

Pervasive Computing - The Innovational Era

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Abstract– This paper describes about the research topic pervasive computing and its advantageous usage in various areas. Pervasive Computing interaction systems are rapidly increasing the usage in every era of our lives and have changed the aspects faster than speed. Large scale of interactive media faces challenges to emergence into existing physical environment and newly built structures, which requires to achieve managing capabilities of various stakeholders, existing work practices and schedules. This technology of Pervasive Computing is growing in human lives and due to this it has become the need of time. The world is changing every bit with the advancement in this technology every minute. This emerged technology has changed the view how we look at the new techniques.

Keywords- pervasive computing, embedded, sensor networks, distributed computing, network, information processing, digital techniques.

I. INTRODUCTION

Human social network plays a remarkable role in the information spread in Cyber World. Innovation has changed our lives to an extensive degree and still can possibly transform it in another and emotional way. Due to multiplication of innovation into our lives to an expansive degree we spend our lives in an alternate manner when contrasts with our forefathers. Innovation has connected us into our everyday life exercises from attempting to recreational exercises. We are presently engaged in interaction with the use of distinctive devices, gadgets, robotics, and machines all the way round.

Pervasive systems also called as ubiquitous computing systems refer to construct a universal computing environment where unified and invisible access to computing resources is provided to the user. It aims to make our lives modest and easier through the use of machine interaction by human. Pervasive computing depends/works with the usage of wireless technologies, advanced, electronics and the Internet. The concept of pervasive computing is based on a simple idea that with advances in technology, computing equipment will grow smaller and gain more power; this would allow small devices to be ubiquitously [3] and invisibly used in the everyday human surroundings and therefore provide an easy access to the computing environment. The main technologies such as internet, intranet, operating systems, sensors, microprocessors, and mobile protocols are used to give support for this technology to function well.

A. History of ubiquitous/pervasive computing

Ubiquitous computing was first discovered at the Olivetti Research laboratory in Cambridge England, where the Active

badge, a “clip on computer” the size of an employee ID card, was created, enabling the company to Track the location of people in a building, as well as the object to which they were attached.

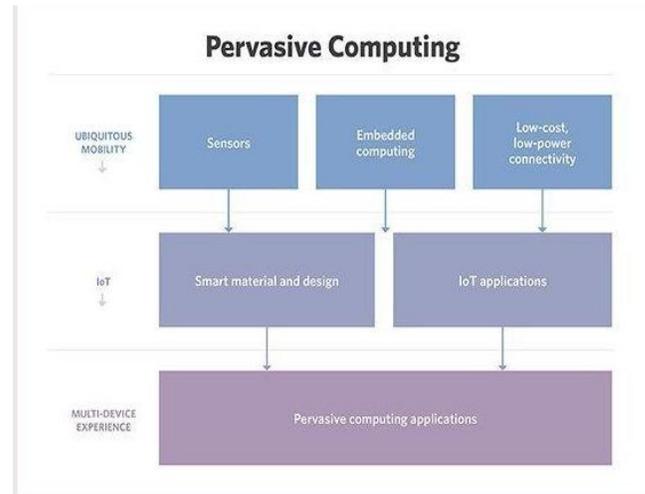


Fig. 1: Example of Levels for Pervasive Computing

Largely considered the father of pervasive computing Mark weiser and colleague at Xerox PARC soon thereafter began building early discoveries of this technologies & the devices in the form of “tabs”, “pads” and boards.

When we say pervasive...

In the year 1999, many news articles appeared about appliance firms planning to link their products to the Internet for maintenance, product orders, and upgrades. As the New Year began, some news regarding strategic alliances between appliance manufacturers and technology companies brought these plans closer to reality. News included the following: An exercise machine maker that plans to equip its products with free Web service -- so that a technologically oriented lifestyle needn't be sedentary (Nettles Communications Inc.,).

1. A convection microwave oven that downloads recipes and automatically sets the time, adjusts the power, and does the roasting, baking, and broiling (Sharp Electronics Corp.).
2. A net-connected refrigerator with bar code-based food tracking and reorder capability (General Electric).
3. Talking wrist watches
4. Navigations speaking in cars, even in bikes. Etc. and many more advancements.

II. ARCHITECTURE FOR PERVASIVE COMPUTING

The Pervasive computing architecture has contains four important areas, they are:

- Devices
- Networking
- Middleware
- Applications

A.DEVICES

The ubiquitous/Pervasive environment consists of many different types of input and output, storage devices. Some of the system devices such as keyboard, mouse, touchpad , wireless mobile devices, sensors and smart phones these systems can be used as input device for a pervasive environment. In that the sensors automatically collect the information about the environment [1] and feed this input directly to the pervasive network.

B. NETWORKING

All the Pervasive devices are connected with other communication devices through the distributed network. They can be connected through the Local Area Network (LAN) or Metropolitan Area Network (MAN) or through Wide Area Network (WAN) for the global availability.

C. MIDDLEWARE

In order to make a communication between a end-user and a system the pervasive network should need a middleware which we often term as"kernel". The middle either may be a web application or set of software(applications)-bundle. The software-bundle is running in an client-server mode or peer-to-peer mode technology.

The Pervasive computing is more environment-centric than web-based or mobile computing. The data which are collected [2] through pervasive environment will be processed by the middleware software and the output will generated based on the present environmental input

D. APPLICATIONS

The applicational fields use the applied research techniques which are helpful to carry out the basic needs and operations in day to day life. The technology of pervasive computing had made easier access to the working of an individual. The literate or less literate person can easily use the technology with fewer efforts.

III. REQUIREMENTS FOR PERVASIVE INTERACTION:

Pervasive applications interfaces are used in a lot many ways and in number of areas, to their surroundings and act as indicated by the situation. They should adapt as per context and don't need explicit interaction from the user. The primary destination of Pervasive Computing is to permit user to emphasize on their task instead on technology. In few years as well as presently we watch numerous applications that will accumulate user context through sensors keeping in mind the end goal to do exact things at exact time.

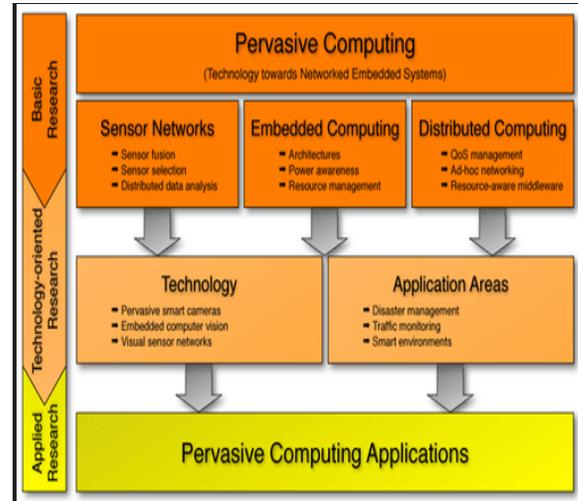


Fig.2: Architecture Plan for Pervasive Computing

A.TASK ORIENTED INTERACTION

Pervasive system environment ought to permit the user to focus on the task as opposed to on the technology. Pervasive systems permit interaction between task and affective information processing. Pervasive devices with high level of tasks orientation are, consequently, a most significant objective.

The Web has proven its value to business by linking various players. Pervasive computing promises even more interaction among players, such as

- suppliers (commodity, strategic, component, emerging),
- customers (catalog shoppers, solution communities, prospects),
- partners (value-added),
- employees (sales, marketing, technical, finance), and
- Influencers (press, consultants, shareholders).

IV. PERVASIVE COMPUTING CHALLENGES

Pervasive Computing has a number of domains on both local and worldwide situations.. One of the most important and open questions is how to ensure that a computing system is seamlessly and invisibly embedded in the environment and how to minimize the possible impact of its intrusiveness on a user's perception. Generally, there are two basic approaches for solving the problem of security of a pervasive system: by Miniaturization of devices and embedding of the system's logic into wearable, handheld, and mobile devices, as well as into the environment, and by achieving a level of intelligence [3] [4] of the system that will be able to anticipate the actions of the user in the context of the factors in the environment. As a result, such a pervasive system will "fade into the background" It is critical for analysts to recognize the challenges, objectives, and methods for mounting these technologies in diverse areas to completely aware of its potential. Pervasive Computing would detriment the entire society and absent the limits in computing. Progressively, a significant number of the chips around us will sense their surroundings simply.

Pervasive Computing systems must overcome following challenges. Security outline must consider standards of time and area though Pervasive Computing is expanded in various environments transparently. The Protection from the Unauthenticated/ unauthorized user (security), avoidance of access by an attacker through unverified techniques (integrity), giving availability to user totally (accessibility) and evading an entity from denying previous activities (non-denial) are essential factors the security model. Recognizing kind of exchanging information, the misuse, shortcomings and features, the security issues in remote system base for network infrastructure can be represented.

- Unauthorized access
- Viruses attack to destroy security system
- Undefined security solutions
- Information hacking by hackers
- Weak infrastructure of application
- Weak synchronization.

V. GOALS OF PERVASIVE (UBIQUITOUS) COMPUTING

The principal goal of the Pervasive Computing interaction is to permit user to pay attention on their everyday task instead of innovation [7]. In last few years we watch number of applications that accumulate user setting through sensors so as to do right things at the correct time. Pervasive Computing systems have utilization sensing, computing and correspondence abilities to watch and react to natural phenomena. Such system will inevitably empower computers to consistently incorporate into ordinary life. They have so much of potential applications in the workplace, home, health awareness, gaming, ecological checking and open transportation and the list is never ending.

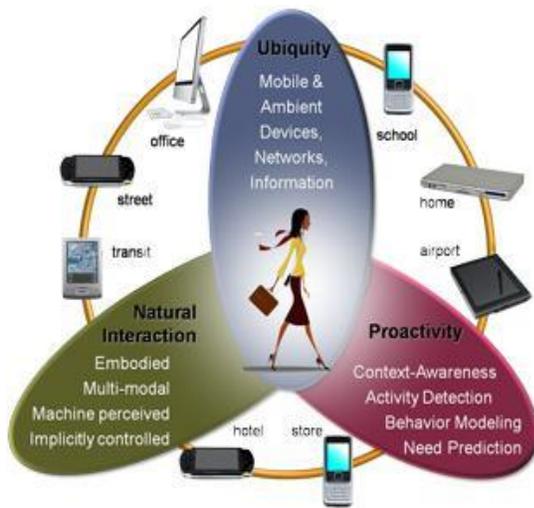


Fig.3: Goal: Integration with virtual and Physical world

VI. SOME AREAS AND FIELDS THAT USE PERVASIVE COMPUTING

A. Smart Clothing

Pervasive computing is widely being used in smart clothing. The technique uses Conductive [8] textiles and inks print electrically active patterns directly onto fabrics. Sensors based on fabric monitor pulse, blood pressure, body temperature. The systems uses processors built in running kit, that tracks distance, heartbeat etc.

Invisible collar microphones are also being used in social media. The interviewer needs not to hold mikes, they just speak on their pitch and the voice is gathered by the help of microphones. This technique is also helpful in detective purposes.

Clothing

- Smart clothing or 'wearable tech' has become big news
- Applications include processors built into running kit to track distance, heartbeat etc.
- One example is a 'smart' shirt from Ralph Lauren...

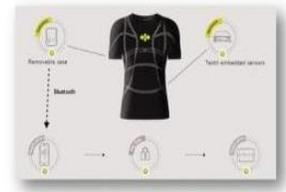


Fig.4: Pervasive Computing Technique in smart clothing

B. PILL CAM

This is an real time application which uses pervasive technique. Pills are used in diagnosis, they contain miniature cameras. The pills are swallowed by the patient. Once swallowed it gives the data about the functioning of the vital organs in our body



Fig.5: Pervasive Computing in Health and medicine

C. PROPERTY SECURITY MONITORING SYSTEMS

Pervasive systems are widely being used in cameras. These cameras are helpful in house monitoring, office monitoring, in shopping malls etc. thus providing security measures to the owners for their property. The owner can monitor the property by keeping an eye through cameras connected via pervasive computing [7] in laptops, mobile phones etc.



Fig.6: Pervasive Computing Technique in Devices

D. WRIST WATCHES

This is a digital era. People often comes uses digital watches. The companies like apple introduced D-Watches which makes the use of pervasive computing techniques. These watches are helpful as they manage health(keeping in account the blood sugar levels, heartbeat etc.), managing social accounts, helpful in home security systems(integrated with security cameras used in house), playing music(integrated with mobile phones), maintaining balances of persons time to wake and sleep(alarms in watches) etc.



Fig.7: Pervasive Computing Technique in Smart watches

E. INTERACTIVE FLEX POSTURES

Flexes that communicate with the persons automatically in a building and then providing him the information about his office and the venue of the meeting that has held



Fig.8: Pervasive Computing Technique in Flex Postures

F. CAR CONTROLLING AND NAVIGATION SYSTEMS

Pervasive technologies are widely used among the automobile companies. They embed sensors using the pervasive computing. The microprocessors are used to accomplish tasks like navigation systems in cars, self-driving, radar sensors, camera views (front camera and back camera) for parking the vehicle etc.



Fig.9: Pervasive Computing Technique in Automobile companies

G.E-Z PASSES SYSTEMS

The E-Z pass systems are now a days attached and totally dependent upon the pervasive computing techniques. The system includes tag reader, traffic [5] [6] monitoring camera, traffic gate etc. all these devices work in coordination as a system.

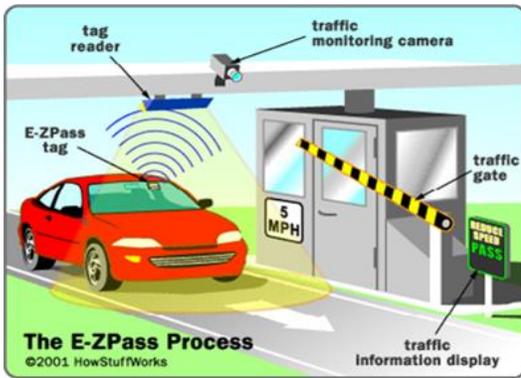


Fig.10: Pervasive Computing Technique in E-Z pass process

Thus this technology is being used in multiple techniques and in billions of devices.

VII. SCOPE

Pervasive computing has spreaded its routes in almost every applicational area, it has immense diversity, the society has happily accepted this innovational era. Ranging from local gadgets to simulation systems, from banking sectors to health sectors etc., this technology has changed the view to look at things. People find it easier and much reliable source to carry out many day to day tasks.

The automobiles companies launches no products without navigation systems, usage of camera security systems at homes and offices has become mandatory today, the health sectors are improving the researches and trying best to make best use of pervasive technology like in the form of Pill cams etc.. And the list is not ending.. Thus the scope of pervasive computing is never ending, world is being conquered by this new revolutionary era.

VIII. CONCLUSION

Pervasive computing is an unstoppable era today which continues to effect more and more of the world's population. It has made the life of a common man easier; the person can interact with the media by having advance or minimal knowledge of the devices. This technology is growing and will continue growing in the vast era. Many steps have been taken and each and every minute this technology is being fixed everywhere. So to conclude it's a vast step into technology that rules the present generation and will continue to rule at its best.....

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X. REFERENCES

- [1]. Tait, C.D., Duchamp, D. An Efficient Variable-Consistency Replicated File Service. In Proceedings of the USENIX File Systems Workshop. Ann Arbor, [35] Khiabani, H., Sidek, Z.M. and Manan, J.L.A. (2010) Towards a Unified Trust Model in Pervasive Systems. Proceedings of the 24th International Conference on Advanced Information Networking and Applications Workshops (WAINA), Perth, 20-23 April 2010,831-835. <http://dx.doi.org/10.1109/waina.2010.144>
- [2]. Campbell, R., Al-Muhtadi, J., Naldurg, P., Sampemane, G. and Mickunas, M.D. (2003) Towards Security and Privacy for Pervasive Computing. In: Okada, M., Pierce, B.C., Scedrov, A., Tokuda, H. and Yonezawa, A., Eds., Software Security—Theories and Systems, Springer, Berlin, 1-15. http://dx.doi.org/10.1007/3-540-36532-X_1
- [3]. Forné, J., Hinarejos, F., Marín, A., Almenárez, F., Lopez, J., Montenegro, J.A., et al. (2010) Pervasive Authentication and Authorization Infrastructures for Mobile Users. Computers & Security, 29, 501-514. <http://dx.doi.org/10.1016/j.cose.2009.09.001>
- [4]. Wang, G., Zhou, W. and Yang, L.T. (2013) Trust, Security and Privacy for Pervasive Applications. The Journal of Supercomputing, 64, 661-663. <http://dx.doi.org/10.1007/s11227-013-0953-4>
- [5]. Bharadwaj, S., Vatsa, M. and Singh, R. (2014) Biometric Quality: A Review of Fingerprint, Iris, and Face. EURASIP Journal on Image and Video Processing, 2014, 34.<http://dx.doi.org/10.1186/1687-5281-2>
- [6]. Voelker, G.M., Bershad, B.N. Mobisaic: An Information System for a Mobile Wireless Computing Environment. In Proceedings of the Workshop on Mobile Computing Systems and Applications. Santa Cruz, CA, December, 1994.
- [7]. Want, R., Hopper, A., Falcao, V., Gibbons, J. The Active Badge Location System. ACM Transactions on Information Systems 10(1), January, 1992.
- [8]. Ward, A., Jones, A., Hopper, A. A New Location Technique for the Active Office. IEEE Personal Communications 4(5), October, 1997.