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Power Saver: Energy Efficiency for Smartphone Using Sensors

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Abstract: *Now-a-days smartphones with embedded sensor is a component of pervasive applications. Smartphone consists powerful sensors like accelerometer, orientation sensor, and proximity sensor. Mobile application based on sensor has grown rapidly over a decade. Sherlock, which is micro-environment is used for providing platform. By referring Sherlock platform, system is designing a micro-environment. Proposed system achieves energy efficiency for smartphone using sensor. Sherlock that automatically record sensor hints and characterizes the immediate surroundings of smartphones. By using the sensor we get data about the running application. If the application is in use then it will continue further, else an application is not in use at that time it will kill the process and help in battery saving. Android operating system is used to create application which is useful for saving the battery life of smartphones. PowerSaver application is used inbuilt sensors of phone for reducing the consumption of battery.*

Index Terms: *Context awareness, GPS (Global Position system),* Microenvironment

I. Introduction

The vision of Pervasive computing is to get interaction between the physical world and human social environment through computer system. Pervasive computing is supporting for computation and efficiency. It makes computing more physical. Pervasive helps in developing wide variety and the range of computer device. It is way through that we get the idea about dealing with limitation of mobile computing device. In Pervasive computing embedded technologies as well as connectivity are used for the real time technology.

Context awareness is a property of mobile devices that is defined complementarily to location awareness. Whereas location may determine how certain processes in a device operate, context may be applied more flexibly with mobile users, especially with users of smart phones.

The microenvironment of smartphones that automatically record sensor activities. Hints and characteristics are the immediate surroundings of smartphone. It runs as a daemon process on a smartphone and provides finer-grained environment information to upper layer running on the smartphone [2].

The micro-environment uses smartphone sensors which are already inbuilt. Now a day's Android is the most used technology and the main advantage of android is its applications. Android has lot of applications with them which consumes a more battery of smartphone. To overcome the battery consumption problem of smartphone, microenvironment is used. In this system, three sensors i.e. accelerometer, proximity and GPS are performing as a main role. In mobile systems, context-awareness is a computing technology that gathers information about the current environment of a mobile user to provide more relevant services to the user.

II. Literature Survey

Our concept of micro-environment sensing is built on both context sensing and context awareness applications, yet differs in its emphasis on perceiving immediate surroundings from the smartphones perspective.

Context Sensing:

Recent advances in lightweight sensors on smartphones have made a lot of efforts on context sensing in a round-the-clock fashion. Survey of Smartphone Sensor clearly see that all the systems concentrate on a single sensor. The existing systems consist of only a single application which use the data broadcasted by the sensor[1]. IODetector [7] provides an indoor/outdoor detection service via collaboration of phone sensors. J. Dai[3] design different detection algorithms based on mobile phone platforms for scenarios with and without simple accessories. PerFallD achieves good detection performance power efficiency. ACE [9] reports users current states to applications in an energy efficient way. Our work falls in this category yet differs in two aspects. On one hand, previous efforts are mainly human-centric, and support targeted computing services with respect to user situation. Conversely, Sherlock[2] conducts environment sensing from the phones perspective, automatically records sensor hints and characterize the surroundings of smartphones. On the other hand, all these works perform coarse-grained environment sensing (e.g., driving, walking, riding a bus etc.), while Sherlock detect immediate surroundings, usually several to a dozen of centimeters, around a phone.

Context-Aware Application:

P. Mohan [4] leverages phone sensors to monitor road and traffic conditions in developing cities. Vtrack [5] constructs an accurate, energy-aware road traffic delay estimation using smart Energy Efficiency for Smartphone Using Sensors phones.

III. Methodology

A. CLOSE ENVIRONMENT:

Close environment functionality is mostly focused on battery saving, while phone get call or notification its screen wake up for provide notification received poke to user. It is very good functionality but think about if your phone in your pocket, bag or any close environment where no requirement of lightning the phone screen, there is unnecessarily battery drainage is perform, to reduce such high battery consumption in close environment we just put screen in off state itself. For detecting close environment just use proximity sensor and most of phone has proximity sensor, "sensor manager "provide sensor value like near and far, so just check near condition if you phone in bag or pocket and callarrived then proximity sensor provide near value because mobile and open environment has in-between obstacle i.e. bag and that instance put phone screen in off state.

B. PROCESS KILLER:

Process killer is also one of feature provided for increase mobile performance and reduced battery consumption drastically. Hear accelerometer and magnetometer are used. When mobile in steady state and come in more magnetic field than defined value it automatically kill all the running process.

C. OPTIMIZATION MODES:

Optimization modes are defined in this application for user perspective. In this two basic modes are defined as Short mode and Long mode. Short mode is used is user want device in high performance. Long mode is used if user want to save the battery.

D. SCREEN LOCK AUTO CLEARER

In this feature, when screen is locked then auto clearer should clean the background running processes.

IV. Experimental Setup

System design is the main part of an implementation. To get the clear idea about the PowerSaver system, design of system is an important factor. By the designing of module, we get the clear idea about system. The following diagram is designed using PowerSaver system which is micro- environment platform we are referring for proposed system. Micro-environment platform has three layers. i.e.

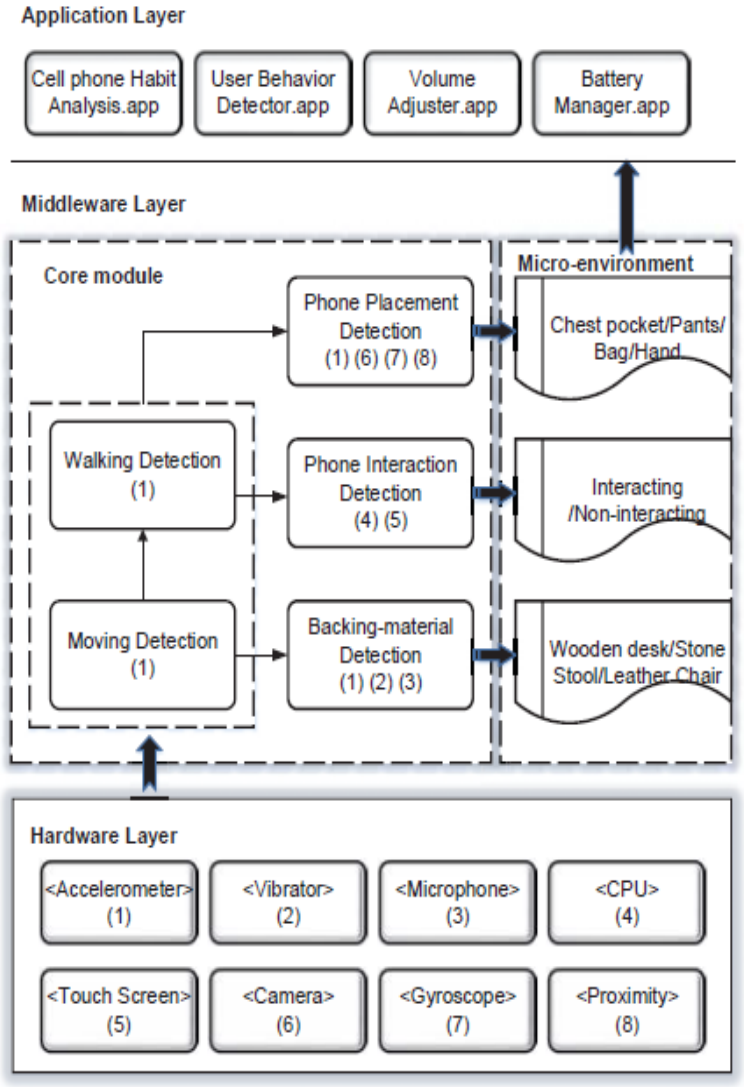
1. Application layer
2. Middleware layer
3. Hardware layer

The Framework covers the majority of phones states, and consists of three core modules such as phone placement detection, phone interaction detection, and backing material detection. Phone placement refers to the location of a smartphone along with its user, and we consider the situations of in bag, in chest pocket, in pants, and in hand.

The user is concentrating on his smartphone is another key for micro-environment sensing. At last,backing material detection analyses the hardness of stuff that touches the phone. An Application as adaemon process in the middle layer.

It employs sensor in the physical layer to record nature value and provides environment information to upper layer. Applications is a long-term middle layer on smartphone, an application optimizes energy consumption via a hierarchical, multistage architecture. Sensors are carefully selected and logically triggered. Identifying the phones micro-environment also open new features to perform energy saving strategies. Which is important for battery power smartphones.

On detecting being placed in the wooden surface, for instances, it is reasonable for the phone to infer that it will not use in the near feature, and can switch to certain power saving mode and turn off unnecessary sensors, software and applications.



V. Implementation

The concept of context awareness and micro-environment sensing can be used to develop many applications based on inbuilt sensors which will be able to achieve the higher level applications of Smartphones.

A. CLOSE ENVIRONMENT

It comes under the local placement detection category. The situations where there is no need of screen light when thephone is in a closed environment like in purse or a bag. So screen light of phone can be turned off while in closed environment. This task can be performed with the help of proximity sensor, thereby reducing the battery consumption.

C. PROCESS KILL:

This application takes the help of back material detection concept and collects the different surface valves and by comparing it to given threshold it behaves. In process killing applications that have been developed so far just trigger the operating system to search the idle threads or the smaller part of the process and kill them. But we can use threshold set by some values collected by magnetic sensor according to the surface on which it is kept. And this way application can be customized for different surfaces.

C. OPTIMIZATION MODES:

Optimization modes are defined in this application for user perspective. In this two basic modes are defined as Short mode and Long mode. Short mode is used is user want device in high performance. Long mode is used if user want to save the battery. Smart optimization is used to create custom mode according to the user.

VI. Experimental Results

There are many different type of sensors in all the smart phones like accelerometer, GPS, Wi-Fietc. we studied all the sensors in our survey paper [1]. These sensors have different functionalities. The consumption of energy by the respective sensors is shown in figure (2) Display is the component which consumes the maximum energy from the device battery as it is the component which is in operation as long as we are using the device.

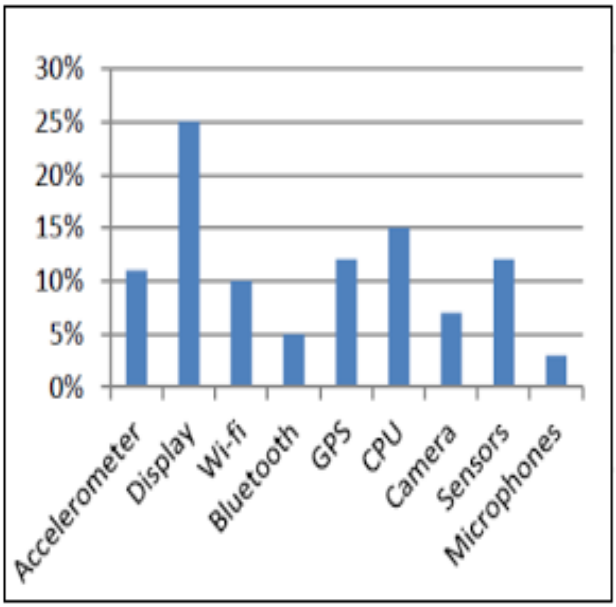


Figure 2.Energy Consumption of various Sensors.

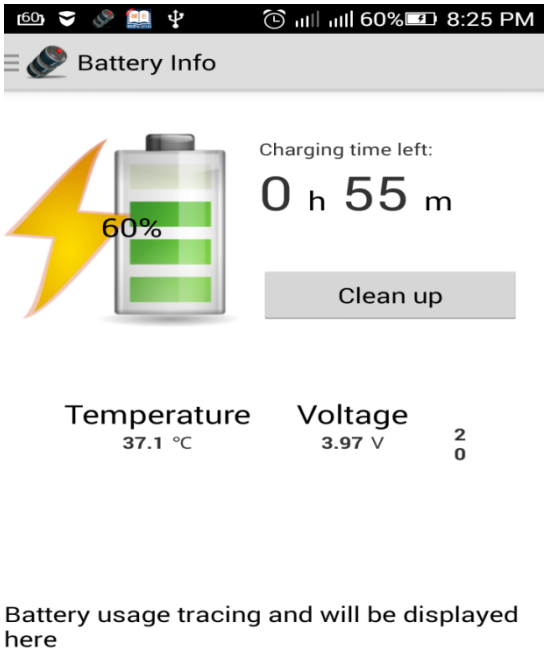


Figure 3. Battery information of smartphone

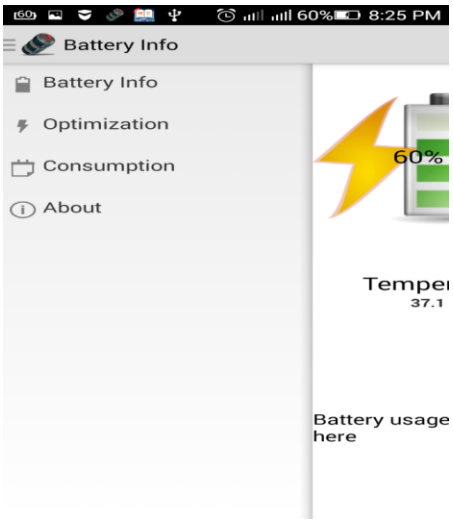


Figure 4. Navigation Bar for menus

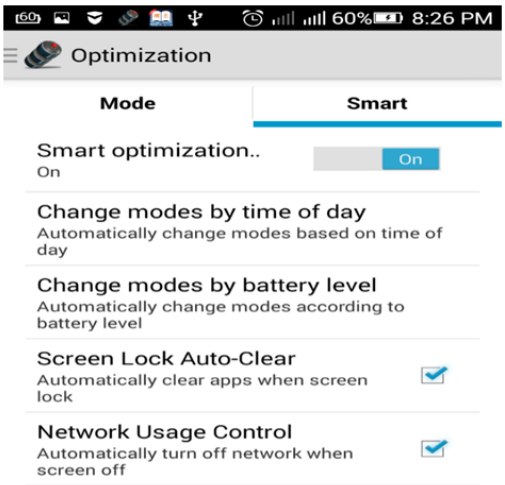


Figure 5. Optimization modes for smartphone.

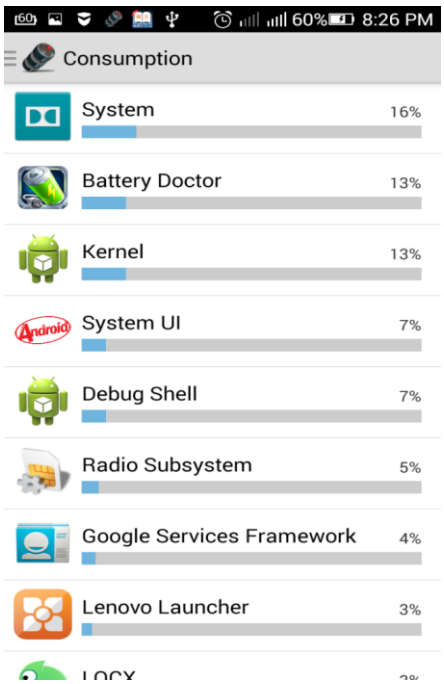


Figure 6. Battery consumption by background application

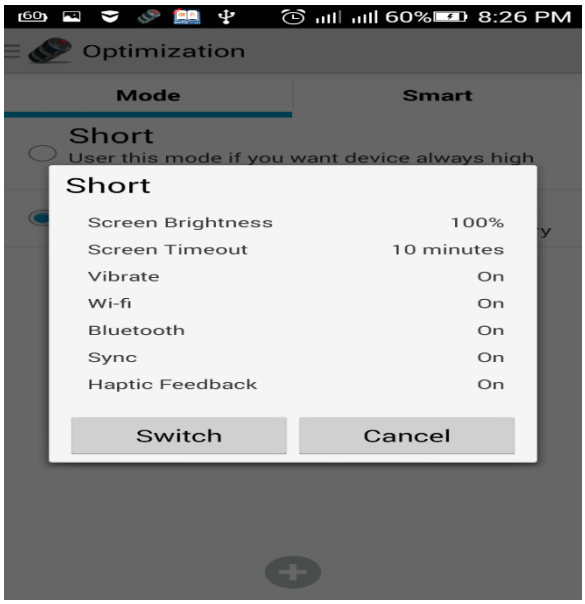


Figure 7. Short mode Menus

VII. Conclusion

Smart Phones are getting smarter because of all the sensors being added to them. In-built mobile phone sensors have many such capabilities that can improve people lives cutting down the time it takes to find things, to prevent people fromgetting lost. In this paper, we present the design and implement the PowerSaver, a implemented system for micro-environment sensing for Smartphone by using built-in sensors like LED sensor, Accelerometer, Proximity sensor etc. The system automatically collects sensor values and detects the environment of Smartphone at good accuracy, providing environment information to applications. We perform all operation and implementation on Android platform. Final operation results show that PowerSaver achieves low energy consumption, and good better sensing accuracy.

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