

Ubiquitous Computing

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Abstract: Ubiquitous computing generally known as “UBICOMP” is a concept in the field of software engineering and computer science where computing is made to appear everywhere & anytime. In light to desktop computing, ubiquitous computing can occur using any device, in any format & in any location. A user interacts with the computer, which can exist in many different forms, including laptops, tablets and terminals on everyday objects such as a refrigerator or a pair of glasses. The technologies that support ubiquitous computing are Internet, advanced middleware, operating system, mobile code, sensors, microprocessors, new Input/Output and user interfaces, computer networks, mobile protocols, location and positioning. This is also described as pervasive computing, ambient intelligence, or "everyware". Each term emphasizes a slight different aspect. When concerned to the objects involved, it is also known as physical computing, the Internet of Things, Haptic computing and "things that think". Ubiquitous computing touches on distributed computing, mobile computing, location computing, mobile networking, sensor networks, human-computer interaction, context-aware smart home technologies, and artificial intelligence. Rather than propose a single definition for these related terms, a taxonomy of properties for ubiquitous computing has been proposed, from which different kinds of ubiquitous systems and applications can be described.

Oftenly considered as the successor to mobile computing, ubiquitous computing involves wireless communication and networking technologies, mobile devices, embedded systems, wearable computers, radio frequency ID (RFID) tags, middleware and software agents, internet capabilities, voice recognition and artificial intelligence. Because pervasive computing systems are capable of collecting, processing and communicating data, they can adapt to the data's context and activity. That means, in essence, a network that can understand its surroundings and improve the human experience. An environment in which devices, present everywhere, are capable of some form of computing can be considered a ubiquitous computing environment.

Layers in Ubiquitous Computing

Ubiquitous computing can be looked at as consisting of several layers, each with its own roles and together they form a single system.

Layer 1: The Task Management layer: known as the first or face or input layer which accepts the user tasks, context and index thus managing the complex dependencies that come within the territory.

Layer 2: The Environment Management layer: that focuses on the resources and their capabilities in addition to mapping service needs and user level states of specific capabilities.

Layer 3: The Environment layer: It tracks relevant resources and manages their reliability.

Ubiquitous computing is a combination of three technologies, namely:

Micro electronic technology: Gives small powerful device with dazzling display and low energy consumption.

Digital communication technology: Provides higher bandwidth, higher data transfer rate at lower costs along with wide world roaming.

The Internet standardization: Is done through various standardization bodies and industries to give the framework for combining all components into an interoperable system with security, service and billing systems.

Thus, wireless communication, consumer electronics and computer technology were all merged into one to create a new environment called ubiquitous computing environment. It helps to access information and render modern administration in areas that do not have a traditional wire-based computing environment.

The desticious focus of ubiquitous computing is the creation of smart products that are connected, making communication and the exchange of data easier and economical. They consider the human factor as an environment, rather than computing, environment with the use of inexpensive processors, thereby reducing memory and storage requirements and capturing of real-time attributes which totally are connected and constantly available computing or processing devices. Focusing on many-to-many relationships, instead of one-to-one, many-to-one or one-to-many in the environment, along with the idea of technology, they include local or global, social or personal, public or private and invisible or visible features and consider knowledge creation, as well as information dissemination which is constantly present. As technology progresses, the reliability factor on the different equipments used may be impacted relying on converging Internet, wireless technology and advanced electronics. Increased surveillance and possible restriction and interference in user privacies, as the digital devices are wearable and constantly connected

Applications of Ubiquitous Computing

The range of devices that are compatible with ubiquitous computing systems is indeed wide. Smartphones, Wearables, Smart speakers powered by (IVAs), Self-driving vehicles / self-driving cars, Smart home gadgets / home automation are some of the good examples of ubiquitous computing. Matter of fact, an autonomous vehicle can identify its authorized passenger through smart-phone respected application, charge itself when needed, and handle tolls, emergency responses, and fast-food payments by itself by communicating with the infrastructure thus making an even better instance of ubiquitous computing.

Advantages of Ubiquitous Computing

- Some of the benefits of ubiquitous computing are:
- a reduction in cost of services utilizing smart networks,
- improved scheduling and productivity in manufacturing,
- quicker response times in health care settings,
- more accurate targeted advertising, more convenient personal financial transactions.

Ubiquitous computing offers benefits to people by combining sensors, networking technology and data analytics to monitor and report several things, from purchasing preferences and manufacturing processes and traffic patterns as such. These computing systems detect anomalies, errors and emissions in the working environment, enabling early intervention or prevention of disaster in the workplace. It also track usage of the resources, inputs and outputs, allowing for better management of resources during high work load periods or for better distribution of resources across the time period.

The deployment of ubiquitous computing sensors and networks to rural areas also help the delivery of services to remote places. Medical services can be offered well beyond the location of a hospital or a clinic, with doctors being able to monitor patient vital signs from great distances. Education to rural areas can also be offered through the usage of interactive media delivery technology, letting students and professors to communicate in a personal context without physical presence in the same classroom.

Challenges of Ubiquitous Computing

Privacy is among the biggest challenges being faced by ubiquitous computing. Hence, protecting system security, privacy and safety in ubiquitous computing is essential. Despite the advances made in this technology, the field faces issues in areas such as human-machine interfaces and data protection in addition to the technical obstacles creating problems on both availability and reliability fronts. Despite the rapid rise of smart devices making ubiquitous computing accessible to everyone with a comprehensive infrastructure and ease of use seems difficult. Senior citizens and people in rural areas are still at a disadvantage and this has to be addressed in order for ubiquitous computing to be adopted in a wholesome or fully fledged manner.

Conclusion:

A new trend toward embedding everyday objects with microprocessors in order to communicate information referring to the presence of computers in common objects found all around us so that people are unaware of their presence. All these devices communicate with each other over wireless networks without user interaction. Pervasive computing is the next dimension of personal computing in the near future, and it will definitely change and improve our work environment and communication methods. It provides us with small portable personal assistant devices having high speed, wireless communication, lower power consumption rate, data storage in persistent memory, coin sized disk device, small color

display video and speech processing technology, these features giving the users freedom to effectively communicate and access information from any place in the world at any time.

References:

<https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing>

<https://www.techopedia.com/definition/22702/ubiquitous-computing>

<https://www.igi-global.com/dictionary/ubiquitous-computing>