WEARABLE COMPUTING: A review

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Abstract—Wearable computing is a term that refers to the computer powered small devices or equipment that can be worn by user includes clothes, watches, glasses, shoes and similar items. Wearable computing can range from providing very specific, limited features like heart rate monitoring, pedometers to advanced "smart" functions and features similar to those smartphones and computers. These more advanced wearable computing devices can typically enables the user to take pictures or videos, write and read text messages and emails ,respond to voice command ,browse the web and many more. Nowadays wearable computers are used in every field like in healthcare, exercise, and daily day to day uses. They can come from size of a ring to a size of a smartphone or even bigger. In this paper, we will discuss about this technology and some applications in this field.

*Index terms***: Wearable computing*; Smartwatches; Smart glasses**

I. INTRODUCTION

Wearable computing is the study or practice of inventing, designing, building, or using miniature body-borne computational and sensory devices. Wearable computers can be worn under, over, or in clothing, or may also be themselves clothes. Wearables computers are also known as wearables or body-borne computers, these are small computing devices (usually electronic) that can be worn under, with, or on the top of the clothing. They can be used for general purpose or specialized purpose such as fitness tracker which can be worn in hand. They may be used as special sensors such as heartrate monitors, thermometers, or novel user interface such as google glass, an optical head mounted display which can be controlled by gestures. In future wearable computers can replace smartphones. It is a device that is always attached with the user, and into which the user can enter and execute some specific commands that can be done while walking or doing other activities.

Wearables computers can be worn on several part of human body like arms, forearm, head, neck, legs and even in fingers. Due to various definition of wearables computers, we can say that the first wearables were introduced in in 16th century as an abacus ring in the necklace. The development of wearable computers has taken several steps from small electronics hybrid designs to fully integrated designs where it takes just only one processor chip, a battery and some user interface to make a wearables device.

Wearable technology is getting more and more common in recent years, there is growing demand for wearable devices in a wide range of fields such as sports and fitness, medicine and also in the defense force. The examples of such applications are smart watch, bio-sensors, contactless payment devices, smart soldier and many more. The early attempts of wearable computers were mainly in the medical field but now they are being used in almost every field.

PDA (Personal digital assistant) were popular wearable computers in mid 90s they are mainly used for industrial works as they save much time, make the work faster for the workers.

II. FEATURES

I. **Consistency**: It does not need to be opened up and turn on for use, it is not like tablets or laptops. It provides constant interface between computer and human.

II. **Enhancement**: The assumptions of the wearable computing is that user will be doing something else along with computing. So the computer should serve to increment the intellect or augment the senses.

III. **Privacy**: The Wearable computers can be used to create a better level of privacy because it can be worn with or along with your body parts so it is more personal

IV. **Multi-tasking**: Wearable computer also support multitasking even when the user's hand, eyes, voice or attention is engaged with physical environment.

V. **Convenient**: Wearable technology is of utmost convenience to the user as the right person can use the device at the right time, it increase the comfort zone and great use of utility.

III. TYPES

I. **Implantable**:

As the name suggests these wearables can be embedded inside the skin of the human body through surgeries.

Currently they can be used for heart conditions, or some circuit can be embedded inside the hand of the human body.

II. **Smartwatches**:

It is one of the commonly used devices among wearables devices. It can be connected to a user's mobile phone and can notify about calls, messages, and emails. They can also be used as fitness trackers.

III. **Smart jewelry**:

Some Companies are bringing the idea of smart jewelry to attract more women. Smart jewelry can inform users about calls, messages, and emails and even they can click pictures when they are unable to access their phones.

IV. **Fitness Trackers**:

These devices are used for monitoring and tracking fitness related metrics like distance walked, how much calorie you have burned, they are also able to track your heartbeat rate and also quality of sleep.

V. **Smart clothing**:

The smart clothing includes specially made garments which allows the transmission of live data during training or playing any sports and can track the level of performance. Clothes are embedded with conductive silver-coated fibers which acts as sensors and transfers the data to the linked devices.

VI. **Smart glasses**:

Smart glasses can be a common option for sunglasses and other eyewear and to grow in popularity as prices come down. Experiments are going on with different kind of display but the next development is likely to be smart contact lenses. Google is the famous smart glasses in the world its tiny display delivers information into the glass.

VII. **Smart Rings**:

Nowadays companies are trying to make smart rings which can track your heart rate, gives you notifications about messages, calls and emails. Very small chips and processors are needed to embed in the ring to make them work. iButton is the best example of the smart ring in which it works with help of java.

IV. APPLICATIONS

I. *Wearable antennas design for wireless communication*

In recent years, development of wireless antennas is taking more speed so due to this, the demand is also increasing in the market such as medicals, sports, military, fitness etc. So here the antenna is attached with the wearable jeans and is used for the Wi-Fi communication in order to improve the communication range and obtain higher radiation efficiency. It can reduce the use of mobile in hands, can be great help for civilians and military.

II. *Use of wearable computers in Industry*

The use of wearable computers is increasing in industry day by day. This is getting more common in e-commerce companies to make ease of facilitate such as picking, sorting, consolidating. So mobile gateway operation is introduced to ease of work. It is an agent based system and has a cloud driver library which is used to save the informations. The workers can easily interact with them and can save their time

III. *Train wear: An assisted training feedback system*

It is a wearable garment which can be used for fabric pressure sensing in sport. These sensors measures the pressures related to the muscle activities, the sensors generate a pressure maps which of each individual point of the body part, which can show the balance between left and right average pressures of the body parts, range of motions. The UI or the software design is based on the c++, html based on the java script.

V. LIMITATIONS

I. *PRIVACY CONCERNS*

Wearable computers have some technical issues common to other mobile computing such as batteries, heat dissipation, software architecture, wireless and also data management. Sometimes user are not able disable some functions in their device they are active all the time and records the data continuously. Wearable computers are designed to understand lifestyle and keep track of your record like your locations, private information's. These devices are always connected to the company's server, so there is chance that hackers can have access to your information and can cause harm to you.

II. *HEAVY AND HOT*

Many components such as CPU and some parts are heavy than expected. Due to their and more work they emit heat radiations which can be dangerous in hot environment. Some users has also reported having headaches with long use of wearables.

III. *HAVE TO DEPEND ON OTHER DEVICES*

Most of the wearable computers are not stand alone devices, they have to link with other devices like smartphones or computers in order to become more

effective. Theirs processors and CPU cannot do everything.

VI. CONCLUSION

So in this paper, we came to know that wearable computing can be the future and may be they can replace smartphones. There is more opportunities that will reduce work load, saves time and can lead to the new capabilities. We have also discussed various applications of the wearable computers. The market is having high demand of wearables and there are also some limitations which cannot be ignored. These tiny wearables are doing are already doing amazing work in medical field, they can be used for entertainment, communications or in the defense field.

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