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Study of Micro-environment Sensing Platform for Smartphones

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***Abstract*— Context awareness is setting trends for applications on modern day smart phones. Nowadays human centric context (e.g. indoor /outdoor, home/office, driving/walking) is explored. Few attempts have been identified from smart phone perspective (e.g. table/sofa, in pocket/bag). We associate such immediate surrounding with micro-environment, usually specific number of centimeters around the phone. In this research we try to design sher-lock a platform that sense micro-environment automatically and extracts sensors data and identifies the micro-environment of smart phone. Sher-lock is unified framework covering the major cases of phone usage, placement, attitude and interaction in practical use with complicated user habitThe preliminary results show that Sherlock achieves low energy cost, rapid system deployment, and competitive sensing accuracy.**

Keywords—Daemon; microenvironment.

I. INTRODUCTION

In relation with smartphones context is nothing but current environment in which smartphones relies. Awareness of context is a technology that holds information about current environment of the user and provides various services according to such environment.There exists wide range of application that makes use of context awareness concept and are human centric i.e. recognizing the environment that are human related (For.eg. at home/in office/driving car/sitting).This recognized information is used to provide services according to the situation in which user is. (For.eg. phone calls are blocked when mobile phone becomes aware that its user is driving). GPS is turned off when user enters the building because there is no need of it. Similarly, it is unnecessary to keep wi-fi on when user is in pen countryside becomes of its unavailability.While intensive utilization of human centric context has been done, phone's perspectives are being studied by few works.The nearby surroundings is named as microenvironment. It is beneficial for broad range of applications that are aware of microenvironment similarly as for human centric environments. For.eg. It is unnecessary to light up the screen for incoming call when smartphone is in bag or pocket of user. If phone is placed on soft surface rather than hard surface, then user will not be able to know about incoming call if phone is vibrating. So it is better to turn up the ring volume when phone is kept on soft surface. If the accurate microenvironment sensed accurately, phone can decide what to do automatically. In this paper, we design sher-lock a sensing platform is for micro-environment the working of which is based on recording the hints given by sensorsand characterizing the smartphone microenvironment.Given accurate micro-environment information, a phone can adapt its behavior automatically and properly.It runs as middleware process on phone and sends information to the application running at upper layer on smartphones.Framework of sher-lock is based on the methods of using smartphone and most of the states of phone are covered by framework. Three core modules are designed i.e. detection of 1.Phoneplacemen

2.Backingmaterial

3.InteractionPhone placement indicates location of smartphones related to its user i.e. situations will be as, in chest pocket, in hand etc. Backing material indicates when the surface on which phone is kept is hard or soft.Sherlockis integrated platform that gathers various applications together which are designed to make smart phones a helpful device for its user. unlike previous studies and existing products ,Sherlock iscompletely focused on smart phone centric contexts. Sherlock is based on the studies done in order to understand user habits in using smart phones .it involves great efforts in studying user habits because it varies with different users.

II.SYSTEM OVERVIEW

The main purpose of sensing micro-environment for smart phones is to provide facilities in the form of phone centric applications rather than human centric applications. Identifying the micro-environment opens the new ways to establish useful battery saving strategies for the smart phones.As shown in figure-1, Sherlock runs at middleware as daemon process [1]. It makes use of sensors present at the physical layer to store events occurred in case of smart

phone and required information to applications present at application layer. Energy consumption optimization is done by sher-lock using hierarchical multi-layer architecture. Sensors are triggered every time when particular event is occurred. For example- Accelerometer sensor is awake all the time and simple environment changes are detected by it, and then other sensors are triggered for complex classification of environment.

The layers of system architecture are classified below:

1.Application Layer.
2.Middleware Layer.
3.Physical Layer.

Physical layer: consists of all the sensors that are present in particular smart phone. But sensors may vary from phone to phone.

Middleware layer: consists of Sherlock platform which in term contains core modules which makes use of values provided by sensors.Then Sherlock makes use these sensor hints and decides in which type of micro-environment phone is and on the basis of this classification particular application is triggered to run which is present at application layer as shown in figure -1.Core module forces the application to perform respective task.

Application layer:consists of multiple user level applicationswhich provide ease of use to the smart phone users in multiple awkward situations.

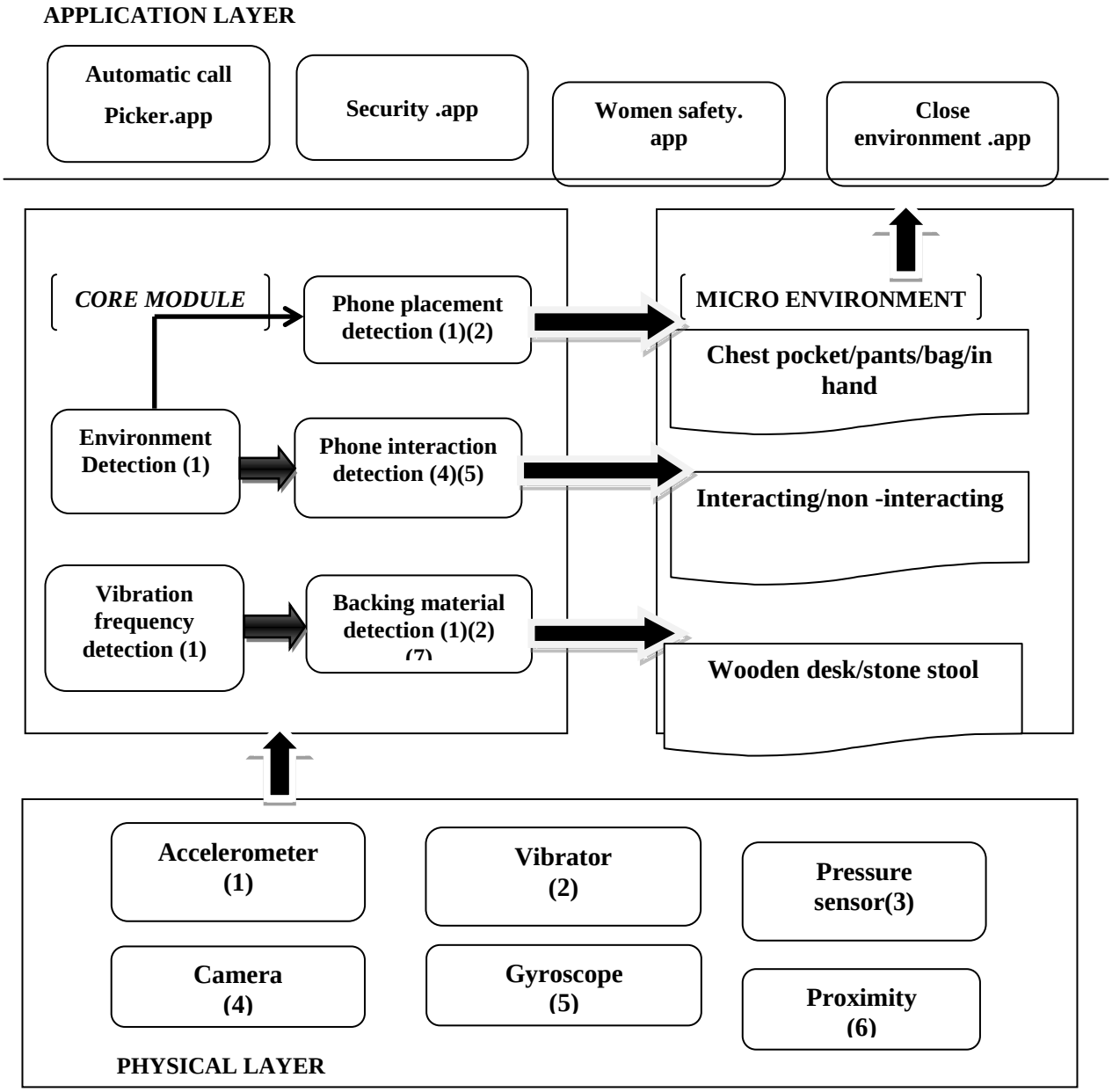

Fig.1. Sher-lock application architecture

II. LITERATURE SURVEY

The 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 spurred enormous efforts on context sensing in a round-the-clock fashion. Sound- Sense [6] models sound events on mobile phones to achieve context recognition. IODetector [5] provides an indoor/outdoor detection service via collaboration of phone sensors. Jigsaw [5] constructs a general-purposed pipeline-based engine for continuous sensing applications on mobile phones. By dynamically learning the relations among context attributes, ACE [3] reports users current states to applications in an energy efficient way.The system working 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 users situation. Conversely, Sherlock 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[1], walking, riding a bus etc.), while sher-lock aims to detect immediate surroundings, usually several to a dozen of centimeters,around a phone. Context-aware Application: Vast works also study the usage of context-aware sensing results. FALCON [2] exploits temporal and spacial characters of user behaviors to pre-load apps to speedup launch time. TagSense[4] takes advantage of sensor hints to piece together environment information about photos. Nericell leverages phone sensors to monitor road and traffic conditions in developing cities. Vtrack constructs an accurate,energy-aware road traffic delay estimation using smartphones. Many research efforts have also utilized context-sensing result for localization. Surround sense [6] ex-ploits phone-equipped sensors to characterize ambient environment features for logical localization. Zee uses inertial sensors to track phone users indoors. These works, in general, can provide partial indication on immediate surroundings of smartphones. However, all of them are application-oriented, thus only suitable for specific scenarios. For example; monitoring road conditions,localizing phone users indoors. However, Sherlock pro- vides a multi-dimensional, phone-oriented environment sensing service for upper layer applications, and is orthogonal to the efforts aforementioned.

III.EXISTING SYSTEM

In existing system, we can 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]. This application will consume more energy as it has to run continuously. They have not developed any supportive application to save battery.

For example,

1. Gesture Detection Application:This existing system itdetects gestures given by the user to perform an action.

2. Women Safety Application:Fires emergency message on pressing power button two times.

Demerits Of Existing systems:

Existing systems are individual system's which are need to be used and installed separately according to their needs. There is no platform exists that integrates all or some needed applications together.

IV. PROPOSED SYSTEM

To use the data broadcasted by the sensor in order to make useful application in security and optimization domain.
The proposed system integrates multiple existing systems into one single application to make the application more useful and efficient.
Development aim:

1. Automatic Call Picker.
2. Women Safety App.
3. Security App.
4. Process Killing App.
5. Backing Material Detection.
6. Auto App launcher.

Advantages over Existing Systems
Sherlock integrates application together with the facility of turning on/off particular service.

V. SYSTEM DESIGN

A. Local Placement Recognition

Scheme that classifies local placement effectively with help of available sensors is developed. There are two observations, there can be two possible environments exist when phone is carried by user like either semi-closed/open environment i.e. in hand or closed environment i.e. in pocket, in bag. Illuminative conditions changes according to methods or extent of covering, these conditions can be sensed using built in camera for classification of placement[1]. Different special movements can be experienced by phone in different local surroundingModule for local placement recognition works as illustrated by followingfigure.

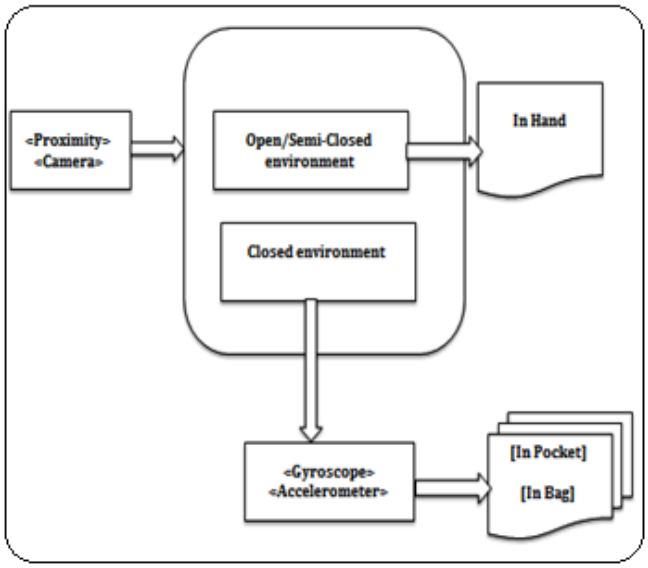

Fig.2. Local placement recognition

Figure-2 illustrates how the open and closed environments are identified by the local placement recognition module.It works as follows:Sensors i.e. proximity sensor on front side of smartphones and camera at backside works together to identify semi closed /open environments.Accelerometer is used to identify closed environment.Smartphone is said to be in hand state when it is not completely covered by surrounding objects. Proximity sensor can be used for proximity perception on front side and that for back side can be covered by camera [1].

B. Backing Material Detection

It refers to the identification of material i.e. hard/soft on which phone is placed. The vibration patterns can be used for these purposes.Distinguishing driver and passenger phone use is a building block for a variety of applications but its greatest promise arguably lies in helping reduce driver distraction [3].The vibration patterns may have two aspects as,

a.Mechanical motion exhibited by phone.

b. Acoustic features that are captured by accelerometer and micro phone.

Phone's vibrations pattern varies with the backing material, stiffness For.eg. If the phone is placed on soft material, there will be smaller phone driven deformation and shorter recovery time, hence phone will vibrate slowly[1]. On other side if phone is placed on harder material, mechanical motion of the phone will be more. Hence it will exhibit large amplitude of vibrations and magnitude of frequency of vibration[1] will be large as well. We design detail recognition scheme as follows,

1. Recognition based on acceleration

Normally, Smart phones are placed on the materials like wooden table, fiber chair, stone or metal material. Results of the acceleration based recognition[1] are the rough distribution in hard and soft material i.e. wooden table or leather chair. The amplitudes of the acceleration and pulses are larger on hard material.

2. Acoustic based recognition

Acceleration based recognition can be used to differentiate between hard and soft material. In acoustic based recognition the spectrograms of sound[1] are compared that are captured by the microphone during phone vibration on two representative hard surfaces.

It is clear that amplitude on the stone is larger than wood, so we can conclude that phone vibrates loudly when the phone is placed on flat stone surface[1].

VI. MATHEMATICAL MODEL

- Let (s1,s2,…,sn) is a set of sensors data broadcasted.
- Let (p1,p2,….,pn) is a set of events that are going to be fired.
- These actions are going to take place in polynomial time. So our project is in P-type category.

VII. CONCLUSION

In this paper,we design and implement of Sher-lock, a practical platform for micro-environment sensing for smartphones via collaboration among built-in sensors. The platform automatically gathers the data from in-built sensors and chatagerized the surrounding of smartphone and provide it to upperlayer applications.

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