

Wearable Computers of Leading Edge Generation and their Mystifying Mechanic's

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Abstract: *Wearable computers are simple small computing - efficient gadgets that humans wear on their bodies and, for instance, are smart watches and are additionally recognised to be wearable. They have specific uses, like fitness trackers with the help of technology known as smart watches, which also have several smart functions which are similar to those we can find on modern smartphones. Wearable computer is a digital device that is carried on the user's body. Some wearable computers allow customers to read and reply to emails, and send messages. They can also surf the internet, view videos and images and receive social media notifications. So far, wearables are typically worn on the wrist or strapped to the user's arm. They may also be worn on the user's head, such as glasses or helmets, or like pendants hanging from the neck. Paper is focused upon wearable computers - what are they? How are they used? How they work, what are the advantages and disadvantages of them and their application and security challenges as the focus of this paper is to give an idea of how wearables will be a helping hand in the long run for future generations, how it will be evolving and its magical mechanics that makes us feel surprised.*

Keywords: Wearable computers, Wearable technology, security, future generation, scope

1. Introduction

Dr. Steve Mann invented the first wearable computer in the late 1970s when he invented digital eye glass or eye tap, which assists with vision and also makes the human eye become both an electronic camera and a television display.

A lot of products are available on the market with respect to updated technology and these are the products that efficiently help human beings in various ways. It spans from desktops, laptops, electronic calculators and alternative PDA. The most focus of wearable computing is that these devices may be carried anywhere and that they take active participation in human activities. There are units in numerous industrial fields in this world that need PC - connected work. However, they require their hands to be free. Thus, wearable computing is attempting to resolve the matter of these fields.

Wearables have distinct characteristics that differentiate them from other technology and devices, so to understand the applications and future goals of them; we need to first understand the characteristics of wearables.

Some characteristics of wearables include:

- 1) Hands - free function which enables people to access data while performing daily activities or job tasks
- 2) Some authors say wearables should be comfortable, portable, multifunctional in nature and practical at work so that the information is conveyed in an effective manner and socially acceptable.
- 3) Some authors also stated that some keywords play a significant aspect while designing wearables where some attributes should take into consideration like the size of device, height - width of device, weight, durability, waterproofing (washability) so that the organization who is developing it would take care of it.

- 4) It provides benefits like mobility, computing power which comes with voice recognition or displaying touch sensors to give input to the server.
- 5) It helps users to communicate with company computers via connection over the internet.
- 6) So, every wearable device does not have the same capabilities and performance, but the aim is to provide entertainment and reduce huge tasks.
- 7) It maintains consistency by bridging the communication flow between user and device, where, unlike laptops, we do not need to open or close them manually.
- 8) Convenience is another great aspect where users in his / her comfort zone can use these technologies.
- 9) Wearables are not restrictive like PCs, where we need manual attention while using PCs, but while using wearables, we can easily do daily tasks because it continuously notifies us.

2. Literature Review

Barfield & Caudell (2001) outline a wearable pc as a totally purposeful stand - upon my own computer that lets customers to access statistics each time, anywhere (p.471) this definition assumes that the wearables are networked and a few do, but other wearables shop information for later transfer to other gadgets (Skiba, 2014). Further to being a standalone laptop, wearable era also can describe one - of - a - kind varieties of body - worn era, such as clever garb and functional clothing (Dunne, 2004, p.5). The wearable tool may additionally gather facts, provide data, or both from the consumer's body or surroundings (Educause, 2013). The age of connectivity means being connected to a few matters: assets, people, gadgets, and possibly yourself (Skiba, 2014). In step with Melanson and Gorman (2012), wearable computing will in addition enlarge this chronic connection and perhaps change the very nature of the relationship manner - paragraph [4]. The wearable device is considered the subsequent step in the evolution of ubiquitous

computing, a term coined by Weiser (1993) to explain the way the generation is retreating into the heritage and turning into a part of our lives (Skiba, 2014).

Wearable era is specific and is often more sophisticated than mobile phones and laptops because of sensory and scanning capabilities along with biofeedback and tracking of physiological function (Tehrani & Michael, 2014). Wearable gadgets can include watches, glasses, touch lenses, textiles, smart fabric, headbands, beanies and caps, rings, bracelets, or even useful hearing - like gadgets designed to appear to be earrings (Tehrani & Michael, 2014).

While maximum wearables may be taken on and stale easily, there are some which might be more invasive bureaucracy which include implanted devices like microchips or smart tattoos (Tehrani & Michael, [2014]. The purpose of wearable generation, whether or not worn on the frame or included inside, is to offer consistent, convenient, seamless, portable and in most cases, handsfree access to paired electronics and computer systems, despite the fact that there are many distinctive styles of wearable gadgets, all are unobtrusive (i.e. small, lightweight, without wires, frame wearable such as in garb), help a primary mission (i. e. do no longer disturb and are useful all of the time), and are context aware (i. e. everyday use, smart)

According to Mann, wearable computing is the observation or exercise of inventing, designing, constructing, or the use of miniaturized frame - primarily based computing and sensory devices which can be worn under, over, underneath, or under According as apparel. Pederson (2005) identifies 4 precise blessings of interaction for customers of wearable gadgets. First, the wearable tool should facilitate social interaction and offer a unbroken way to engage with others at any time. Second, the wearable device makes it simpler to engage with the surroundings and can even show a space for users while the next consumer arrives. Third, wearable devices provide unique methods to interact with software (machines). Ultimately, wearables facilitate unknown interactions.

Racoma (2015), a wearable gadget, has many features and may assist humans with visible and/or hearing impairments and have interaction with their environment. They can access and share statistics fast and wirelessly, as well as perform calculations and put together electronic files at the cross. Wearable gadgets may be used for multimedia entertainment purposes as well as interacting with and controlling other related devices. It allows you to seize and percentage text, audio, and visual statistics which can aid in teaching and learning, calendar and event notifications. From a private fitness factor of view, wearables can offer many features, such as, but not limited to step counting, heart rate tracking, workout development and energy burned.

According to the review taken by wearable computing, its applications and research challenges, where there was discussion about wearables in Pakistan, so to fill that gap, the paper aims to provide India forthcoming developments in how technology is beating other countries in the field of techno wearables where wearable computer applications and

their uses in different sectors include fitness and wellness where most of, the wearables are associated with well - being and health areas, like fitness bands, e. g. Fitbit or Samsung, Apple watches which can track pulse rate while walking steps and check footsteps and how much Kilometre the user has walked and the fitness and wellness activity monitor ring, emotional measurement, and smart glass are used.

According to a UC Berkeley presentation, the algorithm was trained to recognize 21 unique hand gestures, including thumb, fist, palm up, one thumb up, and counting. When an arm muscle is about to contract, the brain sends an electrical signal through neurons in the neck and shoulder to muscle fibres in the arm and hand. In fact, the electrode on the cuff is this electric field.

3. Problem Definition

Wearable computers have a lot of advantages, but there are some problems associated with these technologies with regards to security, where wearable computers have limited power for processing, storage, memory and for adding devices. It is a hard task to secure a separate security base.

Security challenges include:

- 1) Sensitive information: For instance, in clothing wearable can be lost or can be forgotten by users as compared to PCs, laptops or mobile phones, sensitive information should be secured by hard disk and encryption methods.
- 2) Authentication: As users do not give an id/pass to a wearable computer with respect to wearable clothing, there should be a good biometric option available for the user.
- 3) Unsecure networks: while using outside - controlled networks, it requires the highest communication security with respect to encryption, data integrity and non - repudiation, so if we use any unreliable network then there will be a lot of security issues and attacks.
- 4) And for instance, integrity of data and encryption needs power for processing, which puts limitations on encryption algorithm strength.
- 5) In today's generation, wearable technology is acquiring good support of client commitment, but also, some people do not think it to be a practical means of technology because, in some instances, related to unrealistic usability
- 6) There are a number of amazing plus points and useful aims and goals of wearable computers, yet they are neglected by half of the population because of their expensiveness.
- 7) E. g. In construction companies, wearables are very helpful, but the cost of setting up a LAN which helps in synchronization of data, but it is very expensive and propels a high - end product to get set up locally.

4. Objective/ Scope

- 1) A wearable computer helps to check wellness, track location with the help of GPS. And we can get messages instantly on wearables. Besides all this, one of the best things about these wearables is they give us an

- opportunity to try all these specifications hands free, which is portable for even people with disabilities.
- 2) Wearable helps us to stay connected by providing alerts of messages and incoming calls, which helps us to decrease our connection with mobile phones. It also helps when our phone is lost. It finds our phone too, and with the use of the Iot, we can switch on /off lights, temperature of air conditioners handsfree
 - 3) Wearables are consistent where there is constant communication between user and computer where we do not need to turn it on / off, as like PC
 - 4) It is multitasking which handles computational support including user's voice, eyes, hands. User attention is actively tracked.
 - 5) It is unrestrictive and communicative and also it cannot lost easily because it is connected to our cell phones.

Wearable computer architecture and how it works?

- 1) Data is stored and processed by the users where wearables have circuits which take input from the user, perform some operations and return back essential output through circuit modules like storage, connectivity, audio, video

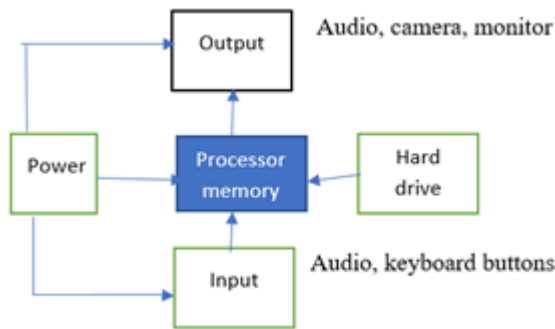


Figure 1: Architecture of wearable computer

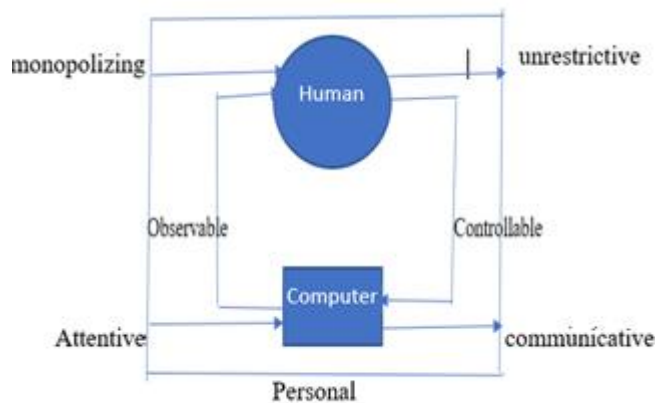


Figure 2: Signal Paths

- 2) Some signal paths of wearables include unmonopolizing, no restriction, observable, controllable, communicative, attentive.
- 3) Wearable computers are based on sensors that take input from users and give it further processing, so sensors perform cognitive functionalities like the accelerometer, which measures angular velocity and is used for navigation because it gives direction and also tracks human movements.

- 4) Second is that electrodes are used in wearables which read pulses of the person with the help of electric pulses present in electrodes.
- 5) Another is temperature and proximity sensors, where a temperature one is used to check sensors of the body sensors. If it is warm, then more workout is done by that person. Such indications are given by wearables and in proximity we can get an idea of whether an object living or non - living is present nearby us or not.

5. Research Methodology

- 1) The method used here to overcome security challenges is using intelligent policy management which handles security challenges.
- 2) It is usually managed by having a baseline approach depending on surrounding scenarios or the environment. This can be done by using security zones or static context which are set manually, and while recognizing the network used.
- 3) Also, we can use personal firewall, antivirus software and, as part of baseline hard disk, encryption of files, authentication, secure interaction, integrity, digital signatures should also be taken into consideration with respect to baseline.
- 4) As mentioned above, security measures are stated. Also, it needs to be properly configured and tested so that the wearable performs adequately, otherwise it will perform inadequately.
- 5) However, these security issues will vanish in a few years because there will be a lot of improvements and developments in the field of hardware and software.
- 6) Low screen size is also a challenge, so to get over it, its developers make UX design in such a manner so that it looks user - friendly.
- 7) Independence of wearables in today's technology is also a task because wearables do not work independently and are connected with smartphones, so here developers should address this issue where wearables can work in an independent manner.
- 8) Usage of battery and memory space is also a limitation because it has small batteries that cause battery issues, so the methodology /solution is that developers should develop and customize code in such a way that it consumes less power and memory so that it performs better.

6. Analysis and Findings

Findings say that there is a lot of scope in the sector of wearable computers where there are challenges, but we need to overcome this because wearables are the future of the new generation and the scope of it is really broad and will have an exponential growth in upcoming years as well, so paper have some findings and analysis in which there are a lot of applications available of wearables but also there are some limitations, advantages, hazards but research tells that it will find growth in future years with regards to each and every wearable device.



MIT scientists, led by an Indian student, have developed a computer system that can decipher the words a user is saying in his or her head. The system consists of a wearable device and an associated computing system. The electrodes in the device capture neuromuscular signals in the jaw and face that are triggered by internal verbalization of the words in your head, but are not detected by the human eye.

According to SmitaJhajharia, computer science and recording technologies, Vol. [5], she addressed the field of education where there will be use of Google glass and in the aspect of Industry, things like some wearables like smart glasses, clothing, head - up display can be used for the betterment and ease of doing business and with regards to Infotainment sector Bluetooth headbands, imaging sensors are used. Wearables has high impact upon sectors like AR/VR (Augmented Reality and Virtual Reality), behavioural systems, health care system, electronic textiles, fashion industry, military departments.

Wearables have a widespread impact in the fields of medical, fitness, disabilities, education, finance, gaming, music. Some applications and their product categories include the military, where smart clothing and head - up displays are used. Some applications also include AR, finger tracking in which fingerprints are used to track a person, usually through computer, face recognition is used to find the appropriate face to recognize and some major users are police, people with disabilities and physically challenged. In a visual filter, the main agenda is to magnify a picture / text with the help of fish eye lens so that the person with a visual disability can read it properly.

In navigation and positioning, GPS is used to track their current location and it is very helpful for people with disabilities, which provides them with safety instructions and barriers. Applications in industries include providing hand - free interfaces for workers and employees so that they do not need to use their hands when they are doing their work.

Application in military includes not just giving navigation, commands and controls but also sensitive information control, which is extremely important during wars, and also gives signals and offers strategy to how to deal in such danger scenarios. The application in the tourism field includes a camera that is used on the chest of the user which clicks two photos a minute, where it can be used while travelling and where it provides a clear record of scenarios.

And in the field of sports and fitness, the application of wearables includes smart phones used for training purposes, which have frequency tags, accelerometers.

Wearable devices can have an impact on security, but they can also use the computing and communication capabilities of these devices to create new countermeasures. One simple approach would be to implement a software constraint that could be triggered by an external signal, or when the device recognizes that it is in a special environment like test mode that disables 3rd party apps on Pebble. However, these restrictions can easily be bypassed if the device is not locked by the manufacturer. Further work is needed to determine whether a wearable can be designed with flexible, secure, and guaranteed constraints.

7. Limitations

7.1 Some limitations of wearables include:

- 1) Wearable computers, in some cases, are quite bulky. Apart from smartwatches, there are wearables which are huge and heavy because a lot of components are attached to the body, because wearable computers, like any other PC, also require a CPU as well as peripheral devices that help input the information into the computer.
- 2) One of the limitations is discomfort. Where there are some areas with a hot climate, wearables tend to irritate the person who is wearing them because they emit their own heat despite having a cooling system present in them and, therefore, the user also emits heat due to daily tasks as they perform, so here the side effect can be headache, dizziness and sleeping problems.
- 3) Another aspect is the battery, because batteries are very limited. Wearables, e. g. Fitbit gadgets, can be used for two days, but Samsung watches can only be used for a day due to poor battery life.
- 4) Another aspect is the charging issue, where wearables need to charge again and again because of poor battery life and also takes time to charge.
- 5) One of the critical disadvantages is accuracy of data, where we cannot blindly follow or trust medical information given by wearables because it is found in research that it gives bogus results and readings which prove fatal for patients having cardiac disease.

7.2 Future Scope of wearable technology

- 1) Wearables are early adapters for the new age and today's age too, because organizations and the public are both adopting these technologies, where companies launch their extended versions of old ones where people are giving positive feedback.
- 2) This paper aims and proposes that a wearable computer is not a fad but it is socially accepted, and it is changing the lives of people today and in the future too.
- 3) In the future, a lot of new specifications will arise wherein military sector army can be aware of hidden enemies. In the world of entertainment, there could be an improvement in music and games.
- 4) There will be wearable shoes and gloves that can handle gaming objects.

- 5) In the near future, there will be an integration of biosensors and wearables which might monitor brain functions which will be used by criminals to obtain truth.
 - 6) Another scope is smart glasses for cars, where there will be a camera to navigate directions, traffic will be monitored and can warn drivers if they are sleeping. e. g. Truck driver
 - 7) Policemen can also use these to recognize faces using smart glasses on streets so that the work of checking the IDs of people will disappear.
 - 8) In business, virtual reality can take place where meetings will be virtual and workers can use at ease at their home.
 - 9) In the field of production, smart glass will help logistics workers to list necessary components listed on display by the manager and they can pick accordingly.
 - 10) Researchers can use smart glass to gather information
 - 11) Augmented reality in tourism will help people visit cities and tourist places virtually without going to that place in 3D format.
 - 12) People with disabilities and impairments could get help from smart glasses, e. g. blind people can navigate indoor / outdoor activities where face recognition of person they meet can be achieved.
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8. Conclusion

In this paper I have given an idea of how wearable computers work, what they are, their applications, limitations, solutions to those limitations like security status and what kind of mystifying magic these technologies do today and in the future.

Also, I have described almost all industries which currently use wearable products where there are a lot of engineers and developers out there developing technology in a more seamless way to give life to people's lives by making them comfortable.

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Volume 11 Issue 7, July 2022

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