Respiratory Rate Estimation with Mobile Phones

Description
Respiratory rate refers to the breaths taken per minute. It is important for many clinical uses including detecting sleep apnea, sudden infant death syndrome, and chronic obstructive pulmonary disease, and measurements of respiratory rate are indicated in many intensive care and operative settings [1]. Continuous and non-invasive monitoring of respiratory rate could be very beneficial in improving the safety of patient.

The aim of this project is to develop a mobile-based system estimating breaths that a person take per minute. A similar approach described in [2] will be used. The mobile phone will be placed on the person’s upper chest lying flat on the ground for recording acceleration changes using the built-in accelerometer of mobile device. Due to the movements of chest wall, each rise and fall will be counted as one cycle of respiration. The system will first filter the acceleration data and then analyze the patterns between the motion profile and breathing.

Figure 1 depicts the setup for locating the phone and different breathing patterns of a sample data received from accelerometer of the mobile phone.

Figure 1: Setup for monitoring respiratory rate (left), acceleration data for breathing under 3 scenarios: (i) no breathing, (ii) normal breathing, and (iii) heavy breathing (right) [2].

References