Title
Context-aware, Energy-aware Sensing of Physiological Signals

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Authors
Au, Lawrence
Wu, Winston
Batalin, Maxim
et al.

Publication Date
2007-10-10
Context-aware, Energy-aware Sensing of Physiological Signals

Lawrence Au, Winston Wu, Maxim Batalin, Dustin McIntire, William J. Kaiser
Actuated, Sensing and Coordinated Embedded Networked Technologies (ASCENT) Lab – www.ascent.ucla.edu
UCLA Electrical Engineering Department

Introduction: Wireless Monitoring of Physiological Signals

Microsensor Technology
- Recent technology advancement permits miniaturization of conventional physiological sensors
  - Can be unobtrusively attached to human body or embedded in clothing.
  - Some examples: electrocardiogram (ECG), electromyography (EMG), electroencephalography (EEG)
- Data acquisition introduces large energy demand
  - Requires high sampling rate—in excess of 250 Hz
  - Requires high resolution—in excess of 16 bits

Wireless Monitoring
- Combines sensors with low-power processing and wireless interfaces
  - Inexpensive and lightweight
  - Enables patient monitoring in home and workplace environments in addition to the clinic
  - Improves patient wearability of the sensors by eliminating intrusive cables
  - Introduces large energy demand when streaming raw samples at high data rates

Problem Description: Energy Constraint

Large Energy Demand
- Required to support energy-intensive sensing
- Required to support power-hungry biological transducers
- Required to support high-data rate streaming
- Supported by a battery in a compact package

Long System Lifetime
- Extending the system lifetime is a major objective
  - Particularly critical to battery-powered wearable platforms
  - Power-hungry components must be power-cycled efficiently

Optimize Real-time Sensing Requirements
- Context-aware algorithms
  - Use patient context to determine when to turn the sensors on/off
  - Systematically activate more sensors as required
- Energy-aware algorithms
  - Require hardware/software integrated solution
  - Hardware design provides accurate platform energy consumption computation
  - Software architecture provides control of major system components

Proposed Solution: Context- and Energy-awareness

Wireless Monitoring System

MicroLEAP: Energy-aware Wearable Sensor Node

Real-time Energy Profiling on MSP430 Processor

System Architecture

Power Consumption of System Components
