A Development of a Weight-Balancing Control System Based On Android Operating System

Rattanathip Rattanachai, Piyachai Petchyen, Kunyanuth Kularbphettong

Abstract—This paper describes the development of a Weight-Balancing Control System based on the Android Operating System and it provides recommendations on ways of balancing of user's weight based on daily metabolism process and need so that user can make informed decisions on his or her weight controls. The system also depicts more information on nutrition details. Furthermore, it was designed to suggest to users what kinds of foods they should eat and how to exercise in the right ways. We describe the design methods and functional components of this prototype. To evaluate the system performance, questionnaires for system usability and Black Box Testing were used to measure expert and user satisfaction. The results were satisfactory as followed: Means for experts and users were 3.94 and 4.07 respectively.

Keywords—Weight-Balancing Control, Android Operating System, daily metabolism, and Black Box Testing.

I. INTRODUCTION

NOWADAYS, the advance of technology has affected many aspects of the social environment, especially changes in the lives of human beings. Humans must adapt their daily lifestyle in hustling around and their surrounding environment because it makes them neglect their daily healthcare. According to the World Health Organization, being overweight and obesity are the fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese. In addition, 44% of the diabetes burden, 23% of the ischaemic heart disease burden and between 7% and 41% of certain cancer burdens are attributable to being overweight and obesity [1].

Furthermore, the impact of the obesity epidemic on non-communicable diseases such as cardiovascular diseases, diabetes, and cancer is set to become one of the greatest challenges to public health in the twenty-first century [2]. Body Mass Index (BMI) is a simple measure of weight-for-height that can be used to assess healthy weight in adults [3]. Mobile phones can be used as tools to calculate body caloric balance [4]. Basal Metabolic Rate (BMR) and Total Daily Energy Expenditure (TDEE) can be displayed to be aware for health care of the user [5].

With recent advances in Information Technology becoming an integral part of everyday life, it is possible with a smart phone device to search and suggest how to search for information about healthcare. In addition, mobile devices are

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becoming more widely used as an opportunity to acquire knowledge about daily health care for users. Hence, the development of this project produced significant opportunities for making users interested to learn and search for knowledge of the ways of balancing of user's weight based on daily metabolism process and information on nutrition details. The mobile application is available and ready to use through the Internet and users can edit and store data in it online. Moreover, the system makes it convenient and interesting for users to assess their healthy weight automatically.

The remainder of this paper is organized as follows: Section II presents the analysis and design of this work; Section III presents the results evaluated by experts and users; finally, Section IV concludes the paper with future work.

II. ANALYSIS AND DESIGN

To develop this project, we studied and collected data from the user's requirements. The information was used as a source of information for management in this mobile application. Database management and internet network technology were applied to make the system fast and work efficiently. From analysis and design phase, we applied UML (Unified Modeling Language) as a tool for this step and Fig. 1 presents the use of this application.
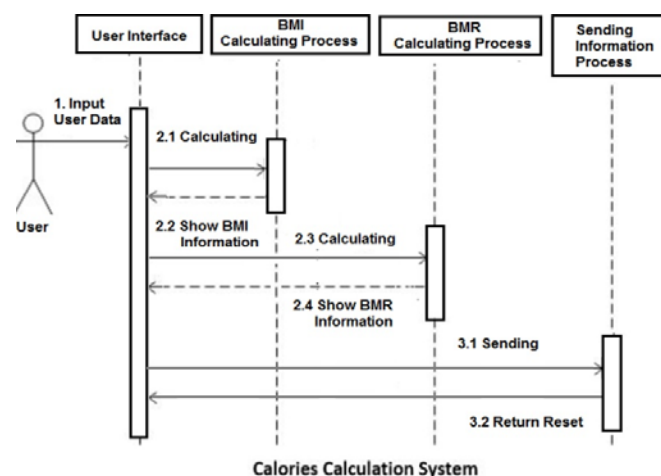

Fig. 1 Sequence Diagram of the Application

Fig. 2 shows the framework of the Weight-Balancing Control System based on the Android Operating System. It consisted of 3 parts: the database and user profiles part, the learning model part and the recommendation results part. This mobile application is implemented by using SQLite Database Browser and Android SDK Manager.

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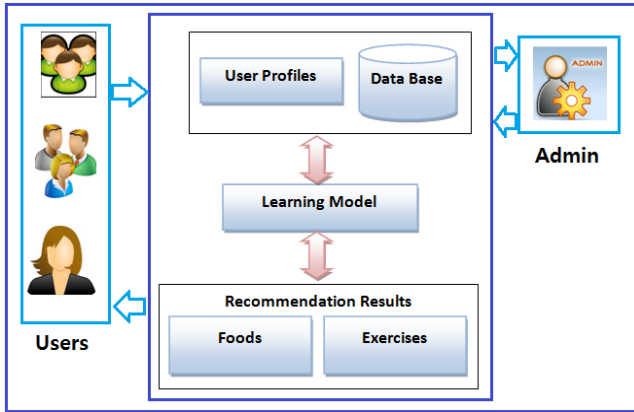Vol:8, No:7, 2014

Fig. 2 The framework of the Weight-Balancing Control System based on mobile Application

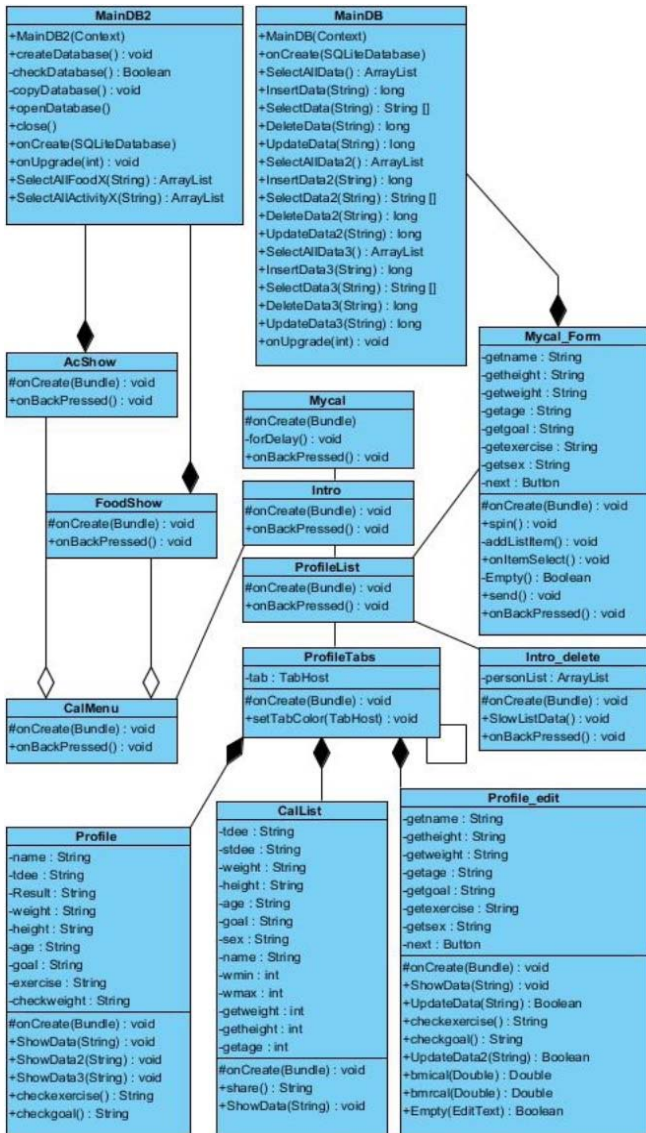Moreover, Fig. 3 presents the class diagram of this project.

Fig. 3 Class Diagram of the mobile application

To test and evaluate the mobile application, Black box testing and questionnaires with 5 experts and 180 users were applied. Black box testing was tested based on the performances of the system and collected errors of the system. Questionnaires were tested for user's satisfaction. To evaluate the quality assessment system, mean (x) and standard deviation (SD) were used to assess the qualities of the project.

III. RESULTS

The results of the Weight-Balancing Control System based on Android Operating System were divided to 2 parts: first, the results of developing the mobile application for recommendations of the ways to balance the user's weight based on daily metabolism process and suggestions to users of what kinds of foods should eat and how to exercise in the right ways, and secondly the result of testing and evaluating the qualities of this system.

A. Developing the Weight-Balancing Control System Based on Android Operating System

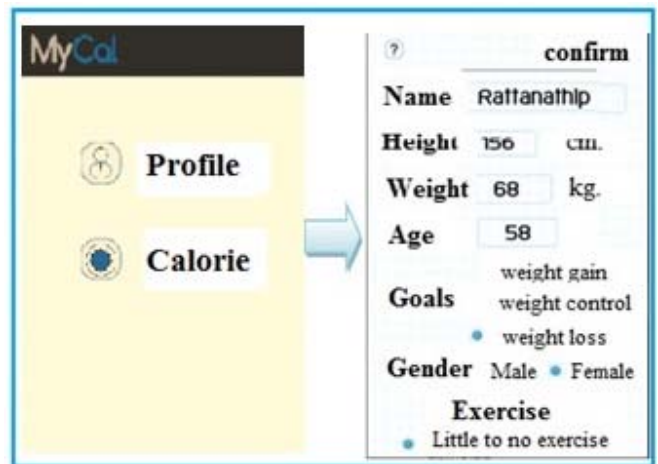Figs. 4 and 5 show the results of the mobile application.
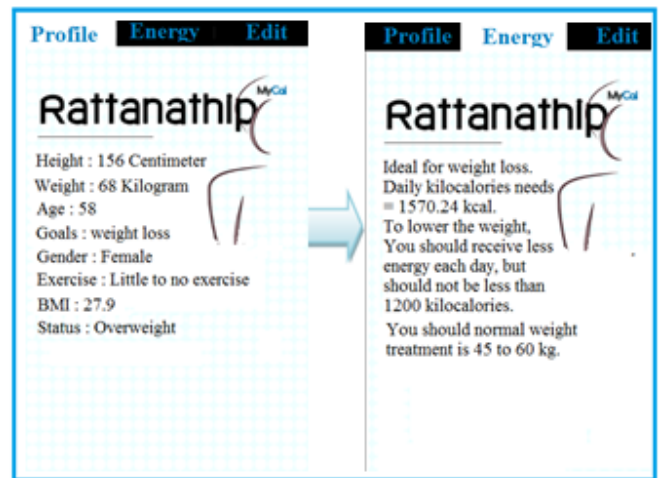

Fig. 4 The main page of mobile application

Fig. 5 An example page of the mobile application

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B. Testing and Evaluating the Qualities of the System

Black box testing and questionnaires by experts and users were used to test and evaluate this project. To test and evaluate the qualities of the system, black box testing indicated the error of the prototype as follows: functional requirement test, function test, usability test, performance test, and security test. Black box testing is the testing approach that ignores the internal mechanisms of a system or components and focuses only on the outputs generated in response to selected inputs and execution conditions [6]. The functional requirement test evaluated the ability of the system to serve the needs of the users and the functional test was used to evaluate the accuracy of the system. The usability test tested the suitability of the system. The performance test assessed the processing speed of the system. Finally, the security test was used to evaluate the security of the system. Table I shows the results of black box testing.

TABLE I
THE RESULTS OF BLACK BOX TESTING

	Experts		Users	
	$\bar{x}$	SD	$\bar{x}$	SD
1.Function Requirement Test	4.00	0.82	4.15	0.75
2. Functional Test	4.20	0.63	4.10	0.72
3. Usability Test	3.90	0.88	4.10	0.79
4. Performance Test	3.90	0.88	3.95	0.88
5. Security Test	3.70	0.82	4.05	0.76
Summary	3.94	0.81	4.07	0.78

As shown in Fig. 6, the results of data analysis by using questionnaires to evaluate user satisfaction found that specialists and users were satisfied with the performances of the system.
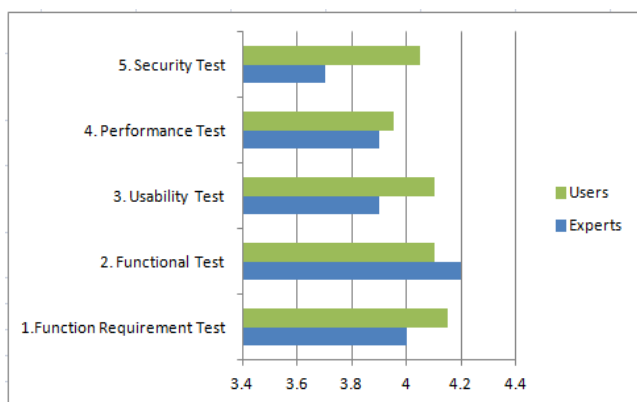

Fig. 6 The results of Mean

The results of user satisfaction by using questionnaires found that Means for experts and users were 3.94 and 4.07, respectively and standard deviation for experts and users were 0.81 and 0.78, respectively.

IV. CONCLUSION AND FUTURE WORK

In this paper, the preliminary results of developing a Weight-Balancing Control System based on the Android Operating System for calculating Weight-Balancing and recommendation on ways of balancing the user's weight based on the daily metabolism process. This prototype can be beneficial to managing and making suggestions to users for control weight balancing. Though, in terms of future development, other advance technologies and techniques can be applied to enhance this project and also apply the tools to manage a Weight-Balancing Control System.

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