Public Abstract

First Name:Licet

Middle Name:

Last Name:Rosales Paniagua

Adviser's First Name:Marjorie

Adviser's Last Name:Skubic

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:SHORT-TERM HEART RATE VARIABILITY AS A GENERAL INDICATOR OF HEALTH ESTIMATED BY BALLISTOCARDIOGRAPHY USING A HYDRAULIC BED SENSOR IN ELDER CARE

A new approach for an accurate heartbeat detection algorithm for ballistocardiographic signals using combined clustering techniques (k-means and fuzzy C-means) for template extraction followed by template matching is presented, which delivered a 99.9 % accuracy. Improvement was performed using a representative template based on the segment of the ballistocardiographic signal containing the IJK complex. A clinical study with 61 volunteers was conducted using an existing hydraulic bed sensor based on ballistocardiography in order to evaluate the performance of the new algorithm in regard to automated generation of the heart rate variability measure LF/HF (low/high frequency). Results showed an almost perfect agreement for beat-to-beat intervals, heart rate, and a substantial agreement for LF/HF for a sampling frequency of 2 kHz, 200 Hz, and 100 Hz compared to electrocardiography as gold-standard. For all sample frequencies, Bland-Altman analysis showed excellent clinical agreement for beat-to-beat intervals, heart rate estimates, and satisfactory agreement for LF/HF between the different measurement methods at all sampling frequencies. Short-term heart rate variability measure LF/HF based on ballistocardiographic signals obtained at a sampling frequency of 100 Hz, which is the operating sampling frequency of the existing hydraulic bed sensor system, provides enough reliable information since it corresponds with a small deviation to electrocardiographic LF/HF. Thus, the existing hydraulic bed sensor system based on ballistocardiography can be used to automatically compute the short-term heart rate variability measure LF/HF, which can be taken as an unobtrusive reliable prognostic factor and general health indicator for in-home monitoring, especially in elder care.