

The Scrupulous Need and Overview of Mobile Sensing in the Modern Period for Recognizing the Physical Behavior and Activities of Diverse Systems

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Abstract

The smart mobile hand held devices are the booming heroes of this new era. The broadly used smart mobiles are not limited to accelerator, Bluetooth etc. Also, modern technology comes in combination with special sensors and proximity sensors, wherein any small accessory can present itself as a sensing device in the mobile phase technology. The large amount of data can be consistently collected from the wide spread sensor knowingly and unknowingly without causing any interruption to the users of the mobile phone device. In particular, the mobile phones with mobile sensing facility has geared up data in volume and has automatically take a role in mobile users life time by producing many data patterns as and when the users charts its mobility from a source to destination. These continuous transmissions can be graphed simultaneously along with logs by calculating the kilometers or meters travelled by a person on a particular day. The objective of this research is to discuss the recent techniques and methods of mobile sensing in combination with specific sensors which are widely used in the smart phones. In addition to that, the chapter discusses the limitations, advantages and application as a major concern.

Key words: Mobile, Sensing, Android, Sensors, Devices.

1.0 Introduction

1.1 Mobile Sensing Basic Methodology

The mobile sensing is defined as a branch of wireless computing in combination with mobile devices [1], which as a key concentration on widely spread sensor equipments by connecting to the main sensor network by monitoring using different devices. It is after the giant leap from wireless technology, sensor technology is popularly used to connect backend and frontend using networking principles. The basic mother boards of sensor devices consist of a sensing and computerized communicating module respectively. The traditional wireless technology focused on interface related issues, but recent sensor technique has a key concentration on military surveillance, arrow surveillance and navy surveillance. The sensor networks always have the brilliance to communicate to each other by using sensor nodes and decide the best node within it so as to act at the real time problem discovery [2]. They have the capability to determine the type

of pattern data collected and transmission of particular data to backend server at the time of specific operation. The ultimate aim of any technology is reduction of power consumed by sensing network and performance enhancement [2]. The figure 1.1 shows the basic model of Mobile Sensing.

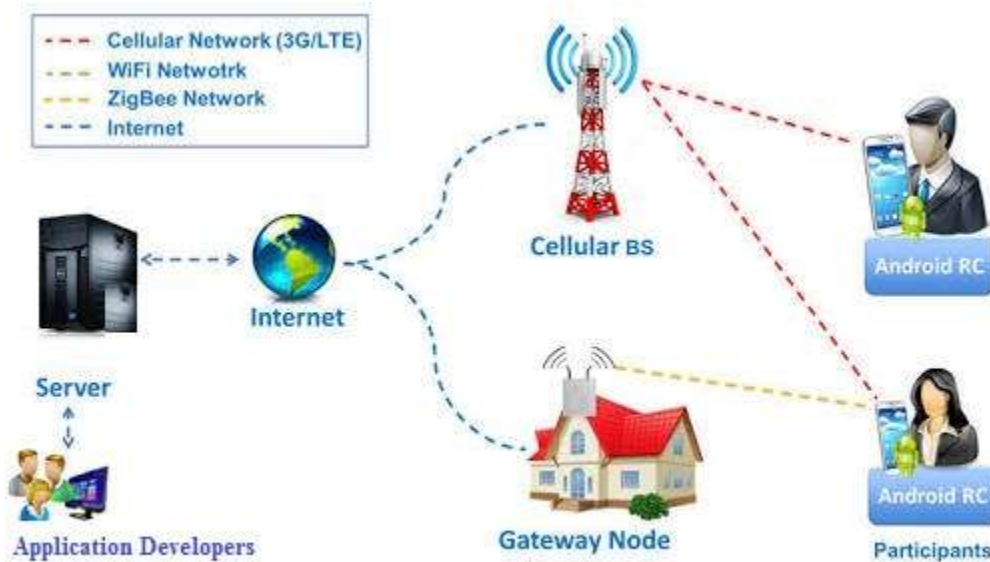


Figure 1.1 : Basic Model of Mobile Sensing

1.2 Relationship between Mobile Sensing and Mobile Devices

The recent smart phones are with inbuilt capabilities of GPS, Bluetooth, Wi-Fi, Accelerometer and so on. They are very powerful not only as communication device but also being a computing device, which can be used in combination with traditional sensors [2] such as, temperature sensor. These sensing devices are used as personal devices with heterogeneous combination and are becoming difficult to program day by day. Over the past decade sensing technology has made a look back on traditional techniques.

2.0 Overview of Sensing Devices

There is a drastic change with regard to mobile, as the sensing devices are becoming cheaper along with embedding technology. The generally used implicit sensor is Bluetooth whereas, the explicit sensor is GPS. Bluetooth is used for peer communication and in discovering the nearest available devices. Moreover, GPS is used for calculating the accurate and approximate position of the mobile phone using ground control stations and satellites in combination with a reference frame, which includes latitude, altitude and longitude with direction [2]. The Bluetooth technology is used to transfer and interchange data between small distances using ISM band.

3.0 Mobile Sensing Designing Principles

The backend sensor can be communicated by the smart phones with valuable information, which is being sensed by the target users. There is a possibility to combine number of devices by predicting the mobile crowd level by quality of surrounding and type of information generated. The major focus is to build a complete application through which many of the users can be benefitted. The important difference [2] between sensing technology and traditional sensor is on

type of network sensors that are used. This technology of sensing the mobile crowd is termed as crowd sensing. In the process of mobile crowd sensing, the major position of task is segmented into many pieces like a top-down integration technology. The mobile crowd sensing technology can also be built in terms of bottom-up integration methodology, which is purely a concept of interest. Recently, many of the modern cities are wireless and are installed with many of the heterogeneous devices such as: CCTV Surveillance etc., wherein social media plays a very important role in capturing this type of sensing data. Furthermore, it is combined with other update application method and has been transferred to parallel users [2]. There are many worldwide researchers that give us mobile sensing crowd, which is being experimented with real time traffic in order to find its robustness.

4.0 Semantic Modeling of Mobile Sensing Crowd

The semantic modeling [3] can be used widely for elaborating the concept of physical and social and communication information. They are highly used in GPS co-ordinates and focuses on creating situation aware application. The GPS locations of objects are determined by their geographical attributes. This termed as Semantic Oriented Trajectories [3].

4.1 Comprehensive Aspects of Mobile Sensors

The accelerometers are commonly used in mobile phones with combination of camera in the recent years. The Figure 4.1 is used to find out the position of user automatically, by holding the mobile phone and displace the result either in landscape or portrait view of the captured photo on viewing in the smart phone include accelerometer, compass, light sensor, proximity sensor front and rear camera GPS, Wi-Fi, Bluetooth, microphone, radio etc., Right sensor and proximity sensor are used for context recognition, in combination with the user interface. The light sensors are used as flash lights and also as to brighten the screen at the time of capturing the photograph in the mobile. Most of the other devices are digitized and they are aware of the location of users. Hence, these sensors are used for showing the roots for driving and also provide information for the people about the new location. The accelerometer [3] finds the physical moment of users, whomsoever carry a smart phone. They have the capability to sense the standing, walking and running of a person. The camera on smart phones are used for photo, editing and also has the capability to click the particular person through eye or hand-top moment. Moreover, ear phones in the mobile devices are also used to calculate the blood pressure levels.

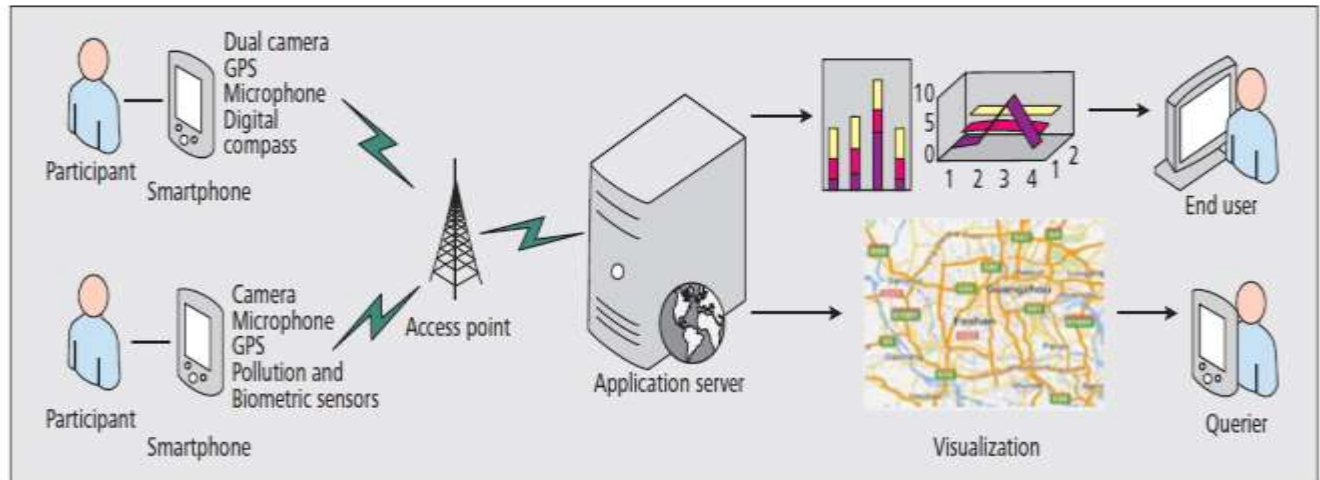


Figure 4.1 : Semantic Modelling of Mobile Sensing

5.0 Applications of Mobile Sensor Network

The recent technology uses both high level and low level sensor information [2] and data in combination with mobile phone in many of the academic and non-academic areas. It is now recently used in military base stations with embedded GPS to find out the location of a person within a city. These recent researches involve large amount of location based information and difficult patterns of mobile and end-up in commercial purpose and some of the applications are discussed in detail.

5.1 Social Networking

There are billions of people who actively involved in social networking sites online and contribute towards consistent amount of data. It has been observed that some of the recent investigations predicted the usage of sensors in mobile phone, which has the capacity to automatically categorize live activities of people in Face Book, LinkedIn and Twitter etc. Thus, sensor plays a major role in online participation of a person and is tracked daily and its performance is evaluated strongly.

5.2 Medical and Health Care

Many of the mobile phones in today's environment come with self-assessment survey reports, which do not require frequent consultation with the doctor. The sensor network [1] has the capability to collect continuous data and provides first aid treatments. The recent technologies have the capability to capture physical activity of a person and relate it to information so as to finally provide feedback. The effectiveness of these systems is proven to be high and increases health consciousness and provides the way to motivate exercises.

5.3 Network Transportation

The congestion and traffic are the serious problems, which affect human and environment by ending up in wastage of human hours. The sensor networks enable the users in which traffic information are routed by using recent techniques [2] and helps in facilitating and planning the accurate travel time needed for individual users.

5.4 Pollution Monitoring

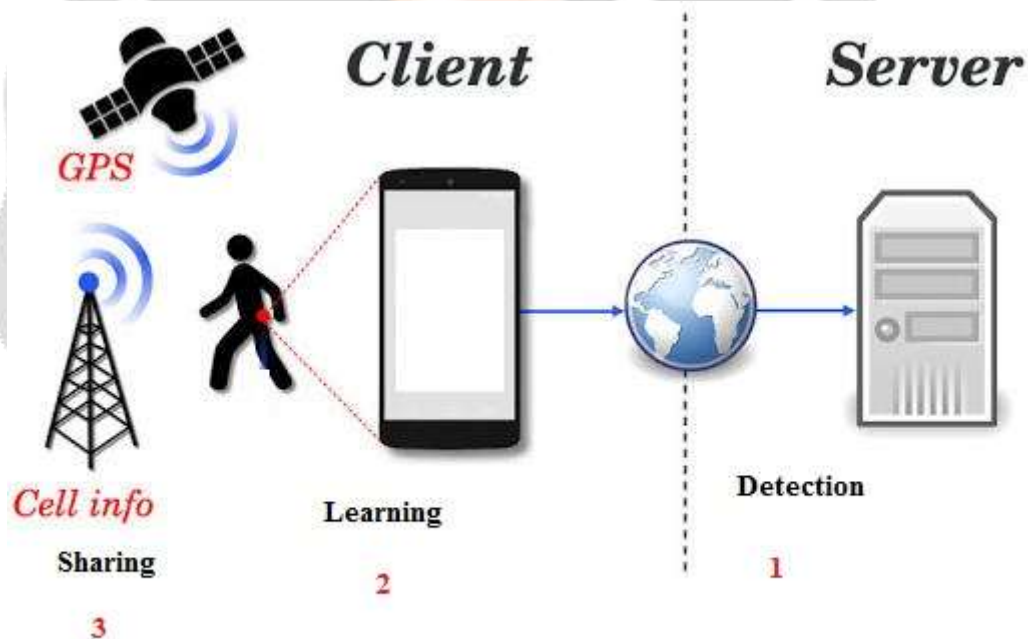
The sensor network used in mobile phone enables personalized environmental reports and provides ways to track carbon emission in vehicle.

5.5 Application Stores

The application stores used for Apple, Microsoft, Android and Nokia helps them in effective distribution of mobiles to meet the future technological advancements [3]. The application stores are successful and attract even individual developers with number of users. In furtherance, the application stores are useful for running consistent experiments with many users around the world and to produce consolidated report on its effectiveness for continuous improvement.

6.0 Mobile Phone Sensing Methodologies

The mobile phone sensing methodology [4] is fantasizing in recent world. There are many new emerging tools and software, which helps in faster development of technology and development of sensing. The figure 6.1 shows the simple view of Phone Sensing Technique.



6.1 Simple Phone Sensing Technique

The important technique have to be framed for collecting suitable data and sharing some of the recent technique argue that sensor raw data should not be pushed directly to sensor cloud or to online drives due to security and privacy issues. Hence, the technique and method, which has been proposed in this chapter is the emerging point to widespread areas. These methodologies [4] consist of three main components:

6.1 Detection

The raw information or raw data has been collected from different types of sensors, which are embedded in mobile phones.

6.2 Learning

The raw data collected from different sensor networks is extracted and transferred to the client machine by using data mining and assembly language learning methodology [4]. These operations can take place directly or indirectly. For instance, if a raw video data is captured using an android mobile phone and transferred to other device or cloud using data mining algorithm and partitioning techniques.

6.3 Sharing

This concept refers to wrap-up of all collected components together in the form of a bundle and sharing (broadcasting) it across the domain. It can be done to a particular individual, to a community or to a group of people during sharing privacy is one of the important factors that are to be considered. Therefore, data has to be sent securely by using protection mechanism.

7.0 Privacy in Mobile Sensing

The important factor [4] to be considered in today's world is the need for continuous sensing. The mobile phone should have operational utility [4] such as: background processing, multi-tasking etc. It is to be noted that in today's world, only Nokia provides holistic android support for continuous sensing. However, other smart phones concentrate only on computation speed, storage and memory required. There is a large increase in limitations of continuous sensing, which requires a very short window time of a data or a single image or a snapshot. There is more amount of fast overhead incurred in continuous sensing. It is the responsibility of market to supply mobile phones with privacy protection technology. Interestingly, now there are many stake holders who understand the issues and sensitivity faced by the sensor network. When user information is leaked there are many techniques available at low cost to provide privacy of data such as RSA algorithm [3], secured data mining etc., There are many risk from third party attacks on online networks. Therefore, the privacy of third party can be effectively protected by means of using methodology which is defined above.

8.0 Scope

Numbers of mobile applications are focused around the location of the users. Reference [4] defends about the increasing number of mobile sensing techniques. The scope of the technology is to gather different type of information from heterogeneous resources and present it to light weight applications. Location based mobile sensing technique is helpful at tracking many users recognizing their activities and transportation modes. The availability of data can be inferred with the help by GPS. The usage of GPS for Mobile sensing is valid for outdoors. Once GPS times out because of the weak signals, Wi-Fi scanning [3] can be performed by checking for the availability of wireless access points. The scope of the chapter is not limited to hybrid localization scheme to achieve high performance. Looking into the future we tend to believe that smart phones have empowered to create innovative social activities at any location. This also leads to the booming society of "Internet-of-Things" [IOT].

9.0 Conclusion

Mobile Sensing plays a major role in developing many applications in smart phones. The chapter provides a comprehensive overview. It also points out the importance of mobile phone sensing techniques in real time and also identifies the opportunities in research area.

The chapter discusses the recent techniques like, mobile sensing technology, which has phenomenal significance in terms of telecommunication effectiveness. The main limitation of this technology is lack of proper infrastructure. Also, more number of people carry mobile without knowing the aspects of sensing capabilities. In furtherance, the privacy protection is to be the major consideration for the technology. It is to be noted that, once if all the above factors and limitations are overcome, then this technology will quickly advance to the next step in providing better solutions for mankind in terms of health and networking. Therefore, mobile phone sensing technology is the best and most needed for socio-economic development.

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