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Design and implementation of battery statistics monitoring & analysis for android based system

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Abstract

Battery Monitoring System which provides sensing and monitoring capability to indicate the Battery conditions in any number of standby powers. Availability of Battery Capability is to monitor any number of cells utilizing a frequency-shift-keyed signal to sequentially interrogate each individual cell and using modulated tone responses to transmit data back to the monitoring module. Advances in battery technology not accomplish the rapidly growing energy demands. Thus energy consumption has more important issue in android devices. To save energy on android applications, it is critical to monitor the energy consumption of each application. As a solution to this, propose a software system which will be design to monitor battery power for each application with battery usage information and restricting the application which uses excess power. Also battery performance is remotely monitor, which is essential for both developers and users.

Keywords: *BMS (Battery Monitoring System); BQS (Battery Quota System); RMS (Remote Monitoring System)*

1. Introduction

With the recent appearance of open operating system and smart phones, new and innovative applications have appeared. For example, from stock tickers to city-wide social games, these devices promise to offer support for a large spectrum of applications. However, many applications such as video-on-demand, mobile gaming, location-aware mobile social applications, and real-time location-based tracking applications are often characterized by heavy network transmission. These features imply a heavy workload on the processors, the wireless network interface and the display in performing these services, which causes a significant energy cost.

However, advances in battery technology have not kept pace with rapidly growing energy demands. Most android devices use rechargeable electrochemical batteries typically, lithium-ion batteries, as their portable energy source. These fully charged batteries can run on this charge for only a few hours. For example, if the Wi-Fi is used all the time, the android can work for only several hours before it runs out of its energy.

Therefore, the power consumption has emerged as a key issue of the energy management of portables. Some existing tools can analyze android applications' energy consumption. However, these tools don't address monitoring energy consumption from a developer's standpoint.

To analyze the energy consumption of the applications on android, software system will be designed to monitoring system energy. It can let developers profile android system applications with battery information. Develop software based on Android operating system, which is one of the most popular operating systems.

The paper is structured as follows: In Section 2, literature review is done with the brief discussion of each paper.

Section 3, provides discussion in brief. Section 4, introduces the distributed and parallel approach. Section 5 describes the proposed work and finally conclusion is drawn in Section 6.

2. Literature Review

Paper [1] has presented the design of SEMO system, which can be used to monitor and analyze the energy consumption of applications on smartphones. The

software system presented runs on Android operating system, and it is able to monitor the energy consumption of applications and rank applications according to their energy consumption rates.

Paper [2] this paper work aims to simplify development of mobile applications by providing communication awareness so that applications can exploit all the intelligence available in these new smarter phones. The working to provide an application-level framework for isolating networking issues, which developers can incorporate in their applications.

Zhang et al. [5] this paper has described an on-line power estimation and model generation framework. The Power Tutor power estimation tool informs smart phone developers and users of the power consumption implications of decisions about application design and use. PowerBooter, an automated power model construction technique which uses built-in battery voltage sensors and knowledge of battery discharge behaviour to monitor power consumption. Even though they provide energy consumption monitoring but they do not provide the application-level energy consumption monitoring.

Paper[6] this paper propose an A-GPS assisted scheme that discovers the nearest Wi- Fi network access points (APs) by using user's location information. This allows the user to switch to the Wi-Fi interface in an intelligent manner when she/he arrives at the nearest Wi-Fi network AP. Therefore, it avoids the long periods in idle state and greatly reduces the number of unnecessary Wi-Fi scans on the mobile device. However, this should first know the energy consumption of the applications on mobile phones. Thus, monitoring the energy consumption of smart phones is very important for saving energy to extend the lifetime of battery.

Crk et al. [7] present a framework for energy monitoring. The goal of this paper is to measure and reduce the energy demand placed on mobile phones that monitor individuals' physical activities for extended periods of time with limited access to battery recharging and mobile phone reception.

Paper [9] this paper analyzes the energy consumption of an Android device and the efficiency of the system in several scenarios while performing video delivery (over UDP or TCP) on network.

3. Discussion

The energy consumption has become an important problem in energy management of android devices and has their own ways to save energy. Some papers improve the energy consumption of the individual application using certain technique. This paper gives the three techniques to save the energy of android devices.

4. Proposed Work

4.1 Battery monitoring system

To analyze the energy consumption of the applications on android devices, design system software i.e. Battery Monitoring System (BMS). First, it is used to check the battery's status, such as its power remaining and the temperature of its battery. Second, it collects the energy consumption data of the mobile devices, and then it analyzes the energy consumption of the applications on android devices according to the data it collects. The collected data include the time, the battery's power remaining at the time and the names of the applications which are running at the time. As shown in Fig 1 Battery monitoring consists of the following two main parts: an inspector and a recorder. The inspector is designed to check the information of the battery. The recorder is used to record the information of battery and applications, especially the energy consumption information.

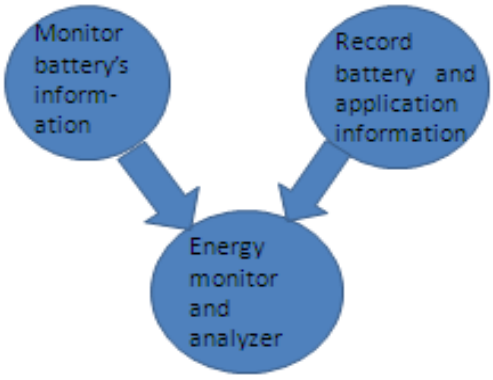

Fig 1: System structure of battery monitoring

The Inspector

The inspector is use to check the information of the battery as shown in fig 2, and warns users when the battery reaches a critical condition. This is the basic function of most energy monitor. First, it gets the information of the battery, including the percentage of the battery, the health status of the battery, the voltage of the battery, the temperature of the battery and the total battery charge. Then, it warns users when the battery reaches a critical condition. Thus, users can respond appropriately according to the information of the battery. For example, if the percentage of the battery is too lower (such as lower

than fifteen), then the inspector will remind users to charge the battery.

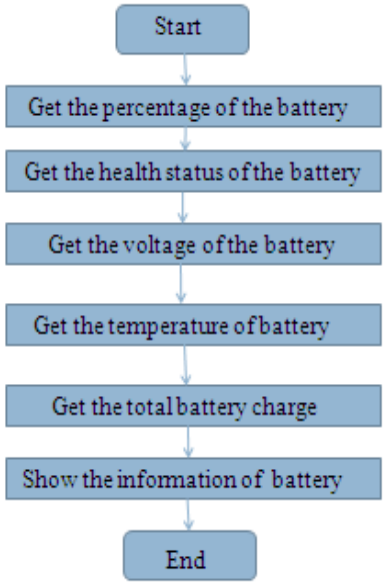

Fig 2: Flow chart of inspector

The Recorder

The recorder which is design to record the information of battery and the applications on mobile devices, periodically as shown in fig 3, including the time, the battery's power remaining at the time and the names of the applications which are running at the time. The recorder interval can be change. With the data of the battery and the applications, recorder can analyze the energy consumption of the applications. It can draw the curve of the battery's power. It draws the history curve of the battery's power remaining according to the information it records and it draws the real-time curve of the power remaining of the battery.

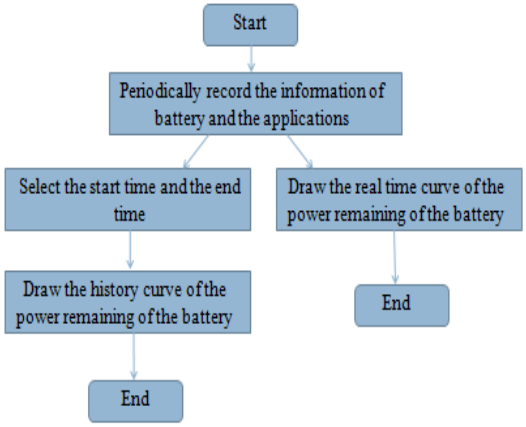

Fig 3: Flow chart of recorder

4.2. Quota system for each application

Battery Quota System (BQM) will be design to display quota system for each application to alert user about consumption of battery by individual application.
Number of application can run at a time and every application requires a battery access and Battery is utilized by background processes also.
BQM system will restrict the extra energy consumption of the application. This system also gives extra battery usage to the applications. It will alert to user when existing application crosses the battery quota and it will save battery power in case of no use of running application.

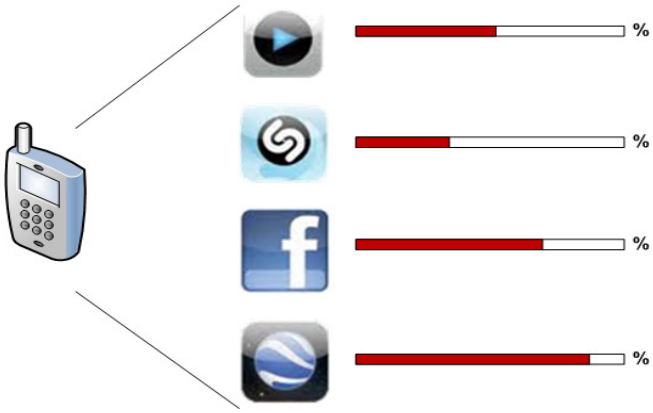

Fig 4: Quota system for applications

4.3. Remote android device battery status monitoring

In data center like organization need power status monitoring system. Proposed system is designed to plot the status remotely.
In Remote monitoring system (RMS), the devices are connected to the server with the communication media. The server communicates by performing socket communication. Android devices send the battery information in string format. Web services parse information and plot the battery usage in graphical format to monitor the devices.
As shown in fig 5 the android devices like smart phone, android phone, ipad, android device are connected to the server. By establishing the socket programming we connect those devices and monitor the android devices.

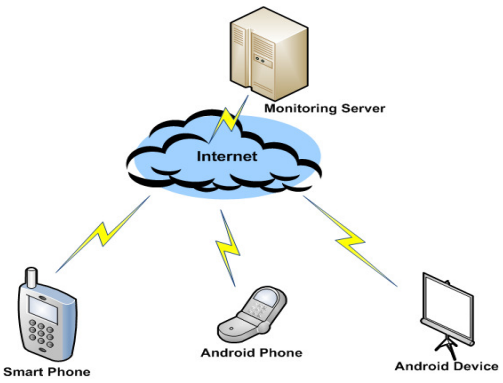

Fig 3: Remote monitoring System

5. Implementation

The Designed described above will be programmed by the java programming language. It will be developed on Android SDK (Software Development Kit) by using eclipse integrated development environment with the ADT (android development tool) plug-in for eclipse

6. Conclusion

The conclusion from the above is that the energy consumption in android devices has become more important issue. To save energy it is critical to monitor the energy consumption of applications on android devices.

For minimizing and alerting the energy consumption problem on android devices, this paper presents the three modules-design of software this can use to monitor and analyze the energy consumption of applications on android device, design software to display quota system for each application to alert user about consumption of battery by individual application by restricting extra usage, design software which send data to the server for monitoring the remote applications.

The software system will run on android operating system, and it will able to record the energy consumption of the application.

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