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Bed-Based Ballistocardiography: Dataset and Ability to Track Cardiovascular Parameters

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Abstract

Background: The goal of this work was to create a sharable dataset of heart-driven signals, including ballistocardiograms (BCGs) and time-aligned electrocardiograms (ECGs), photoplethysmo- grams (PPGs), and blood pressure waveforms. Methods: A custom, bed-based ballistocardiographic system is described in detail. Affiliated cardiopulmonary signals are acquired using a GE Datex CardioCap 5 patient monitor (which collects ECG and PPG data) and a Finapres Medical Systems Finometer PRO (which provides continuous reconstructed brachial artery pressure waveforms and derived cardiovascular parameters). Results: Data were collected from 40 participants, 4 of whom had been or were currently diagnosed with a heart condition at the time they enrolled in the study. An investigation revealed that features extracted from a BCG could be used to track changes in systolic blood pressure (Pearson correlation coefficient of 0.54 +/-0.15), dP/dtmax (Pearson correlation coefficient of 0.51 +/- 0.18), and stroke volume (Pearson correlation coefficient of 0.54 +/- 0.17). Conclusion: A collection of synchronized, heart-driven signals, including BCGs, ECGs, PPGs, and blood pressure waveforms, was acquired and made publicly available. An initial study indicated that bed-based ballistocardiography can be used to track beat-to-beat changes in systolic blood pressure and stroke volume. Significance: To the best of the authors' knowledge, no other database that includes time-aligned ECG, PPG, BCG, and continuous blood pressure data is available to the public. This dataset could be used by other researchers for algorithm testing and development in this fast-growing field of health assessment, without requiring these individuals to invest considerable time and resources into hardware development and data collection.

Biography

Dr. Eng Ala Sakran completed his studies at Modern University for Technology and Information-MTI, Egypt.