

An In-Depth Study of Mobile Computing Devices Applications and Challenges

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Abstract— The mobile computing is a computing organization in which a computer and all necessary accessories like files and software are taken out to the field. It is a system of computing through which it is being able to use a computing device even when someone being mobile and therefore changing location. The portability is one of the important aspects of mobile computing. The mobile phones are being used to gather scientific data from remote and isolated places that could not be possible to retrieve by other means. The experts are making top procedure mobile devices and web-based applications to scientifically explore interesting scientific aspects of their surroundings, ranging from climate change, environmental pollution to earthquake monitoring. This mobile revolution empowers new ideas and innovations to spread out more speedily and efficiently. Here we will discuss in brief about the mobile computing technology, its guessing, challenges and the applications.

Keywords— Mobile Computing, Mobile Sensing, Applications.

I. INTRODUCTION

The mobile computing is a category of computing where the computer and all necessary files and software are taken out into the field. Several kinds of mobile computers have been introduced since the year 1990, including wearable computer, personnel digital assistant (PDA), enterprise digital assistant (EDA), smartphone, carputer and ultra-mobile personnel computer (UMPC). The mobile computing has three aspects,

- (i) The mobile communication
- (ii) The mobile hardware and
- (iii) The mobile software.

The first aspect addresses communication concerns in ad-hoc and infrastructure networks as well as communication belongings, protocols, data formats and actual technologies. The second aspect focuses on the hardware, i.e. mobile devices or device components. The third aspect deals with the appearances and requirements of mobile applications. In the year 1972, American Telephone & Telegraph (AT&T) department submitted a proposal for cellular facility to the Federal

Communication Commission (FCC). The proposal had been approved in 1982. The scheme to create the first handheld mobile phone called the DynaTAC 800X, was ongoing by Motorola in December 1972 and took until 1983 [2, 3]. The first generation (1G) mobile phones which existed

developed in the year 1983 are analogue and used 824-894 MHz frequency band. The voice channel was 30 KHz wide and each channel had 2 frequencies, one for transmission and the other for reception of information separated by a frequency of 45 MHz. The 2nd generation (2G) phone added compression and can accommodate 3-10 times more networks. There are 3 competing technologies for 2G phones,

(a) The Frequency Division Multiple Access (FDMA) anywhere each cell uses a separate frequency. This is mainly used in analogue phones,

(b) The Time Division Multiple Access (TDMA) where every cell uses a certain portion of time on a given frequency. This offers three times the size of analogue system and is used by Global System for Mobile Communications (GSM). The

GSM has encryption for safety and uses the 900 MHz and 1800 MHz frequency bands in Europe, and much in Asia and Africa. It uses 850 MHz and 1900 MHz in the US and Canada,

(c) The Code Division Multiple Access (CDMA) where each cell uses a single code and spreads the code over the available frequencies. It uses Global Positioning System (GPS) for timing. The 3rd generation (3G) mobile technology was planned for smart phones. In individual it increases the bandwidth and transfer rates up to 3 Mbps, and accommodated web applications, audio and video files. There are several access protocols including CDMA, Universal Mobile Telecommunications System (UMTS) who's most common form is wideband CDMA, and Time-

Divisionsynchronous CDMA. The 4th generation (4G) is the name specified to the next generation of mobile devices. There are two mainchallengers,
 (d) the worldwide interoperability for Microwave Access (WiMAX)and
 (e) The Long Term Evolution (LTE). They increase data speeds up to 100Mbps down and 50Mbps up, enhance security. It enables to carry High Definition Television (HDTV). They are plannedforinternetuseoncomputersalso.Theyare companionable to Internet Protocol (IP) packet switching and support IP version 6(IPv6).

II. MOBILE COMPUTINGDEVICES

There are several mobile computing devices developed by number of companies. The dashtop mobileequipment(DME)referstoawirelessmobile devicemountedonthevehicledashboard.TheDME includes satellite radios, GPS navigation, OnStar, mobile TV, High Definition Radio (HDR), vehicle tracking system, motor vehicle event data recorder (MVEDR) and Broadband Wireless Access (BWA) devices. Except for OnStar and BWA devices, most of them are in the period of passive one-way communications equipment. However, fast- evolving mobile technology is on the threshold of turning dashtop mobile equipment into full-duplex multimediagadgetryonthe strengthoffast-growing broadband infrastructure, including expanding WiMAX networks worldwide, with growing indications that convergence into an all-in-one dashtop mobile device is an ultimatedestination.

An EDA is a hand held computer which was adapted for extensive more robust use within the small to medium enterprise (SME) and enterprise business applications (EBA) as a data capture mobile device.

Over the an inordinate length of time, these business application have industrial from easy batched records collection using Barcode readers to contain extensive usage of other growing business technologies within the areas of Wireless Local Area Networks (WLAN), Global Positioning Remote Sensing (GPRS), Edge Communications, Biometrics, Magnetic Stripe, Smart Card and Radio Frequency Identifier (RFID) data capture technologies. The EDA is also known as Data Capture Mobile Devices (DCMD) or Batch Terminals (BT) or Portables. The EDA has many uses in various types of business, e.g. (a) the warehouse management, (b) the inventory control and (c) in the Field Services etc. The EDA is available on a variety of different Operating System (OS)Platformse.g.WindowsCE,WindowsMobile, Windows Pocket PC, Windows XP Tablet Version, Linux (Various), Palm, DOS and some patented OS Platforms. An EDA is designed to use in more harsh or hazardous environments.

These rugged compact devices can deliver wireless Wide Area Network (WAN)/Local Area Network (LAN)/Personnel area network (PAN) voice and data communications, including voice over internet protocol (VOIP)functionality.

TheEDAsareavailablein a numberofformfactors, e.g. handheld or wearable and know how to be further extended to include figure barcode scanners, RFID panel antennas, swipe card readers, external Battery Packs and printer carry cases. The PDAs container be extended to add-on data capture functionality the EDAs very often are designed without theessentialforadditionsandcaninclude a combination of build in records capture functionality. A smartphone is a mobile device that offers more advanced computing capability and connectivity than a contemporary basic feature phone. Most of the feature phones are able to run applications based on platform such as Java Micro Edition (JME). A smartphone allow the user to install and run extra advanced applications based on a specific platform. The smartphones track complete OS software providing a platform for application developers. It can be considered as a personal pocket computer (PPC) with mobile phone functions, although quite smaller than a desktop computer (DC).

Thegrowingdemandforprogressivemobiledevices brave powerful processors, Plentiful memory, larger screens, and open OS have outpaced the rest of the mobile phone market for several years. According to a learning by ComScore, over 45.5 million people in the United States of America (USA) owned smartphones in 2010 and it is the fastest growing segment of the mobile phone marketplace, which comprised 234 million subscribers in USA.In the face ofthelargegrowthinsmartphonesales in the last few years, smartphone shipments only make up 20% of total handset shipments, as of the first half of2010.

The Carputer is the major expression used to depict a group of mobile computer designed and modified to specifically install and run in automobiles. Originally these were based on industrial PC technology. But as smartphones and PDAs have become more powerful, and have included useful technologies like GPS and Bluetooth, they become the predominant base platform for developing carputers.

The recent popularity of carputers has caused the creation of more advanced units that use touch screen interfaces, integrate with vehicles via On BoardDiagnostics(OBD-II)link,andofferavariety of other add-ons like rear-view cameras and GPS. Among PCs, UMPC is a term coined by Microsoft for a small form factor version pen computer running a licensed copy of Microsoft's Tablet PC OS. With the declaration of the UMPC, Microsoft dropped the

licensing requirement that Tablet PCs must support proximity sensing of the stylus.



The fig.1 shows some of the common mobile computing devices recently in used

III.MOBILESENSING

They industry analyst sp redicts that cellphoneswill become the “next PC”, it is believed that the cell phone has the power to become something much more than a scaled-down, connected Input Output (IO) and processing device. In addition to these ordinary PC characters, a cell phone is located in an environment, mobile, and typically co-located with a user. These characters make the cell-phoneideally suited to track and understand the impact that the environment has on individuals, communities, cities, as well as understanding how humans effect their environment. By attaching sensors to GPS- enabled cell phones, one can gather the raw data necessary to begin to understand how, for example, urban air pollution impacts both individuals and communities.

Understanding the raw data gathered from the network of cell-phone-attached sensors presents significant challenge as well. The cellular phone users are mobile, are improbable to calibrate their sensors, typically put their phone in their concise or handbag, thus obstructing the sensor from airflow, spendconsiderabletimeincars,andtypicallycharge their phone at most once per day, often much less frequently. Even if users did calibrate their sensors, the very low-cost sensors future to use drifts over time and environmental conditions. Without knowing the location of a sensing event, automatically calibrating the sensors in the phone, detecting the environment of the phone, and intelligently managing power, the data gathered by the phones will be next touseless.

The economics of mobile phones furthermore provide a unique opportunity for developing countries in particular. Since mobile phones be inclined to first find markets in the highly industrializes world, and then secondary markets in less industrialized areas either in the form of used devices or low valued overstock, if devices are manufactured with sensors integrated into them, they are almost certain to find their way to all corners of the globe.



Fig 2: On Top is the Opening Screen; Middle, Directing, the user bottom, ready to report.

Even these days, the low cost of mobile phone-based computing offers the chance for scientists in developing regions with modest budgets to deploy sensing in their communities or areas of study. Integrating sensing into mobile phones is increasingly straightforward and common. The mobility of the phone so provides some significant opportunities. At the expenditure of sampling a given location continuously, a sensor in a user’s phone can provide significant geographic coverage. The mobile sensors will be heavily biased towards location in which people collect, so for human- center applications, sensing in mobile phones will often provide coverage exactly where it is needed most.

The Computer experts in the University of Southern California (USC) have found a way to combine smartphone resources with a novel application that allows the phone users to help in monitoring air quality. The application is provisionally titled, "Visibility". According to GauravSukhatme,thecomputerscienceprofessorof USC who documented the paper work, the basic principle of the Visibility app is simple. The user takes a picture of the sky while the sun is shining, which can be compared to establish models of sky luminanceto approximatevisibility. The perceptibility is directly related to the concentration of harmful "haze aerosols," tiny particles from dust, engine exhaust, mining or other sources in the air. Such aerosol sturn the blue of a light clear sky gray. Fig.2 gives a glimpse of the application. The system has been tested in numerous locations, including Los Angeles and in Phoenix, Ariz. The USC rooftop camera has a built-in "ground truth" test - it is near a usual air pollution monitoring station. So future the results are promising, but they indicate that several improvements are possible.

IV.APP INVENTOR FOR IMPLEMENTING MOBILEAPPLICATIONS

The App Inventor is a prototype programming tool for Android 1 that lets someone easily create mobile

applications and customize existing applications. With the support of Google University Relations, a faculty group is working together to pilot courses where beginner students, including non-computer science majors, can create Android applications that incorporate social/ networking, location awareness, and web-based data collections. App Inventor could change the nature of introductory computer science by making it less dissociated and more about people and their interactions with the world around them. The educational perception that motivates App Inventor holds that programming can be a vehicle for engaging powerful ideas through active learning. As such, it is part of an enduring movement in computers and education that began with the work

of Seymour Papert and the Massachusetts Institute of Technology's (MIT) Logo Group in the 1960s.

The block editor uses the Open Blocks Java library for create visual blocks programming languages. The Open Blocks visual programming is closely related to the Scratch programming language, a project of the MIT Media Laboratory's Lifelong Kindergarten Group. The open blocks is distributed by the MIT's Scheller Teacher Education Program and derives from thesis research by Ricarose Roque.

The compiler that translates the visual blocks language for implementation on Android uses the Kawa Language Framework and Kawa's dialect of the Scheme programming language, developed by Per Bothner and distributed as part of the Gnu OS by the Free Software Foundation. The beta version of the Website for App Inventor for Android went live from Google Labs with a video demonstrate how easy it is to make App, including a number of thoughts for Apps people can make themselves. To use App Inventor, one does not need to be a developer. According to the websites, the App Inventor requires no programming knowledge. Software code is written by App Inventor software, while users are given option on what to include in the App. The site offers a number of suggestions in App creation, including use of the handset's GPS function for location, creating SMSs for friends, or building apps that link to other services, such as Twitter. The new software tools should give Google's Android mobile software a support up against rival smart phone software, including Apple's iPhone OS. The App Inventor site lets anyone be converted into an App creator, giving people the power to design software specifically for their own needs. That's not so easy in iPhone. Anyone concerned in using App Inventor to start making Android Apps will need a few things, including a Gmail account, a computer and an Android-based handset. Smartphones let us transfer computing with us, have become central to servicing our communication and information requirements, and have made the web part of all that we do.

V. CHALLENGES

Integrating sensors into mobile phones have a number of practical advantages. For many applications, the most considerable challenges that face conventional wireless sensor networks are power management and network development and maintenance. Among these, power executive is greatly simplified in mobile computing, because user charges their phone regularly. The network construction is also largely solved. Also, a lack of real-world, real-world applications have limited the sum of wireless sensor network nodes that get produce, and thus the price of a node remains relatively high. With the number of mobile phones sold in the year 2010 on track to surpass 1.2 billion, cell phones obviously have enormous economies of scale that will be rigid to imitate in the near term. Thus the mobile phone stage has several significant advantages as a sensor that will allow relatively simple and massive deployments.

The Human Computer Interaction (HCI) offerings new challenges, like the introduction and widespread adoption of the internet. It is taken for arranged that the most common way to access the Internet will soon be through mobile devices and that everyone, even those who never wanted to use a computer, will grip the use of mobile services. However, if HCI aspects of mobile technologies are not correctly addressed, the above mentioned scenario is not so likely to come true. Users resolve not happily adopt mobile computing devices if we are not able to prevent the caution and complexities of interacting through very limited input and output facilities. The mobile services will not be successful if we do not understand mobile users and design for their situations, which are very different from the one traditionally studied in HCI. The society stands to impact extensively from advances in mobile computing. Improved effectiveness in business may see less time spent in working, with more time for leisure. In other professions, this may see more opportunities to travel, with businesses based nationally and globally. The world will possibly communicate mainly in an online environment, changing the way we interact and engage. The theory of anywhere anytime connection may mean we are never un-contactable, adjusting our public and private lives. The mobile computing presents new encounters as well as new advantages, and must be tailored to suit the needs of the individual and organization.

The mobile computing faces many challenges on the path the accumulation acceptance and use. The initial costs of setup and preservation prevent many businesses from making the change. McKimmy assert that wireless networking setup, access restrictions, power supply, and file storage are all issues to contend, with careful planning essential for protection and piloting. The power is another critical issue with laptops

The security is additional major challenge in mobile computing. The miss-configured wireless networks present

a security hazard. Someone with a wireless computer could have full access to a LAN unless restrictions are implemented. This can be prohibited by instituting Message Authentication Code (MAC) addresses, a unique number that identifies its Network Interfacing Card (NIC). Unidentified computers can then be denied access if their MAC address is not on a certified list. Other alternatives such as a virtual private network (VPN) also exist. Other limitations related to connection speeds and access points. The Wi-Fi has seen some success, however it is hoped that the introduction of WiMax will see a greater number of users adopt mobile computing practices. Norman (The Invisible Computer) in Goldstein, Nyberg and Anneroth suggests that getting each tool to perform effectively presents yet another challenge. In order to make certain good enough usability, each tool should be tailored to fit the task and the interface should be as transparent as possible to the user.

VI. APPLICATIONS

Some of the applications of mobile computing are education and research, healthcare area, pollution monitoring, tourism industries, airlines and railway industries, transportation industry, manufacturing and mining industries, banking and financial institutions, insurance and financial planning, hospitality industry etc. The internet can be available from business, homes, and hot spots cyber cafes, available on cell phones. It is a critical business constraint, such as the oceanic fiber cuts that may result in loss of revenue and severe disruptions in networks. The essential speeds have moved for supporting simple text stations to email, the web, audio and video, requiring orders of magnitude increases in performance. It is no longer to a salesman come door to door for advertising shelves full of dictionaries and encyclopedias. Rather one preserve use the search engines such as Google, online dictionaries, Wikipedia etc. The written word is more and more enhanced and replaced with graphical images, sound clips and videos.

New software technology permit cell phone and PDA users to download their medical proceedings, making them quickly accessible in case of emergency, creating rooms for accessing the information about the status of airline or railway tickets. The new software to be accessible in years to come which can even display animated 3D scans. The computer scientists predict that the technology will also make possible students to do research using their portable devices.

Social networking has also in use off with application such as Facebook, Twitter and so on. The freedom of data via Google, blogs, photos, video (YouTube), Twitter, WikiLeaks are some good examples, or police harshness are often reported first by individuals. Intellectual property, e.g. the music industry's defensive stand, or how much does say Facebook or Google know about you, who your

friends are, where you live, where you work, for searches made, or mining all the emails etc. The smart phones convey mobility to the internet user.

VII. CONCLUSION

Today's computing has rapidly full-grown from being limited to a single location. With mobile computing, people be able to work from the comfort of any place they want to as long as the connection and the security concerns are appropriately factored. In the same light, the occurrence of high speed connections has also promoted the use of mobile computing. Being an always increasing and emerging technology, mobile computing will stay to be an essential service in computing, and Information and Communications Technology.

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