

EHS II Brochure

Embedded Microphone Array for e-Health Monitoring

Motivation

With a rising expectation of the quality of life, there is a growing importance for health condition monitoring. One effective way of such monitoring is to leverage on wearable technology where the health conditions can be monitored over a long duration of time and even outside the hospital. This is important for respiratory based health condition monitoring such as that for asthma patients where daily symptoms provide crucial health information but are not available to medical doctors. A wearable microphone array developed for sound based e-health monitoring is a key enabler to this crucial capability.

Objective

The objective of this project is to develop a wearable microphone array system that can be used to capture and analyze the sound generated by the person wearing it, for health condition monitoring purposes.

Scope

This project involves the design and development of an array of microphones and the associated signal (sound) processing algorithms. Specifically, the array configuration, the algorithm for acquiring good quality sound signal at a distance (e.g. beamforming), and the classification of the sound signal (e.g. wheezes), etc. will be developed and tested in this project. The design will take into considerations the constraints imposed by a wearable environment (e.g. low power consumption, low sampling rate, movable array, weak signal versus strong environmental noise and interferences, etc.).

Innovative Ideas

While some wearable sensors have been developed for health condition monitoring, sound based wearable systems using microphone array is a novel idea. An array based system is able to not only determine the sound source location but also obtain high quality target sound signals. This is a critical enabling capability especially when the environment is noisy and/or accurate signal classification is crucial. As the respiratory sound can be captured from the throat, mouth or nose, or from the chest wall, this project investigates two novel wearable configurations: "pendant" and "chest wall" (see Figure 1. Figure 2 shows how this system can be integrated into the real world infra-structures). Findings obtained on the analysis of sounds captured from different sources for medical diagnosis will contain novelties too.

Demonstrable Activities

The technology demonstrator to be developed in this project will comprise a wearable microphone array module connected to a PDA. GUI software will be developed to display the results obtained too (see Figure 3).

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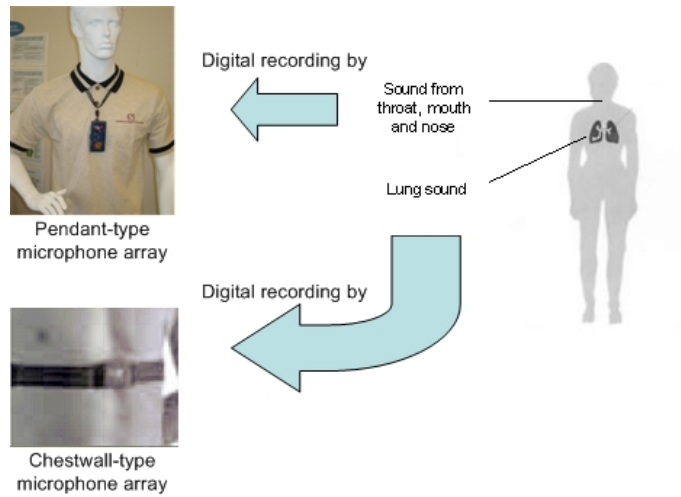


Figure 1. Microphone arrays for recording human respiration sound

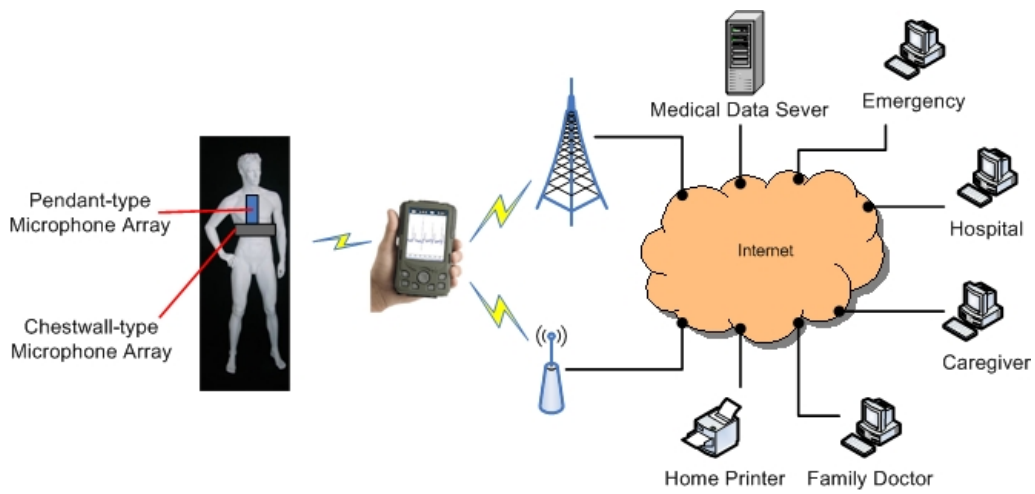


Figure 2. Proposed system and how it can be integrated into real world infra-structures

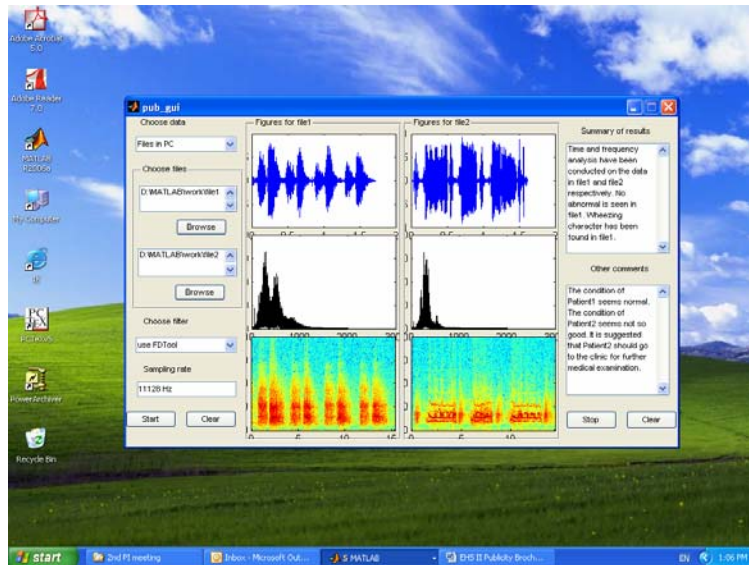


Figure 3. GUI for proposed system