

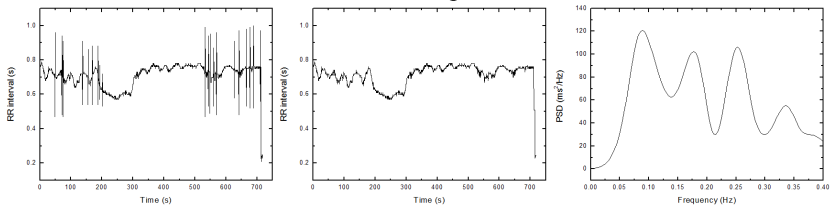
Prediction of Ventricular Tachycardia by a Neural Network using Parameters of Heart Rate Variability

S Joo*, KJ Choi, SJ Huh

University of Ulsan College of Medicine, Seoul, Korea

Prediction of ventricular tachycardia (VT), which is a life-threatening arrhythmic event, is an important issue for those people with heart problems. Heart rate variability (HRV) analysis has been used to find relations of parameters of HRV with not only heart problems but also other problems, such as, apnea and Parkinson's disease. In this paper, we present a method for prediction of VT by using an artificial neural network with parameters of HRV analysis.

PhysioNet's spontaneous ventricular tachyarrhythmia database, which consists of 232 RR interval (RRI) data (106 data recorded before VT events and 126 most recent (MR) data (control)), was used in this research. Each RRI was preprocessed before extracting parameters. At first, ectopic beats were removed by integral pulse frequency modulation model based correction algorithm. And then four time domain parameters (MeanNN, SDNN, RMSSD, and pNN50) and three Poincaré plot indexes (SD1, SD2, and SD1/SD2) were extracted. After detrending the RRI signal, data was interpolated with cubic splines and resampled at 7 Hz. The power spectral density of the resample data was analyzed with Welch's periodogram method. Four frequency domain parameters of VLF, LF, HF, and LF/HF were then extracted. Total 11 parameters were set for the input features of an artificial neural network (ANN) and the ANN was trained with 2/3 of the entire database. After complete training, the ANN was tested with the remaining 1/3 of the database to examine the classification performance.



Processing steps of RRI data. Data of original RRI, after Ectopic beat removal, and PSD with Welch's periodogram

The ANN showed overall accuracy of 77.9% (60/77), 78.6% (33/42) for VT, and 77.1% (27/35) for MR data. This result shows fair success rate of VT prediction. With more number of data and improved algorithm, the developed method can be integrated into various health monitoring devices.