomous nervous system. Therefore, the mental stress can be made function of heart rate variability and various activity measurement. Heart rate variability (HRV) analysis is a important for analysing the activities of ones nervous system. Electro Cardiogram (ECG) is directly related with heart functioning and stress changes can be analyzed in various ways, to extract effect on mental stress. The ECG is the graphical representation of the potential difference between two points on the body surface, versus time. In the present work ECG is decomposed and analyzed using statistical parameters (energy, entropy, standard deviation, power and covariance). ECG Decomposition is used for signal preprocessing, denoising, and for extracting the statistical parameters as features of each ECG beat. The energy and entropy are the two parameters that show an effective variation in values when normal to depression or normal to hyper case is observed. In order to automate the system for stress level determination a fuzzy rule base has been developed by using energy and entropy as two antecedent variables and stress as the consequent variable. The entropy and energy are further used to resolve different stress states. We can get rid of many disorders my estimating stress. Hence an attempt has been done to develop a fuzzy classifier for stress estimation. The whole the data as well as the results are in accordance with the practical diagnostic system which has been authenticated by a qualified doctor. Hence the system can be used by professionals for diagnosing level of stress and suitable medicine can be prescribed.