Wireless Multi-Sensor Platform

Published date: Oct. 20, 2011

Technology description

A wireless multi-sensory wearable device for concurrent analysis of cardiovascular conditions.

Background

Cardiac disorders are the leading cause of mortality in the world. Considerable advances have taken place in the clinical diagnosis of various cardiac disorders. But the recent advancements in wireless technology offer a unique opportunity to elevate cardiac healthcare and quality of life for a variety of at-risk (e.g., critically ill, infant and athletic) populations to an unprecedented level. Lately, the use of wireless technologies for critical care has evoked significant interest. Most of these attempt to mimic the current clinical practice, albeit using wireless data. But the current diagnostic approaches are based on sequential clinical examinations, usually starting with auscultations (using a stethoscope), followed by electrocardiograms (ECG), and advanced imaging and in-vitro interrogations. Only the basic patterns, such as intervals and amplitudes, of these signals are typically used for diagnosis. Rich dynamic information discernable from tracking multiple physiological signals, such as ECG, heart sound, and pulse, remains unexplored, and harnessing of the complex spatio-temporal patterns of these wireless signals, so vital for effective prognosis, has not received due attention.

Summary

A highly economical, wireless MEMS (small footprint) multi-sensory wearable device, is being developed at OSU. Uses fewer ECG leads, uses transformation software to generate other ECG leads, synchronously gathers ECG, sound, respiration and other haemodynamic signals for concurrent analysis of cardiovascular conditions.

Application area

Monitoring under-stress populations (e.g., athletes, fire safety operators, defense personnel)
Home-care (enhanced mobility) for at-risk and aged population
Infant monitoring (small sensor footprint)

Advantages

Combines information from multiple phono-electro-cardiological signals for continuous, quantitative prognosis of cardiac disorders. Novel aspects of the proposed work are:
Captures the complementary aspects of the heart operation - electrical (ECG), acoustic (sound) and mechanical (vibration)
Provides an early warning (prognostic) system for cardiac disorders among at-risk populations, such as critical care and sports medicine scenarios
Can be easily integrated as simple accessories to currently popular wireless platforms, including cell-phones and tablet devices. This will lead to scenarios where, the device "will talk to the expert caregivers as and when the need is perceived."
More energy efficient (longer battery life)
Longer transmission range (improved mobility)
Higher sampling rates (improved diagnostic power under multi-sensory regime)
Will use advanced VCG based diagnostic capabilities resulting from recent research efforts.

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