REVIEW ARTICLE

REVIEW PAPER ON WEARABLE COMPUTING ITS APPLICATIONS AND RESEARCH CHALLENGES

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ARTICLE DETAILS

ABSTRACT

Wearable technology provides number of opportunities in today's world that trigged all the imaginations for the people. In today's era we are more and more dependent on computers and to be compatible with the technology we have to be omnipresent and embrace new developments. Our daily use material is imposed by factor such as battery life, processor power, display brightness, network coverage and form factor have led to the delay in the widespread introduction of wearable computers. In this paper we will review wearable early design that was merely used for aircraft and military purpose and compare that with its today's application that how nowadays they are used for personal activities. It also highlights the scope and market of wearable computers and how it is emerging day by day.

KEYWORDS

1. BACKGROUND

Steve Mann, his invention of the 'Wear Comp' in 1979 gave invention to this concept of wearable computing. He created concept to introduced tiny computer only initially. Limitation of this initial invention was lightweight; height and high-speed processors and display devices were another Error [1]. The 1980s brought forward the development of the consumer camcorder, miniature CRTs etc. brought forward the development of the eyeglass mounted multimedia computer. As soon as the era of internet and wireless technologies arises it help a great deal in wearable computing. After the invention of wearable, it has pass through 18 generation of development and modification [2].

2. INTRODUCTION

However, in past 15 years wearable have successfully achieve its goal by implementing its applications that provide number of benefits, whereas in wearable computer operational and interactional constancy are the key features which brings allot of ease of communicating via using sensor-based devices to humankind [3]. We can refer it as device in which user can enter and execute set of commands while walking on ground or doing other activities .it can perform same function as mobile phones and laptops as well as other task that these handheld devices cannot perform. It is made in such a way that it could be easily worn constantly with the goal of becoming seamless extension of a body and mind that is connected to various sensors that are connected to our body to perform various function such as measure heartbeat, body temperature, walking speed etc [4]. due to its sensor technology wearable are more sophisticated that daily handheld devices. Wearable computing has introduced a new form interaction between human and computer comprising of a small computer part that can be easily worn and accessible and ready to use. It is just like becoming a superhero where you can be at more than one place at a time [5]. It's like having superpowers like x-ray glasses, VR glasses and many more. A wearable is more than just a watch or regular glasses rather it acts like a whole computer system. The fact that differentiates a wearable device from a wearable computer is that a device is not programmable whereas wearable computer is reconfigurable and can be programed as needed [6].

This computer can perform equal numbers of computation as desktop or laptops. Computer to be wearable must pass 6 tests to be in the categorized as wearable computing devices [7].

2.1 Test 1-Wearable

These computers must be easily wearable for the certain of period of time. More ever easily come off.

2.2 Test 2-Smart

Theses system must contain advanced circuitry, wireless connectivity and minimum level of independent capability for processing.

2.3 Test 3

This test should provide some information based on provided services. They must interact with user easily.

2.4 Test 4

Sensing and best cognitive support must be provided under this test.

2.5 Test 5

Attention should be reduced to provide high level of user privacy.

2.6 Test 6

They must be smart enough to maintain the balance between automation and computation and provide the user with the environment with his /her preference to work.

3. FEATURES OF WEARABLE COMPUTERS

The features of wearable are as under

3.1 Consistency

These systems run continuously and work in user friendly environment. Unlike PC and laptops, they don't need to be open or closed. The flow of

signal from human to computer and computer to human is continuous [8-10]

3.2 Mediation

Wearable computing unlike traditional computing acts as a intermediary as it aids its users by providing its umpteen applications in medical care, domestic use, corporate world, military etc [11].

3.3 Convenient

One of the goals of wearable is to be convenience in sue for then user so user won't feel any difficulty or problem. User should be able to use it in his comfort zone which will increase its overall utility.

3.4 Enhancement

Normal computers perform only task that they are designed to perform but this notion is not used in case of wearable. User will be doing something else along with that task.

3.5 Unrestrictive

One of the best things about a wearable is that it doesn't kept u restricted like other handheld computers, wearable promote multi-tasking so you can perform our other daily life task while using a wearable. Wearable doesn't require your much attention, sometime no attention at all, so you could focus more on your work [12].

3.6 Privacy

Wearable is being considered more secured and it respect privacy like no other. As the system is on our body so that only point of interaction is our body no other.

4. APPLICATION

Mankind is achieving easily mode of communication in vast field of applications such as environment monitoring, medical care, fitness aging disabilities, education, transportation, enterprise, finance, gaming and music. The goal of wearable in each field is to make devices portable electronic and computers into individuals' daily lives. Proceeding to its usage in early stages, where they were mostly used in military and medical care [13].

Table 1: Applications of wearable computing

Application	Product categories	
Healthcare And Medical	Blood pressure Monitors ContinuousGlucose Monitoring Defibrillators Drug Delivery Product ECG Monitoring Hearing Aids	Insulin pumps Smart Glasses Patches PERS Pulse Oximetry
Fitness and Wellness	Activity Monitors Emotional Measurement Fitness &Heart rate Monitors Food Pods & Pedometers Heads-up Displays	Sleep Sensors Smart Glasses Smart Clothing Smart Watches Other, Audio Ear buds
Infotainment	Bluetooth Headsets Head-up Displays Imaging Products Smart Glasses Smart Watches	
Military	Hand-Worn Terminals Head-up Display Smart Clothing	
Industrial	Hand-Worn Terminals Head-up Display Smart Clothing Smart Glasses	

4.1 Finger Tracking

The computer would track the finger of the user visually and user could control the computer through its fingers a simple camera based wearable device [14].

4.2 Face Recognition

When combine with appropriate face finding software, face recognition could be used in police departments, politicians, and teachers.

Figure 1: Face recognition

4.3 Visual Filter

Used for people that is visually disabled. They digitally magnify an image or a prose through a virtually fisheye lens to help in reading. It is done by visual filter.

4.4 Navigation

Connecting a Global Positioning System (GPS) to wearable allows its users to track their current location. It is help full when exploring anew town or a city.

4.5 Remote Sensing and Maintenance

Wearable cam also be used by field workers that gives them remote assistance and expertise through digital data audio and image. With the help of this even a newly rookie can accomplish a simple task, with the help of remote expert at the main desk.

4.6 Industrial

Availability of complex information to the worker on the field, workplace or non-workplace is an important issue since the dawn of computerized records. Depending upon the usage wearable has many advantages in industry. Because of their flexibility, portability and hands-free use are being used by workers in many types of industries. The wearable with hand free interface has been a huge help for workers in the field that have no spare hands i.e. speech and head mounted display [15]. Another example is the Mercedes-Benz pebble smart watch. The drive has a stylish watch which is connected to the car GPS so that he can check the location of his car through his watch. It has additional capabilities such as door lock status, even fuel tank status, driver can also check his incoming calls or sms through the watch.

Figure 2: Mercedes-Benz pebble smart watch
(http://www.digitalspy.co.uk/)

4.7 Military

The potential applications of wearable computers are for law agencies. Apart from providing command/control communication and navigation functions, a wearable can also be used in tactical information to distinguish between a friend and a foe. It could help soldiers to interpret digitally disturbed signal and massages. Wireless helps them to communicate easily on the battle ground. They could also exchange video allowing their superiors to watch and analyze the situation from the base. Wearable for military are more power full and more rugged and robust to withstand knocks and shocks. However, much of the information on military is kept confidential by the state.
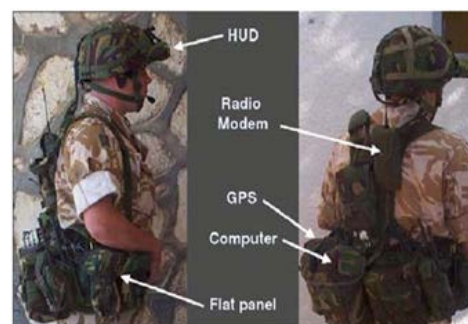
Figure 3: Military wearable

4.8 Medical

Wearable can also be designed to monitor health issues to detect movement, heat flux, skin temperature, near-body temperature, and

galvanic skin response. Sensor and health applications are installed on wearable's that give the health status of a patient. The most common is the pacemaker. Examples include insulin pump for diabetic patients and brain implant to facilitate communication for that patient that is incapable of speaking. Nowadays health monitoring wearables are easily available in markets. Data can view or downloaded. Many systems are working to assist the blinded people. The Remote Monitoring System (RMS) system was developed to support remote monitoring for those who have cardiac problems.

Figure 4: Health monitoring (http://www.embs.org/)

4.9 Sports and fitness

There is not much scope and interest of wearable in sports, but there are some basic function that a wearable can perform. Another example are the Smart Training Shoes, these are next generation shoes that will feature radio frequency identification tags, motion sensors and accelerometers. They can customize your look.

Figure 5: Nike Smart Training Shoes (https://www.google.co.in/)

5. ADVANTAGES

Consistent   Unlike PC and laptops they don't need to be open or closed. The flow of signal from human to computer and computer to human is continuous

Unrestrictive: one of the best things about a wearable is that it doesn't kept u restricted like other hand-held computers; you don't need to worry about your work while using a wearable

5.1 Mobile

You can carry a wearable almost anywhere any time.

5.2 Multi-Tasking

Wearable promote multi-tasking so you can perform our other daily life task while using a wearable. Wearable doesn't require your much attention, sometime no attention at all, so you could focus more on your work.

5.3 Lost

Wearable is attached to some specific part of your body. Making it hard to be lost unlike mobile phones that you kept in pockets which can be easily fell from your pocket.

5.4 No distraction

Wearable computer will never disconnect you from real world like one a user can feel under virtual reality applications.

5.5 Communicative

Wearable can be work as an excellent communication medium between two or multiple users. Anyone can communicate with his enterprise information with getting his/her routine disturbed.

6. DISADVANTAGES

Some of the disadvantages of wearable computing are as under

6.1 Expensive

Wearable are the most sophisticated, cultural piece of technology nowadays. As we no quality ever comes cheap. The technology required to make wearable are costly so making the wearable high price. As wearable is modern an efficient technology but the price factor is too high, so it is not available for everyone.

6.2 Heavy

Wearable can sometimes be very heavy. They have very complex technology, such as sensor which requires computation and a CPU to perform these computations so their hardware can sometime be quite heavy depending upon the device.

6.3 Discomfort

Wearable is a technology that we wear additionally, they are not part of our body, so we are not used to it. So wearing them for a long period of time can irritate the user especially in hot and humid conditions, where heat is continuously emitting from the CPU. And absorb by the body, this can cause real discomfort to the users.

6.4 Security

One of the biggest drawbacks of wearable is security if it is not attended it can cause some serious security issues; it can be hack if it got in to wrong hands and data could be compromised. Some wearable is connected to companies' servers, they can be hacked.

7. WEARABLE IN PAKISTAN

As we know that Pakistan is a developing country but still wearable has a large scope and have number of applications for these wearable devices market and consumers. Wearable can be vastly use in villages where the mainstream people are uneducated and are easily trenched or fraud, these can provide them with essential knowledge or information that they lack. These can also provide farmers information about their crops and fields that can help them increase the crops yields thus helpful in country GDP rate. Wearable can also be helpful in medical situation not only in monitoring health but also decrease the need of doctor and hospital. This can reduce the cost and expenditures and also reduces the severity of transport requirement. This can be usable be by old peoples that can show his/her previous health and its current status. Also reduces the severity of transport requirement. Safety is an emerging concern in Pakistan. There are wearable that can be used to track the location f users this provide safety feature because we can track them, especially women that are vulnerable and can't defend them self. Location with combination of health monitoring is a great combo.

8. FUTURE MARKET SCOPE

We are living in an era, in which everyone is competing in technology, and Wearables give them a hard and competition, everyone is working and experimenting in this field from small startups to big organizations and firms, everyone wants to capture the market and convince the people to buy their products. Their aim is to make wearable very stylish and invisible, and eye catching In today's fast moving world besieged with technology all around, there is immense marketplace. Pakistanis industries may experience a boon in production by using wearable's which will help in easier and better manufacturing processes besides also providing safety and comfort. It includes the heads-up display production lines, hand-worn terminals in logistics and warehousing.

9. CONCLUSION

Wearable opens a new door towards advancement and research and help to embrace new technologies such as artificial intelligence, and perception and combining perception and user modeling new and intelligent interface will result in reduce work and complexity and lead to new capabilities. By making the ear able eye catching is not sufficient until it meets with its needs. More and more people are using wearable for personal activities and comfort.

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