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A study on the app development using sensor signals from smartphone and smart watch

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Abstract. In this paper, we present an app development using sensor signals from smartphone ans smart watch. We use Bluetooth communication for the connection between the smartphone and the smart watch. Smart watch includes a various of sensors such as acceleration sensor, gyro sensor, pressure sersor, etc. Using these sensors, we can measure the movement data of the user and transmit to the smartphone. In this study, we measure the values of the gyro sensor and acceleration sensor, and transfer them to the smartphone for game app development.

Keywords: Wearable, Connection, Smartphone, Smart watch, Sensor signal

1 Introduction

Various wearable devices have been widely used recently. [1] [2]. Lots of companies have released their smart wearable devices such as smart glasses, smart bracelet, smart necklace, and so on. Among them, smart watch is the most typical device representing the wearable technology trend. Smart watch provides not only the function of watch itself, but also provides additional features using a various sensors like acceleration sensor and a gyro sensor. For example, there are some sensor related apps such as pedometer, heart rate, and exercise assistance app and so on [3]. Novel smart watch technologies provide an interesting opportunity to design new forms of user interaction with mobile phones [4].

In this paper, we connect the smart watch and smartphones using Bluetooth for app development. After the connection has completed, smart watch collects movement data of the user and transmits them to the smartphone. From this connecting technique, smart watch can be a tool for the motion based game app in the future.

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2 Related works

2.1 Samsung Gear

Samsung Gear is one of smart watch provided by Samsung. The smartphone app is developed using the Android APIs, whereas, the smart watch widget is developed using the Tizen wearable platform [5].

Since it has accelerometer, gyroscope and heart rate sensor, developer can implement creative apps using those sensors. Samsung differentiate three types of app such as linked type, integrated type and standalone type. First, linked type app should be developed smartphone part and smart watch part separately. Second, integrated type app contains both part in one app. Last, standalone type app does not need a smartphone part app, and can be operated independently [6]. In this paper, sample experimental app is developed as an integrated type.

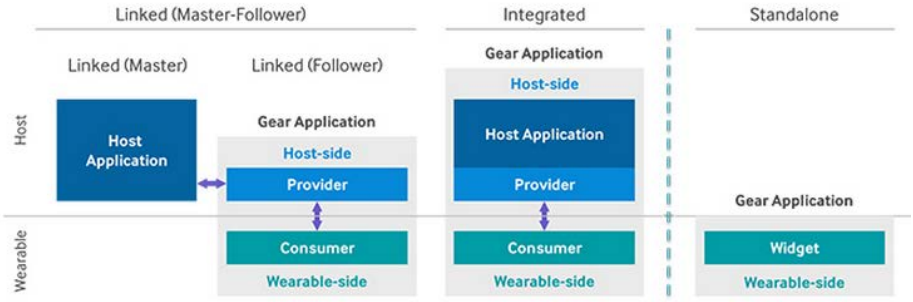

Fig. 1. Application package structure of Samsung Gear

3 System Overview

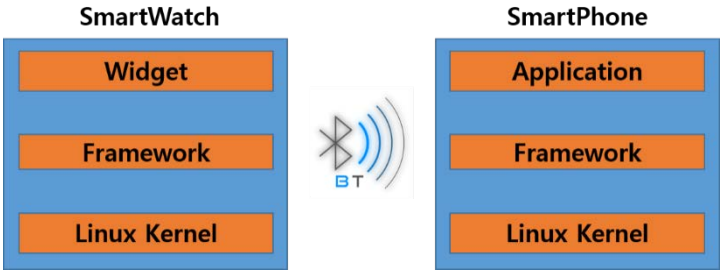

Fig. 2. Smart watch to smartphone communication architecture

The simplified architecture of the system can be presented in Fig. 2. Smart watch has a widget and smartphone has an application for the software. Moreover, both have a framework and Linux kernel. The widget and corresponding application are running

on the smart watch and smartphone, respectively. Since they are paired by Bluetooth communication, they can transfer the data each other.

4 Experimental Results

4.1 Implementation of the Experimental app

For the experimental app implementation, we use the Android SDK Platform 4.4.2 "Kitkat" and Tizen SDK for Wearable 1.0.0b2 on Eclipse as the development environment. In the experimental app, we can measure accelerometer data and gyro sensor data, and successfully transmit the data to the smartphone. For the testing purpose, the experiment is conducted on Samsung Galaxy S4 and Samsung Gear 2.

4.2 Transmission sensor data from smart watch to smartphone

For the same experiment environment, we wear a smart watch on left wrist. In this study, acceleration sensor and gyro sensor are tested. The process can be describe as the following.

Fig. 3. Experiment of acceleration sensor

Fig. 4. Experiment of gyro sensor

First, a user fixed the wrist and moved the wrist to the front as a similar speed for measuring acceleration sensor data. Second, a user rolled the wrist as a same pattern for measuring gyro sensor data. We have experiment ten times in the same way.

From the experiment, average of the accelerometer size was around 8.7 and average of x axis gyro sensor data was around 17.3. Although we did simple

experiment we could confirm that smart watch can be a tool for the sensor based game app.

$$Accelerometer\ size = \sqrt{accelX^2 + accelY^2 + accelZ^2} \quad (1)$$

5 Conclusion

In this paper, we presented an app development based on the sensor signals from smart watch and smartphone. The smartphone and smart watch are connected by Bluetooth. Acceleration sensor and gyro sensor are used for the transmission experiment and we get the desired results. From the result, we confirm that smart watch can be a tool for the motion based game app.

In this study, we have checked data transmission between smartphone and smart watch with simple app and widget for app development. In the next work, we will design and implement a motion based game app. For implementation of the game app, we should measure the sensor data of the user more and analysis the pattern. This remains as the future work.

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