INTRODUCTION

This project is aimed to develop an Android application for monitoring and measuring user's health condition during exercise or daily checking. For example, the running distance, heart rate, BMI and the calories burned. Besides of getting the data, we also focus on the storage of the information so that the users can review and observe the changes of body condition while using charts to represent the data.

APPLICATION OVERVIEW

Main design:
This is the main page of our application. It shows the personal data, BMI index and the past records. By “swiping”, the user can switch to other pages, to record the calories consumption or heart rate.

User Interface (UI) is an important part of our application, as it gives the first impression to the users. Our UI design aims to let users to enjoy the best experience. This can be done by considering in users sight. Use “Swipe” to replace the buttons can make apps become more user-friendly. Some important data are presented in the first page with adjusted placement so that the users can get that information in the first time.

Calories measurement:
By the function of calories measurement, the exercise information can be represented in the map, and get the data like: time duration, step rate, total distance. After analyzing these data, the consumption of calories can be evaluated by the formula below:

\[ \text{Kcal} = \text{weight} \times \text{time duration} \times \text{step rate} \times \text{total distance} \]

Where:

- \( E = \frac{30}{\text{Velocity}} \)

GPS is used to record the route of the user and calculates the distance of the user has walked. Based on Google Maps API in Android and point out the coordinates data and point on the Google map and show the path of target's walking history. Accelerometer is used as a pedometer and records the walking step data.

Heart rate measurement:

By using the microphone in the hands-free device, the beat pulse would be captured. Then, the sound track would be converted into saw file from mp3 file, and the signal would be analyzed in frequency domain by Fast Fourier transform. In order to reduce the background noise and sharpen the signal-to-noise ratio, a band-pass filter with cut off frequency 50 and 150 Hz is applied. After this, the objective signal is easier to be captured in time domain.

RESULTS

For Calories measurement:
After testing, we found that the recorded path is slightly different from the real path, with about 6 to 7 meters error. These differences are mainly from the mobile GPS positioning accuracy. If the environment is surrounding by high-rise buildings, the GPS signal will be blocked by the buildings, and make inaccurate records.

For Heart Rate Measurement:
After the signal processing, most of the noise are reduced and the beat pulse are become more apparent. However, if the background noise has great magnitude within the same range as heart beat in frequency domain (around 50 to 200 Hz), then, it would give uncertainty to our result.

Statistics
The history of heart rate and calories measurements can be reviewed as a bar chart in different length of periods, selected by users, so that the users can observe the change of health condition.

Conclusion:
Smart phone is a common electronic device which can facilitate for different kinds of functional applications. In our project, we designed an application which can monitor the user’s health conditions, like heart rate and calories consumption. The consumption of calories is evaluated by the distance and time recorded from GPS, while the heart rate is measured by analyzing the sound recording of heart beat, with signal processing technique. Besides of this two main functions, the design of user interface, database, would be included in our project.