Sound based Wearable Techniques for Long Duration Respiratory Disorders Monitoring

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Background & Motivation
• Growing demand for chronic illness monitoring in home or ambulatory settings
• Long duration monitoring of wheezes is valuable to Diagnosis of Asthma, COPD, etc
• Wearable sound based technique is a key enabler to this unmet clinical need

Overview of Research Program
• Aim: Develop wearable techniques for long duration respiratory disorders monitoring
• Clinician Partner: Dr. A/Prof. Daniel YT Goh, National University Hospital (since 2006)
• Research Grant Record: More than S$1.5m (4 major grants from ASTAR and MOE)

Achievements
• Novel algorithms (wheeze detection, estimation of wheeze severity, respiratory rate, etc.)
• 3 versions of multiple-sensor wearable systems tested (pilot) with patient data from NUH
• Preliminary Results: Sensitivity > 85%, Specificity > 70%
• One pending patent and several publication, approached by Biofactory Ltd.

Experiments and Results

Data Collection at NUH

Respiratory Rate Estimation

Wheeze Detection

-0.5 0 0.5
Time (s)
Amplitude
(a) Respiratory Signal

-1 0 1
Time (s)
Frequency (Hz)
(b1) Time (s)
Frequency (Hz)
(b2)

-0.5 0 0.5
Time (s)
Amplitude
(c) Autocorrelation