Development of Smart Healthcare Scheduling Monitoring System for Elderly Health Care

Sooyong Cho¹, Sang Hyun Lee²*

¹,²*Department of Computer Engineering, Honam University, Korea
Leesang64@honam.ac.kr

Abstract

Health care has attracted a lot of attention, recently due to an increase in life expectancy and interest in health. Various biometric data of the user are collected by using the air pressure sensor, gyro sensor, acceleration sensor, and heart rate sensor to perform the Smart Health Care Activity Tracker function. Basically, smartphone application is made and tested for biometric data collection, but the Arduino platform and bio-signal measurement sensor are used to confirm the accuracy of the measured value of the smartphone. Use the Google Maps API to set user goals and provide guidance on the location of the user and the points the user wants. Also, the basic configuration of the main UI is composed of the screen of the camera, and it is possible for the user to confirm the forward while using the application, so that accident prevention is possible.

Keywords: Smart Health Care, Android application, Google Map, Coefficient of motion.

1. Introduction

Currently, "rapid economic growth" has improved the standard of living, improved living environment; the development of medicine and the extension of the average life expectancy due to the increase in income have made the aging trend very fast in the world [1].

The proportion of the elderly population over 65 years old in Korea was 7.2% in 2000 and it is expected to increase to 13.8% in 2017, 15.6% in 2020 and 24.5% in 2030 after entering the aging society, and 41.0%, respectively, and it is predicted that the aging phenomenon will accelerate [2]. In addition, in Korea, since 2006, we conducted remote counseling and healthcare services using IT to measure blood pressure and blood glucose in patients with chronic diseases and high-risk patients through a public demonstration project related to healthcare since 2006. In the public sector, IT was used to commercialize remote medical care and visiting nursing for the elderly living alone to promote the healthcare business as a preventive center rather than the patient's treatment center [9].

Smart healthcare consists of personal health devices, personal health applications, personal health information platforms, and healthcare and healthcare services. In recent years, Smart Healthcare sensors have been developed into simple analytical technology of wearable sensors and 1: N, which are mainly convenience and usability, in the early stage simple measurement sensors that have added communication functions to household and personal medical devices [8]. In addition, Internet of Things (IoT) and Big Data are important technologies for detecting, predicting and inferring patients' status as a core technology of
smart health care [6].

In this paper, we will develop a smartphone application that can be used in the walking exercise for accelerating aging and health care. The development contents are monitoring which can help the healthcare scheduling, and various biometric data of the user is collected by using the gyro sensor, the acceleration sensor, the heart rate sensor, and the like. In addition, when walking using Google Maps, the user can set the destination and set arbitrary destinations [3].

2. Related Research

2.1 Samsung Healthcare

Samsung Health (Samsung Health) is a self-help health care service for Samsung. The primary use of basic applications is the goal of a personal health coach. The information provided by numerous trackers is designed to enable goal-setting, daily activity tracking, and systematic exercise [4].

Samsung Health uses a variety of sensors built into the smartphone to measure the heart rate and the number of steps of the user. In addition, it performs diverse functions such as eating habits, blood sugar, blood pressure, and caffeine recording. Figure 1 shows an example of the compatibility of various applications and devices of Samsung Health.

![Figure 1. Samsung Health is compatible with other apps and examples of Samsung Health-enabled devices](image)

2.2 Health Center Mobile Healthcare

The health center business of the health center provides customized health counseling services to health center experts (doctors, nurses, dieters, exercise specialists) through mobile apps to people who have health risk factors according to the result of national health screening [7].

The purpose of this project is to provide customized health care services in public health centers using ICT and Big Data (national health screening results) to meet the demand for preventive health care. Provide personalized healthcare services for national health checkup results, and manage the results through the Web site [5].
3. System Design

Figure 2. Flow chart of application

Figure 2 is a general flow chart of the application used in this paper. Because it uses Google Maps, when the application is executed, the user asks the user whether to allow the Android Google map permission on the smart phone, and the application is automatically terminated if the user rejects it. If you grant permission, you switch to the camera view and choose whether the user will be given a random spot. If any point is provided, check the user’s real-time location and provide an arbitrary point with a red pin within about 150m. Otherwise, only the blue pin will be activated in Google Map to provide the user’s location in real time. The healthcare item shows the number of steps, the amount of calories consumed, the distance traveled, and the distance remained at the target point.

3.1 Design Android

The health center business of the health center provides customized health counseling services to health center experts (doctors
To create an Android application, we created an application based on the Android platform as shown in Figure 3, used Android Studio (Android Studio) to build the application, and used Java (JAVA) language. In order to secure the safety of the user, the camera view is inserted so that the user can look forward through the camera screen while using the application because the biometric data changing over time periodically conforms to the health care application characteristic.

As shown in Fig. 4, camera activation was performed using 'CameraSurfaceView' to use camera view and the layout was configured using 'FrameLayout' as shown in Figure 5.
A gyro sensor is used to measure the user's momentum. First, we developed a class for gyro sensor detection. It detects the shake of the smartphone and converts it into X, Y, Z triaxle values.

Then write a script to convert the measured value to the number of steps and calculate the converted value as the momentum. Figure 6 shows the gyro sensor value and Figure 5 shows the code for measuring and calculating the momentum.

3.2 Motion coefficients and Calorie counting

Calculation of calories consumed according to the amount of exercise is calculated by calculating the momentum according to the gyro sensor value measurement as shown in Table 1, and then calculating the consumed calories.

To calculate calorie expenditure, aerobic coefficient of motion and calorie counting were used. The amount of exercise and calorie expenditure by step number were calculated. Calculation result is calculated...
by consuming 1Kcal per 30 lines during walking exercise and the corresponding formula is reflected in the application.

### Table 1. Aerobic Exercise Coefficient and Calorie Calculation

<table>
<thead>
<tr>
<th>Types of exercise</th>
<th>Coefficient of motion</th>
<th>Based on a person weighing 60kg Calories consumed for 15 minutes = motion coefficient x body weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>walking (usually, 5km/h)</td>
<td>0.9</td>
<td>54 kcal</td>
</tr>
<tr>
<td>running (usually, 8km/h)</td>
<td>2.0</td>
<td>120 kcal</td>
</tr>
<tr>
<td>aerobic (usually)</td>
<td>1.5</td>
<td>90 kcal</td>
</tr>
<tr>
<td>swimming</td>
<td>2.0</td>
<td>120 kcal</td>
</tr>
<tr>
<td>bicycle (usually, 20~25 km/h)</td>
<td>2.3</td>
<td>138 kcal</td>
</tr>
</tbody>
</table>

3.3 Acquired Google map qualification

Since the user can watch the real time forward through the application by using the camera view, it is used for providing simple navigation up to the point desired by the user by displaying the Google map in order to use it effectively.

The user can specify the distance by the navigation due to the navigation, and Google Map can check the total distance by continuously measuring the moving distance of the user.

In order to qualify for Google Maps, you must acquire the SHA1 key and Google Maps API key, and first obtain the SHA1 key using the Android keytool. Figure 7 shows the SHA1 key acquisition. Obtain the Google Map API key using the acquired SHA1 key.

Get the Google Maps API key and then enable GoogleMapApiClient in your application so you can get Google Maps data from Google server. Figure 8 shows the source of the Google Maps API activation.
3.4 User Authorization Request

Some of the features of the Android smartphone have features that require the user to approve the feature directly. In this application, permission of the user for the functions of camera, GPS, Internet, etc. is required.

To do this, request permission to the Android device. Figure 9 shows the Android rights request list and the user rights request.

4. Result

The volume application screen configuration is shown in Fig. When the user launches the application for the first time, the screen shown in Figure 10 is displayed. In the upper left corner of the application, a healthcare item appears, indicating the user's movement distance, the total number of steps, and the amount of calories consumed.

If the user wants to point to a certain point, the red pin is activated in Google Map as shown in figure. 10, calculates the distance of the current user, and displays the distance in the bottom right corner.
The current user's location is enabled with a blue pin on Google Maps. The user's step count is calculated as 1kcal of 30 and displayed on the screen. When the user achieves the goal, the bottom right text of figure 11 is displayed as 'Guidance Ended.' Since the application is not terminated after the guidance is completed, the user can continue to receive the arbitrary point [10].

5. Conclusion

In this paper, we aimed to develop scheduling monitoring for health care for the elderly due to the acceleration of aging. For this purpose, the gyro sensor of the smartphone was used to calculate the number of steps and distance.

For the accurate calculation, we compared the values using the Arduino gyro sensor as a method to reduce the error of the gyro sensor. This application checks the number of steps and calculates the calories, and provides the user with a Google map to move to the desired point or any point. We will provide various
healthcare data by applying various sensors in the future.

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