Abstract

The electrocardiogram (ECG) signal is susceptible to noise and artifacts and it is essential to remove the noise in order to support any decision making for specialist and automatic heart disorder diagnosis systems. In this paper, the use of Particle Swarm Optimization Neural Network (PSONN) for automatically identifying the cutoff frequency of ECG signal for low-pass filtering is investigated. Generally, the spectrums of the ECG signal are extracted from four classes: normal sinus rhythm, atrial fibrillation, arrhythmia and supraventricular. Baseline wander is removed using the moving median filter. A dataset of the extracted features of the ECG spectrums is used to train the PSONN. The performance of the PSONN with various parameters is investigated. The PSONN-identified cutoff frequency is applied to a Finite Impulse Response (FIR) filter and the resulting signal is evaluated against the original clean and conventional filtered ECG signals. The results show that the intelligent PSONN-based system successfully denoised the ECG signals more effectively than the conventional method.

References

- Robert M. , Ian R. G. The effects of noise on computerized electrocardiogram
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- Sadik K., Mustafa O., Atrial fibrillation classification with artificial neural networks, Pat Recogn, 2007, 40 (11), pp. 2967-2973
- Ferguson D., Particle Swarm, University of Victoria, Canada; 2004.
Intelligent ECG Signal Noise Removal using PSONN

- Gerd W. , Manuel S. , Dieter K. , Ralf D. B. , Clemens E. , Verification of humans using the electrocardiogram, Pat Recog Let, 2011, 28 (10), pp. 1172-1175.

Index Terms

Computer Science  Signal Processing

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Keywords
Cutoff Frequency  Particle Swarm Optimization Neural Network (psonn)  Low-pass Filtering  Finite Impulse Response (fir)