

# A Ubiquitous Computing – One of the Step Towards Smart Environment

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**Abstract**— Ubiquitous Computing means anytime anywhere computing. The main purpose of Ubiquitous Computing is to have computational possibility everywhere without being aware of the underlying network and this is going to play a significant role in the upcoming decade. As the wireless communication revolution is bringing wide changes in computing, ubiquitous computing has become one of the future vision of it. It tries to be highly embedded, properly fitted and become so natural that one's desire gets fulfilled without even thinking at it. One of the aim is also to sense the environment and react automatically with users need and to make their life simple, secure and easy. In this paper we are trying not only to explore the present status of ubiquitous computing in every aspect but also future approaches related to it. We also try to investigate the issues and wide range of engrossing applications. Many other developments such as wearable computing, handheld devices, RFID tags, smart areas etc. are also highlighted in this paper.

**Keywords**—ubiquitous; wearable computing; radio frequency identification

## I. INTRODUCTION

From Mainframe to desktop computing and from desktop to mobile computing the technology has always made transformation with the need of the era. Along with the research in this field the world is trying to achieve faster and continuous computing everywhere which has raised the need of Ubiquitous Computing.

Mark Wieser coined the term Ubiquitous computing in 1988 and in 1996 he introduced three stages of computer and computing use .Firstly the mainframe computer when people share one big computer .Secondly the personal computer period when one person uses one computer and Thirdly, and now the beginning period, when many computers serve one person. And according to him the last period began in 1990.

Ubiquitous computing is also sometime refer as pervasive computing and is use to describe a reality in which numerous computers are invisibly woven into the fabric of daily life. Many research are being carried out around the world and their work include areas of embedding system, use of sensors network, network protocol, software, security, wireless and fast communication and other computational methods. Many embedded, wearable, handheld devices communicate transparently to provide different services to

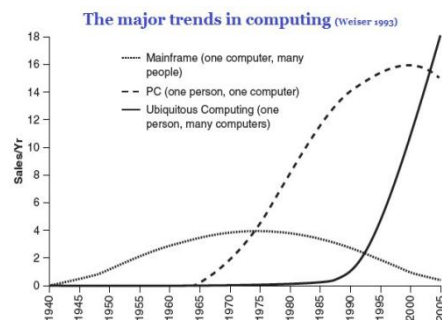


Figure 1: Graphical Analysis of trend in computing

the users based on requirement .These devices mostly have low power and short range wireless communication capabilities. Devices utilize multiple on-board sensors to gather information about surrounding environments. We can achieve ubiquity by making mobile computing and connected, instrumenting the person or by instrumenting the physical surrounding.

## II. CHARACTERISTICS OF UBIQUITOUS COMPUTING

Ubiquitous computing characteristics reveal that it is has many aspects to which it stand on differently with the other technologies. Its characteristics are as:

- **Permanency:** The information remains unless the user purposely removes it. User can never lose their work.
- **Accessibility:** The information is always available whenever the users need to use it. System access via ubiquitous computing technologies.

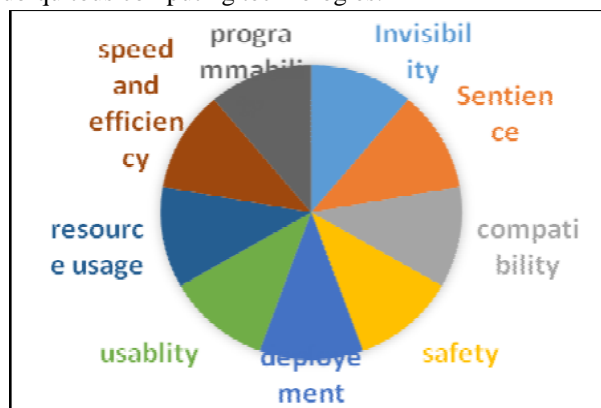


Figure 2: Characteristic of Ubiquitous network

- **Immediacy:** Information can be retrieved immediately by the user. Thus it saves users time and resources. Ubicom makes information sharing and getting an easy task.
- **Interactivity:** The devices can interact with other devices efficiently and effectively through different media interfaces.
- **Context-awareness and Adaptation:** The system can adapt to the user real situation to provide adequate information for the user. The system can understand the user's environment via database and sensing the user location, personal and environmental situations. It can adapt to Device Type, Time, Location, Temperature, Weather, etc.
- **Invisibility:** It contains Invisible Intelligent Devices, Wearable Computing Devices, RFID, Sensors, Smartcard, Information Artifacts, and Tiny Smart Device.

### III. GOAL OF UBIQUITOUS COMPUTING

The area of universal computing, which combines current network technologies with wireless computing, voice recognition, Internet capability and artificial intelligence, is to create an environment where the connectivity of devices is embedded in such a way that the connectivity is unobtrusive and always available. It wants to spread connectivity to everything from shopping mall to cars, from schools, hospitals, home and even to clothes. It aims:

- To provide best system design (which type of embedded system ,web server ,sensors and actuators)
- to provide service such as virtual mapping
- Mobility management
- Energy management
- Environmental monitoring, I/O matching, Service Composition, adaptation
- Extend the Internet to everyday object
- To achieve infrastructure support (roads, electricity, open platform ,DNS registry, time server TCP/IP protocol, web standards)
- To provide security, privacy, reliability and availability

### IV. CURRENTLY WHERE DOES UBIQUITOUS COMPUTING STAND?

- Ubiquitous devices (always at hand) – Mobile phones, PDA, laptops etc.
- Ubiquitous network (always available)- LAN/WMAN (Ethernet and IEEE802.11)-GSM/GPRS/3G-PANs (Bluetooth, AudioNet and IrDA etc.).
- Ubiquitous Services –currently mostly “location based”.

Today, there are already several analogous commercial devices that are in wide use. For example, smart phones are much like Tabs, as they can be kept with us at all times, access a ubiquitous data network, and put us in touch with useful remote services. Modern laptops(some of which also

convert into tablets) are very similar to ParcPad concept. Furthermore, modern electronic books such as Google play book based on e-ink technology are already providing a Pad-based user experience that rivals traditional books. Large-screen LCD displays with 50 to 60 inch diagonals are now also common, primarily driven by the television industry. Unlike the Live board, the majority of these devices do not have pen input or touch surface, but there are few products that provide this capability.

At present Japan, USA, China, UK, and France are the leading one in practicing ubiquitous computing. Two examples of contemporary computational practice, often neglected in Western research conferences—ubiquitous computing in Singapore and in Korea. Singapore is one of the most wired countries in this world yet digitally connected via wireless network. With a population of 45 million Korea is said to be the most connected countries in the world.

### V. FUTURE OF UBIQUITOUS COMPUTING

The next step is to Internet enable physical objects connecting people with things and even things with things. The Internet of Things will not only enable connectivity with people and their computing devices but with actual everyday things .By enabling connectivity for virtually any physical object that can potentially offer a message, the Internet of things will affect every aspect of life and business in way that is used to be the realm of fantasy. As our survey of existing research has indicated, there is lack of availability of tools and development environments that enable application development in ubiquitous environments. Clearly, significant progress must be made in this area before applications can be rapidly and reliably created for ubiquitous environment.

Right now we receive information in two distinct ways: pull or push. Pull can be characterized by a user sitting down at a computer, firing up Google, and searching for specific information in real-time. Push is characterized by receiving filtered information based on user preferences; much like the personalized text messages on your cell phone informing you of weather or traffic conditions. When computing becomes ubiquitous you will not need to manually set preferences. The object you interact with will learn from you and provide information based on your environment. Temperature, time of day, movement, sound, color and light will all influence the information you receive. Ubiquitous computing will provide a continuous stream of information without being distracting and will only provide the information you need at the time. Everything will become interactive and more importantly, reactive.

### VI. ISSUES AND CHALLENGES

Privacy, security, information management, reliability, mobility, Interoperability, scalability, networking, resource discovery etc. are the issues as well as the challenges of

Ubiquitous Computing. Its challenge is to develop new software with self- optimization, self-configuration, self-repair, self- protection and self-learning to achieve a networking environment, where user may interact with computers without being aware of the network and that too with low power supply.

## VII. RELATED AREAS

Many fields are related to ubiquitous computing they are:

- **Mobile Computing:** Mobile computing is human-computer interaction by which a computer is expected to be transported during normal usage.
- **Wearable Computing:** Wearable computing facilitates a new form of human-computer interaction comprising a small body-worn computer (e.g. user-programmable device) that is always on and always ready and accessible.
- **Wireless communication:** Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio.
- **Embedding system:** An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints
- **Human computer interaction:** Human-computer interaction (HCI) researches the design and use of computer technology, focusing particularly on the interfaces between people (users) and computers.
- **Artificial Intelligence:** Artificial intelligence (AI) is the intelligence exhibited by machines or software.
- **Distributed computing:** A distributed system is a software system in which components located on networked computers communicate and coordinate their actions by passing messages.
- **Context aware computing:** In computer science context awareness refers to the idea that computers can both sense, and react based on their environment. The term context awareness in ubiquitous computing was introduced by Schilit (1994).
- **Sensors Network:** A wireless sensor network (WSN) (sometimes called a wireless sensor and actor network (WSAN)) are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location.

## VIII. CONCLUSION

Ubiquitous Computing is gradually becoming the reality of our life and is changing our way of living. Now every computing device is becoming smart and is the need of present generation. Technology is finding its way in every aspect of our life. Computing and communication technology

is widely used and integrated in devices, environments, and everyday objects. Even with major advances in technology the vision of ubiquitous computing – from a user perspective – is not yet achieved. It is hard to achieve yet not impossible. Researchers are trying to deliver ubiquitous services in every field and are working continuously towards it. This paper tries to deliver the new era of computing its need, status, goals, and challenges in order to reflect ubiquitous computing in a broad way.

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