Abstract

Heart rate variability (HRV) refers to the beat-to-beat alterations in heart rate. HRV analysis is based on the concept that, fast fluctuations reflect the changes of sympathetic and vagal activity which results in variability of intervals between R waves i.e. "RR intervals". In the current work HRV was assessed by traditional linear time and frequency-domain indexes, in parallel with the non linear Poincare plot analysis.

Initially R peaks are detected from the ECG and RR interval signal is obtained which is further used to get the HRV signal. Spectral analysis of this HRV signal is done to estimate the power content in different frequency bands. Two frequency bands play a vital role in the power spectrum, a low frequency and a high frequency. Simultaneously, for time domain analysis, parameters such as mean of RR interval signal, standard deviation, coefficient of variance, root mean square of standard deviation are evaluated from RR interval signal and analyzed for different arrhythmias. Poincare plot analysis is an emerging quantitative-visual technique whereby the shape of the plot is categorized into functional classes that indicate the
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different arrhythmia. In this each R-R interval is plotted as a function of the previous one, and the standard deviations of the instantaneous and long-term R-R interval variability are calculated.

It is observed that mean of RR interval signal and coefficient of variance plays an important role and can be used in classification along with the power content in low and high frequency bands. Also position and orientation of RR intervals in Poincare plot play an important role in visual identification of arrhythmias. The method is applied to normal sinus rhythm, ST change, CU Ventricular Tachyarrhythmia, Malignant ventricular arrhythmia signals. In this work, the different linear and non linear parameters evaluated show a particular range for various cardiac arrhythmias.

Reference

- Rajendra Charta U., Kannathal N., g Wai Sing, Luk Yi Ping and Tijileng Chua, "Heart Rate Analysis in normal subjects of various age groups", Biomedical Engg. Online 2004.

Index Terms

Computer Science
Signal Processing
Key words

- Coefficient of variance
- Heart Rate Time Series (HRTS)
- Heart Rate Variability (HRV)
- Poincare plot
- Power Spectral Density (PSD)
- Standard deviation