Breath sounds analysis by mobile phone for diagnosing wheezing

Student name: Yingying Tang student ID: 2111703
Email: 2111703t@student.gla.ac.uk

Introduction

Asthma disease is a common chronic inflammatory disease, which affects over 3000 million individuals [1] [2]. Wheezes are adventitious sounds and used as a sign to diagnose asthma [2].

This study is to show the conveniences and feasibility of using mobile phone as e-health device to recording breath and monitoring asthma.

Aim and objects

Aim:
The aim of this project is to determine whether wheezing sound could be recode via smartphone, and if it is reliable to use as an indicator to diagnose asthma.

Objectives:
• Capture reliable sound by different types of mobile phone, which contain all the components for wheeze detection.
• Develop an algorithm to detect wheezing and contrasting recording breath sounds from difference smart phone.
• Develop a user interface to collect data and sending results.

Methods

This study used iPhone 6 as the main device to recording voice, as it is a common device with consistence quality. After recording of breathing sound, users could sent a mail to the server account with sample attached. Figure 1 illustrated the placement of using iPhone 6 to record breath sounds.

The aim of this algorithm is to detect wheeze automatically. It is achieved through identifying peaks in frequency-time domain and obtaining the signal noise ratio of the peaks, then comparing it with certain threshold. Additionally, by calculating the length of wheeze and comparing with certain duration (100ms), a wheeze will be marked and identified [3] [4].

Results and discussion

A ultimate testing sound was recorded simultaneously with iPhone 6, Nexus 5 and Samsung Galaxy S4. Figure 2 illustrated the frequency response of these three smart phone. Which show the reliability of recording sounds, which able to cover the frequency rang of wheeze.

After processing the email from users, their recorded sound will be processed and the email address will be saved. Figure 3 shows the recording breathing sound with the wheeze marks. In the end the detected result will be sent back to user immediately. This whole process has been tested and run successfully.

Reference