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Intelligent Pedometer

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Abstract:
Google's Android has become the leading platform in smart phone market. Android has also integrated various sensors including gyroscope, orientation and accelerometer, so it is quite suitable to design mobile sensor applications. Pedometer is a common auxiliary device used for maintaining health and fitness. In this paper, an intelligent pedometer is developed using Android. The user's walking motion was detected via android sensor and pedometer application then analyzes the signal, calculates the walking distance and calories burned, and provides real time feedback to user via Bluetooth. The system provides three action modes: time-based mode, distance-based mode and count-based mode. All the tracking data are saved in SQLite database, and automatic threshold detection is used to improve the accuracy

Keywords: Android; pedometer

I. INTRODUCTION

According to the Canalys's *Q4 2010* global country level smart phone market report, Google's Android has become the most popular mobile platform. Android consists of a kernel based on the Linux kernel, with middleware, libraries and APIs written in C and application software running on an application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run compiled Java code. Besides, Android has a large community of developers writing applications ("apps") that extend the functionality of the devices. One of the attractive features of Android is that Android devices have multiple different types of hardware that are built in and accessible to developers. Android can use video/still cameras, touch screens, GPS, accelerometers, gyroscopes, magnetometers, proximity and pressure sensors, thermometers, etc. A Because of additional hardware support, Android is more suitable for creating creative applications than other smart phones. This study applied Android to develop an intelligent pedometer. The user's walking motion was detected via Android sensor. Pedometer application will analyze the signal, calculates the walking distance and calories burned, and then provides real time feedback to user via Bluetooth. The system provides three action modes: time-based mode, distance-based mode and count-based mode. All the data that are captured by the pedometer device is stored in firebase platform. that can be accessed by the proposed application.

II. LITRATURE SURVEY

The proposed model of pedometer will be tracking our day to day activities like walking pattern, walking range in terms of time duration ,distance and steps . These values will not only be tracked but also stored in cloud platform .the aim of this review is to develop a system that will be ensuring a good health to its user no matter what their age is ,it will be equally good for all age groups. In one of the article it was mentioned that walking is a funny and practical way to improve the nation's health .This encouraged us to develop a system that would increase the interests among the users since they will be able to track their progress, that would give them motivation to take right steps towards a fit and Healthy Life. Every human has a natural desire to stay fit but its difficult without any proper tracking tools, so this lead us to develop such an Android Application which will be capable to fulfill the demanded needs. In one of the review it was concluded that the Pedometer's use is associated with a significant increase in the Physical Activities, leading to a clinical way to reduce the Body Mass Index and Blood Pressure, helping out adults as well as people of all age group. The number of users of smart phones has increased insignificantly in recent years. Which can be justified as Approximately 63.5% of the world's population in 2014 used Smart phones and Android Applications in it, this result is in accordance with statistics from eMarketer. Smartphone applications today has become part of our daily lives. Thus it can be said that a Smartphone pedometer application will definitely prove to be more favorable and better than a traditional pedometer so as to improve physical activity and body mass index in community-dwelling older adults. After going through many journal papers and research works, it was decided by us to make such an android application, which could be easily installed and run on the System without much problems, Thus the purpose this review is to develop an intelligent pedometer device, that will track Physical Activity like walking and Running and Storing the values in Firebase Cloud platform.

III. PROPOSED SYSTEM

Existing Systems:

In earlier existing systems had various limitations like:-

- It only performed the task of counting the number of steps.
- The principle of data storage was introduced in those systems but it was just a database format
- Upon changing the device there were possibilities of data loss.
- Apart from this earlier versions of pedometer were not integrated with GPS tracking technology.
- Usually the previous Generation pedometers did not had the facilities of Text to Speech conversion.

Proposed System:

The system that is being proposed here definitely has all the features of normal pedometer like counting steps apart from this it has a number of new features making it more interactive and easy to use. Working of proposed system can be explained as follows:

- A button is present at the start screen to activate the GPS tracker of the phone.
- It basically pins your location there itself as soon as you activate the button.
- When you will move then it will tell your number of steps based on the distance you have covered from that pinned point.
- If device is offline, it will store the data in SQLite database else it will automatically store it in the Firebase cloud system as soon as internet connection returns.
- Plus if your data is getting into cloud everyday then based on those data firebase will itself send notification in phone about your new goals n reminder to increase your walking distance.

Advantages of Proposed System:

The proposed system is a new approach of looking and defining Pedometer App ,it has a great advantages over existing System, which are as follows:-

- The proposed System makes use of database as well.

Identify applicable funding agency here. If none, delete this text box.

as cloud Storage

- The proposed system makes the use of GPS technology so it don't need internet connectivity.
- When you will move then it will tell your number of steps based on the distance you have covered from that pinned point.
- If device is offline, it will store the data in SQLite database else it will automatically store it in the Firebase cloud system as soon as internet connection returns.
- Plus if your data is getting into cloud everyday then based on those data firebase will itself send notification in phone about your new goals n reminder to increase your walking distance.

Limitations of Proposed System:

Followings are the limitations of our proposed model:

- The Group interactions are not possible with the present proposed System .
- We cant pinpoint the start and destination at the beginning of the session.
- Since the Proposed system will be using GPS,it will lead to high power consumption as a result of which battery will be quickly Discharged.
- It don't have any map interactions like in Google Play.

IV. MODULES OF THE SYSTEM:

The various modules that will be contributing to the formation of this Intelligent Pedometer system includes the following:-

1. Bluetooth

The Bluetooth (IEEE 802.15) is a proprietary open wireless technology standard designed for short-range, low-bandwidth peer-to-peer communications. It has been widely used in cell phone. Android provides classes that manage Bluetooth functionality and let applications:

- Scan for other Bluetooth devices
- Query the local Bluetooth adapter for paired Bluetooth devices.
- Establish RFCOMM channels/sockets
- Connect to specified sockets on other devices x Transfer data to and from other devices.

2. Android Sensor

Smart phones are becoming sensor hubs in a way, opening a rich experience for users. Android devices have multiple different types of hardware that are built in and accessible to developers. Sensors, such as a camera, accelerometer, magnetometer, orientation sensor, and proximity sensor, are available on most devices. Android abstracts the sensor implementations of each device. The Sensor class is used to describe the properties of each hardware sensor, including its type, name, manufacturer, and details on its accuracy and range. The Sensor Manager class is used to manage the sensor hardware available on Android devices.

3. FireBase

- Open Cloud access software.
- User can create its own cloud server.
- Stores information sent by the device.
- It's a BAAS(Backend as a service).
- It not only takes care of all of the problems mentioned above but also provides you with a hell lot of features that you can play with.

1. Real time database.
2. Storage.
3. Authentication feature for your user.
4. You can also use cloud functions for complicated logics in your app.

2 SYSTEM REQUIREMENTS (HARDWARE AND SOFTWARE)

I. Hardware

Following are the system requirements in order to make pedometer work (hardware):-

1. Quad Core processor
2. Screen 4' wide at least
3. Internal memory of at least 4GB
4. 2GB RAM

II. Software

Following are the system requirements in order to make pedometer work (software):-

1. Android Version 4.0(Jelly Bean) or above.
2. Manually controllable GPS

V. SYSTEM DESIGN

A. Getting Device's acceleration & rotational attitude

The pedometer application uses acceleration sensor and orientation sensor to detect user's walking motion, and infer the walking steps, walking distance and calories burned form the sensor data Figure 1 shows the coordinate system of Android. The coordinate system of the device frame is defined as: x-axis in the direction of the short side of the screen (along the menu keys) y-axis in the direction of the long side of the screen z-axis pointing out of the screen. In addition to acceleration, we also need to detect the device's orientation. We can invoke the Sensor Manager. Get Orientation () method to retrieve a rotation attitude vector attitude [] which represents the:

attitude [0]—Azimuth (in radians) is the rotation angle around the world-frame z-axis required to have the device facing north.

It takes values between -PI and PI, with 0 representing north and PI/2 representing east.
attitude [1]—Pitch (in radians) is the rotation angle around the world-frame x axis required to have the device face straight up along the long dimension of the screen. It takes values between -PI and PI with 0 representing device face up, and PI/2 means it points toward the ground. up along the short dimension of the screen. It takes values between -PI and PI with 0 representing device face up, and PI/2 means it points toward the right. For a pedometer application, there are two cases when a user is walking with an Android device hanging on waist. As shown when the device is horizontal, the acceleration value of x axis represents the up-down vibration, and the acceleration value of y axis represents the forward-backward vibration. In case of the device is vertical the acceleration value of x axis represents the forward backward vibration, and the acceleration value of y axis represents the vibration.

B.Action Modes

The system provides three action modes: time-based mode, distance-based mode and count-based mode.

- Time-based

User sets up the walking time, system will notify user via Bluetooth when the exercise time is out.

- Distance-based

User sets up the walking distance, system will notify user via Bluetooth when walking distance is achieved.

- Count based.

User sets up the walking steps, system will notify user via Bluetooth when walking steps is achieved

C . Operation flow

The sequence diagram of the pedometer application:

1. User selects action mode and setup parameters.
2. Pedometer activity retrieves the sensors' values.
3. Pedometer activity analyzes the user's walking motion.
4. Pedometer activity checkup goal.
5. Pedometer activity sends feedback information to user via Bluetooth.
6. Pedometer activity persists walking data in SQLite data base.
7. Pedometer activity notify user when preset goal is achieved.

D. Automatic threshold control

When a user hung the Android device at the waist and walked for fifteen steps. There is notable noise at the begin and the end of walking. Besides, the vibration amplitude of sensoring signals of each user is different. So the pedometer application should calculate the counting threshold according to the censoring data at the sampling phase for each user.

VI. IMAGES

1. System Architecture

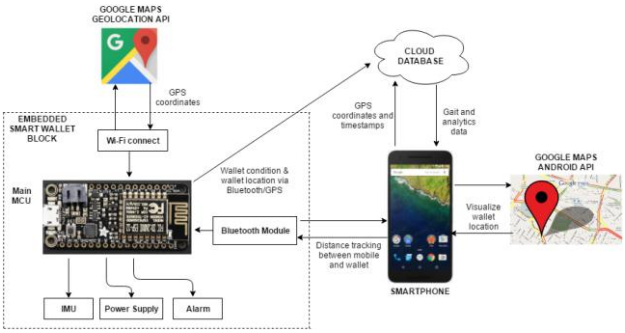

Figure.1. System Architecture

2. Application Design

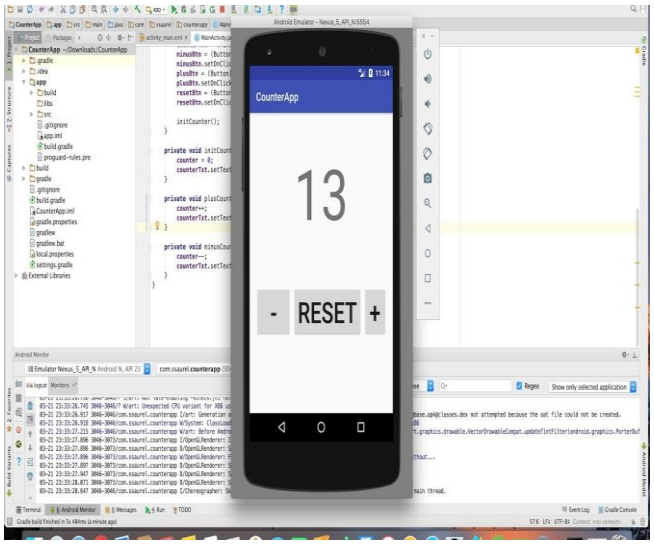

Figure.2. Application Design

VII. RESULTS

Similar to the actual steps was the Sportline™ brand (−3.83 ± 22.05 steps, p = 0.28). The other three brands significantly underestimated step count ($p < 0.05$). The largest difference was the Fitbit™ (55.00 ± 42.58 steps, $p < 0.001$). The Smart Health™ pedometer (43.50 ± 49.71 steps, $p < 0.01$) and the Omron™ (28.58 ± 33.86 steps, $p < 0.01$) also under-estimated the step count. Step counts from video analysis ("Actual Steps") and from the four brands of pedometers, the Fitbit™, Smart Health™, Omron™, and Sportline™. Values are mean ± SD. An asterisk (*) indicates statistical significance with regards to variance from the Actual Steps (*$p < 0.05$, Pedometer vs. Actual Steps).

3. Graphical Result

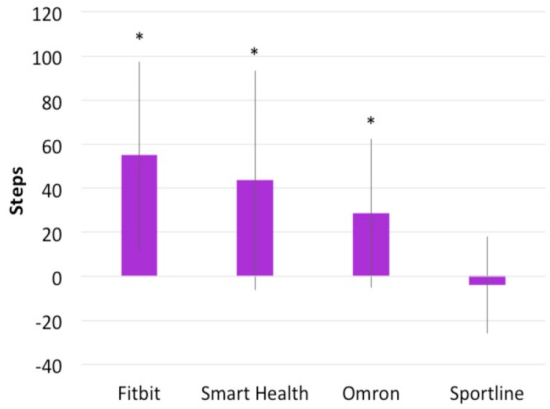

Figure.3. Graphical Result

VIII. FUTURE ENHANCEMENTS

Android is becoming sensor hubs in a way. In this study, Android is used to develop an intelligent pedometer application. User's walking motion was detect by acceleration sensor and orientation sensor, and voice feedback was provide via Bluetooth. All the tracking data are saved in Firebase, and automatic threshold control is used to improve the accuracy. Our work has minimised following issues.

Some of them include.

- Integrate with Wi-Fi communication to provide group walking interactions.

- We can’t pinpoint the start and destination at the beginning of the session.
- Since the Proposed system will be using GPS, it will lead to high power consumption as a result of which battery will be quickly discharged.
- It doesn’t have any map interactions like Google Map.

IX. CONCLUSION

Android is becoming sensor hubs in a way. In this study, Android is used to develop an intelligent pedometer application. User’s walking motion was detect by acceleration sensor and orientation sensor, and voice feedback was provide via Bluetooth. All the tracking data are saved in Firebase, and automatic threshold control is used to improve the accuracy.Android has got a great future. It is a great achievement, for health concerns. Pedometer can be seen as a motivational tool for people ,which would motivate them to make more moves towards thephysical Activities.Thus based on all this aspects it can be said that the intelligent pedometer goes by its name is a smart device in comparison to previous versions of pedometer.The GPS inability in our system makes it better than earlier versions.

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