AUTOMATIC DIET MONITORING THROUGH BREATHING SIGNAL

ANALYSIS USING WEARABLE SENSORS

By

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ABSTRACT

This dissertation presents the design, system level details and algorithm of a wearable food and drink intake monitoring system that analyzes human breathing signal. Food and drink intake can be detected by the way of detection a person’s swallow events. The system works based on a key observation that a person’s otherwise continuous breathing process is interrupted by a short apnea when she or he swallows as a part of the intake process. We detect the swallows via recognizing apneas extracted by a wearable sensor chest-belt. Such apnea detection is
performed using matched filters and machine learning mechanisms, and further refined using a Hidden Markov Model (HMM) based mechanism that leverages known locality in the sequence of human swallows. This dissertation also demonstrates the effectiveness of the proposed mechanisms using experimental data.
LIST OF PUBLICATIONS

Peer Reviewed Journals


2. **Bo Dong** and S. Biswas, *Analyzing Breathing Signal and Swallow Sequence Locality for Solid Food Intake Monitoring*, Submitted to Biomedical Engineering Online


6. Alexander Montoye*, **Bo Dong***, Subir Biswas, Karin Pfeiffer, *Validation of a wireless accelerometer network for energy expenditure measurement in a simulated free-living setting*, Submitted to Physiological Measurement (* indicates co-first author with equal contribution)


Peer Reviewed Conferences


18. Alexander H. Montoye, **Bo Dong**, Subir Biswas, and Karin A. Pfeiffer, *Comparing Energy Expenditure Prediction from an Accelerometer-Based Artificial Neural Network to Indirect Calorimetry*, 3rd International Conference on Ambulatory Monitoring of Physical Activity and Movement, Amherst, Massachusetts, USA, June 2013


22. Stephan Lorenz, **Bo Dong**, Subir Biswas, *Pulse-based sensor networking using mechanical waves through metal substrates*, SPIE Defense, Security, and Sensing, April 2013, Baltimore, Maryland USA


24. Debasmit Banerjee, **Bo Dong**, Subir Biswas, *ZEA-TDMA: design and system level implementation of a TDMA protocol for anonymous wireless networks*, SPIE Defense, Security, and Sensing, April 2013, Baltimore, Maryland USA


**Peer Reviewed Conferences**