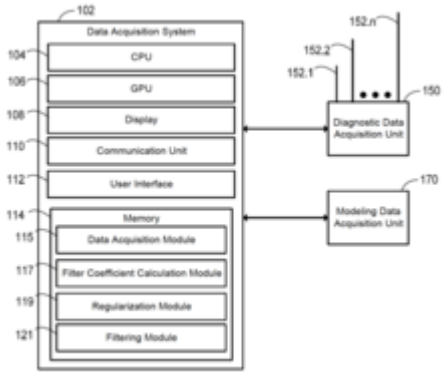
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Adaptive Epsilon-Tube Filter for Blunt Noise Removal

TECHNOLOGY NUMBER: 6655



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6655

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OVERVIEW

A novel approach to filter motion artifact (MA) in portable diagnostic equipment

- A technology that is superior to existing MA reduction approaches
- Adaptive for current physiologic signal monitors as well as wearable sensor monitoring

BACKGROUND

Signals generated via relevant medical diagnostic equipment may provide valuable insight for medical professionals for patients suffering from a variety of injuries or disease states. However, in many medical diagnostic examinations, a diagnostic signal generated by the relevant diagnostic equipment may include noise and/or artifacts. Noise and artifacts maybe introduced into the diagnostic signal due to a presence of one or more extraneous factors that may influence the diagnostic signal while the test is being performed, such as the patient's movement during the test, electrical noise, or other factors.

In some cases, the amplitude of the noise may be larger than the amplitude of the diagnostic signal, and the frequency components of the noise may largely overlap with those of the diagnostic signal. As a result, conventional filtering methods may attenuate or distort the diagnostic signal or fail to model the noise adequately and effectively. In addition, conventional attempts to remove artifacts from diagnostic signals using multi-channel recordings of the diagnostic signal, such as independent component analysis (ICA), may add unwanted complexity, size, and cost to the diagnostic equipment. Therefore, a need exists to perform signal filtering with portable diagnostic equipment that has the capability to remove noise such as motion artifacts (MA) while recovering the signal of interest.

INNOVATION

Researchers report a method to adaptively filter signals from medical devices which have mixed blunt noise, which may be characterized as noise having relatively high amplitudes and low frequencies with a frequency spectrum that overlaps with the signal of interest. The adaptive filter is capable of filtering data within a series of time windows such that signals may be sampled and filtered in real-time or near real-time. Filters may be applied to signals received from common medical testing equipment such as electrocardiograms, impedance cardiographs, impedance-based blood volume waveforms, arterial blood pressure waveform, venous blood pressure waveforms, intracranial pressure waveforms, photoplethysmography waveforms, end-tidal carbon dioxide waveforms, Doppler signals, and piezoelectric signals. The invention is sophisticated enough to differentiate between periods of blunt noise when a patient is moving versus times of lesser noise when they are still. The process is particularly useful for signal filtering with motion artifacts inherent in the use of portable recording devices.