Android application for Micro-environment detection using mobile sensors

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Abstract: *Now a day, Smartphone's are used for wide range of tasks .We design application which is for Micro-Environment detection. Context-awareness is a technology which includes the information of environment surrounding to mobile phone. Application uses the sensor Context-data and also characterizes the surrounding environment. The application runs as a daemon process on smartphone and gives accurate environment information to upper layer application. Sherlock is application that covers the cases of placement of phone, usage of phone and interaction of user with difficult to detect user habits. The application is run in middleware for long term because of this it considers energy consumption and user-friendliness.*

Key Words: Mobile sensor, android smartphone, camera, Context-awareness applications.

INTODUCTION

We all are on the brink of a new era in the development of mobile application for smartphones. Today's smartphones used to context-awareness computing technology which defines the information about the current environment of a mobile user. It plays very important role in pervasive computing.

An android application is designed for micro-environment detection using the mobile sensors. Smartphones sensors like proximity, Accelerometer, GPS, camera, Touch etc. used for micro-environment sensing. This sensor based application framework is based on the phone usage as well user's habits.

The application covers various modules like Auto call picker, pressure sensor used for user security, unauthorised access protection, location traces when wrong pattern entered, ringer mode on when on soft surface, environment detection and battery optimization. The application is a platform which records the sensors micro-hints automatically and also characterizes the micro-environment of smartphones. The platform runs as a daemon process i.e. run in background and don't interrupt the execution of processes running on phones and provides finer-grained environment information to upper layer applications through programming interfaces.

The platform run as a middle ware stage and provide data which is collected by various sensor to the application. Sensor based application is a unified framework including the major cases of phone usage, placement, attitude and interaction in real life uses with complicated user habits. The preliminary result shows that a module of an application achieves low energy cost, fast system deployment, and competitive sensing accuracy.
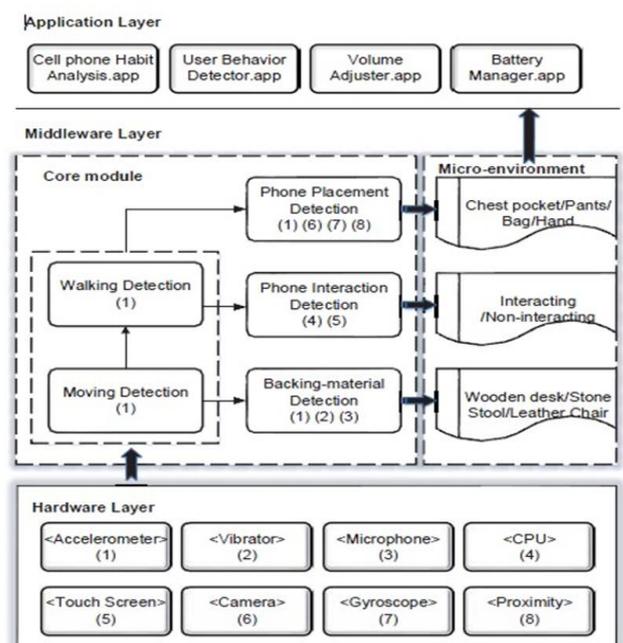
SYSTEM DESIGN AND OVERVIEW

Fig -1: System architecture

As Figure 1 shows, the application runs as a continuous process in middleware layer. It uses multiple sensors in physical layer to characterized nature events and gives accurate environment information to upper layer of application. In this application many modules are implemented which covers the functionality of security and optimization domain. The modules are broadly classified in three key modules 1) Phone placement detection 2) Phone interaction detection And 3) Backing material detection. The functionality of modules are automatic call picker, pressure sensor used for security, GPS sensor to track the location when wrong pattern lock entered, Soft surface detection for activate the ringer mode, closed environment detection for

battery optimization purpose, Morse code generator using flash sensor for sending message etc.

Phone placement detection

This module classifies daily on-body placement of mobile such as in-hand, in-bag, etc. For detection of phone placement it uses the sensors like proximity sensor, Accelerometer sensor, etc. The proximity sensor is used to detect the object in front of mobile. Accelerometer sensor is used to detect the acceleration i.e. speed of mobile movement.

Phone interaction detection

This module detects whether the user is using the phone, like browsing, gaming, texting etc. Such interaction is appearing when the phone is in-hand, the phone interaction detection module important in the semantic perspective. Sherlock exploits common screen-lock on smartphones and process transition on OS to identify whether the user is actually interacting with his phone.

Backing material detection

This application performs functionality with the magnetic sensors and vibrators for detecting the back material environment of the phone. As it determines the back material the application comes under the back material detection category. The surface detection can be done by using the values obtained by the magnetic sensors. It will help to toggle the mode of phone from vibrating mode to ringing mode when soft surface is detected.

IMPLEMETATION

For making code compatible for all the devices we need to check on different android devices. Here need to write an adaptive parser algorithm which will change for each sensor as per the data size transfer of sensor.
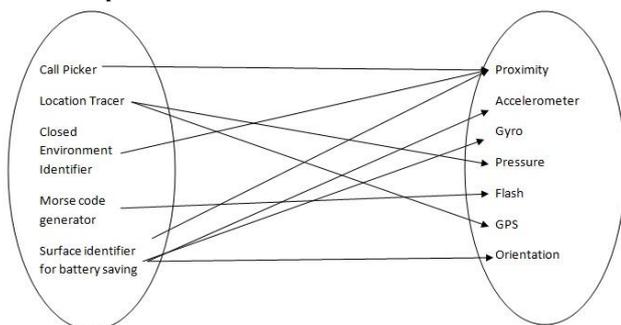

Fig. 2 Mobile sensors with uses

To read the information broadcasted by sensors
To store that data in SQLite
To convert that finer-gained data into ASCII format
To write logic for modules that need perform by captured data.
According to the concept of context awareness and micro-environment sensing many applications developed based on inbuilt mobile sensors.

Auto call picker:

We face some situations in our real life when we are not able to pick a call because for that we need to swipe to receive a call e.g. stuck in traffic, markets etc. using this application we can pick a call automatically without swiping it with the help of proximity sensor. In this application checks open and close conditions of proximity sensor and also it consider semi open/closed condition of it. This sensor detects the object within range of 2 to 5 cm.

Pressure Sensor used for security:

For this module, touch and pressure sensor of screen are used to measure the pressure value on a single point of screen. If that pressure value is greater than the threshold pressure of application then that application will trigger the alert to the configured numbers or e-mails in an application.

Unauthorized access protections

In this module, camera and GPS sensor are used. If someone inserted the wrong pattern lock then at that time, application will be capturing picture of him/her using the front camera and save it into DCIM directory and also latching his location using GPS or LBS. Application will send this location, time and image taken to the configured Email ID. If front camera is not available then it will only send location and time to the configured Email ID.

Battery Saving Application:

In this module, application is trying to find the place of mobile. Here we consider the different habits or a condition of mobile user such as mobile is in hand or kept on some surface. This will be done by using Environment, Metal Detector, and Magnetic Field Detector sensor. We found that, Many times our mobile is not in use so in that case application will stop the running processes. It saves the battery of mobile and whenever mobile is again back to active mode it will start those processes.

Ringer and Vibrate toggle for soft surfaces:

In this module magnetic sensors and vibrators are used for analyzing the back material environment of the smartphone. Metal detector sensor is used for identifying soft surface. Suppose a situation, soft surface is detected and mobile found is in vibrate mode and if call comes then application switch on the ringer mode. So that user can get the call is coming. A soft surface is not able to give vibration sensing.

Morse code generation:

In this module, flash sensor is used to for generating Morse code. This application mostly useful in the navy system, there need to type a word that user need to send to another user. Flash sensor will blink as per the word typed.

CONCLUSION

We present the design and implementation of Android application for microenvironment detection using built-in sensors. In this application multiple sensors are utilized whose result is able to achieve low Energy consumption, rapid system deployment, security and Competitive Micro-Environment Sensing Accuracy.

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