

Wearable Technologies and Its Future Applications

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Abstract- Wearable technologies are gaining fame day by day. They will play an active role in our future life. This study is mainly based on two points that may include primarily “Wearable Technologies with their Several Applications in field of Textiles, Electronics and Health”. Secondly, to know how they become good advantage in future. Although these applications are helping mankind to work safely, easily and comfortably in their daily life.

Indexed Terms- Textile, Technology, Wearable Technology, Disable, Fashion etc.

I. INTRODUCTION

Due to the development of mankind in technical way, technology is increasing day by day. Several inventions from past few years had put the world at highest position which may include route trackers, Bluetooth etc. Out of all those, “Wearable Technologies” had created a new era. Wearable Technology is simply defined as “the technical devices that are worn on human’s body”. Even though they are part of several applications still there are several things to know. Understanding the scope of this “Wearable Technology” is somewhat difficult. So, in order to understand this, it is mainly classified into three categories.

It may include Wearable Textile Technologies, Wearable Health Technologies, Wearable Consumer Electronics.



Companies and several organizations are working hard to design these Wearable Devices more sophisticated and comfortable. These devices may be like Wrist Watches, Shoes etc. [20]. Several predictions says that many companies are emerging these technologies as it helps to increase their revenue.

II. WEARABLE TECHNOLOGY- CHARACTERISTICS

There are several characteristics of this technologies in different fields. It may be like Ornament attached to body or it may be like a device to worn around body as a Watch or in the body like Sensor sometimes. These devices work independently by taking input from users. Its characteristics are quite different from other devices. One of its crucial key characteristics is “Hands-free” functioning [21]. This helps user to use them easily with their daily busy life without wasting time for its operation. They perform several complex functions. It is simply an application-oriented device. These are Portable, Mobile, Comfortable, Transparent. There are several key features that determine these technologies.

One of the most important things is its attributes. Nugroho also have explained the same point in 2013 [14]. These attributes mainly include source of Power, Size, Design, Weight etc. These plays key role in decision making by the companies to opt this technology.

There are at most key functions of these Wearable Technologies. It broadly includes five major functions. Those are Integrated Circuits, Energy Management, Interface, Data management, Communication. Integrated circuits defines that these technologies include Integrated design for efficient working. the next function is Energy management which means manage the use of it. For example, even though there are still some problems in this without solution that are unsolved till today. Next function is Interface which means a medium which is useful to transfer data between user and device. Although in this the data is collected by different sensors receivers' antennae etc. Data management implies that to store data and to use it effectively. Communication is nothing but two-way transfer which means receiving and transferring information using Bluetooth devices, wireless systems, networks etc. [20].

A best example of this is Google glasses have only just 6 hours of battery life. In this way there are several issues till today. Bluetooth devices, wireless systems, networks etc. [1].

These are playing lead role in almost all the sectors in present generation. Different technologies have their own features and characteristics according to their use.

III. WEARABLE TECHNOLOGY-TYPES

Although we have discussed it earlier that these technologies are mainly of three types which includes Textile based technology, Health based technology, Consumer Electronics technology. let's have a brief outlook over all these.

1. TEXTILE BASED WEARABLE TECHNOLOGY:

This Textile based Wearable technology is a new advancement in this. In fact it surprises entire world with its features. This includes several inventions like electro textiles which monitors our body time to time

and transfer data from there to here and delivers the communication from user to device.[20]. The entire name and fame gained by this technology is due to its integrated Nano technology. It's nothing but these textiles include nano fibres and nano coatings in it. The best and latest technology that emerged into this technical world is that Clothing based on temperature. It is definitely a big deal. This means the clothes can change their colour according to the indications given by wearer.



In 2014 Philips company designed new technology in textile that the clothes change its colour according to the user's emotions [27]. Not only that although designer should take a lot of things into considerations which includes durability of device, Flexible nature, moisture control, fit sizes etc.

2. CONSUMER ELECTRONICS WEARABLE TECHNOLOGY

Consumer electronics are nothing but the electronic devices that we are using in our everyday life. These devices are mostly used for Office purposes, Entertainment purposes, Communication. Not only these but

Consumer electronics are nothing but the electronic devices that we are using in our everyday life. These devices are mostly used for Office purposes, Entertainment purposes, Communication. Not only these but also, we have come through several devices in our daily day to day life which includes digital cameras, televisions, music players [9]. Apart from all those there is a key difference in this technology i.e., these are wearable, which means these devices are worn on human body. Today several top companies like Apple, Google, Microsoft, Samsung are taking a

big part in these type of devices [11]. Examples of this devices are wristbands, headbands, rings etc.



Several studies says that retail revenue is increasing tremendously due to these technologies. Research says that Samsung galaxy Gear 2 is the toppest smart watch which enable users to manage calls, message notifications, Heart rate monitoring, step counting(footsteps), listening music. Coming to the next toppest technology includes smart glasses, Google is taking lead in this. Google glass composes of computerized CPU, microphone, camera, sound transducer. Of course, it is facing several issues like heating which need to overcome to run in future. This type of technology will lead the mankind into sophisticated and more comfortable world in near future.

3. HEALTH BASED WEARABLE TECHNOLOGY:

This wearable technology is also playing a crucial role in health sector in present days. As compared to other this health sector gained more popularity in this technology. Many academic experts, professionals strived hard to design new devices on basis of this. One of the best examples of this technology is the devices which monitors patient health condition from time to time which helps in reducing the risk for patients. This helps the doctors to get the most crucial information of their patients easily like their BP status, Diabetes report etc. [2],[3]. This also helps doctor to give the treatment for different diseases and diagnose time to time.



Not only that wearable technology is mostly used for e-health, phealth, telemedicine, homecare, telecare, telehealth, gerontechnology [3]. Wearable Technology plays an important role in several aspects like Cardiac arrest, patients suffering from eplilepsy, diabetes stated by Bonato. Besides that, there are also some other applications like treatment of Parkinson’s disease, Rehabilitation, Cardiovascular treatment, Functional assessment [2]. Thus, this health based wearable technology became more useful by its characteristics.

IV. WEARABLE TECHNOLOGY-THE FUTURE

Day by day more latest versions of these devices are emerging into this technical world. Companies are more concentrating on this. Some are at advanced stages while others are at prototype stage [26]. In near future these products emerged in high quantity and in turn their prices also increased highly thus demand increases. But always a question remains unanswered about this technology i.e., whether it is an innovative or fad? Several discussions and debates are going on still. In 1943, Watson made a statement that there may be only 5 computers in the market, no one needs monitors at their home [. This paper focusses on giving an explanation for the above query and support that this technology is more innovative. Top most companies like Google, Samsung are keen interested on adopting this. This is the proof to say that these are innovative and leads our future life.

There is also one other major query in regarding this that whether it is safe or hazardous? In 2013 Popat, Sharma raised a problem that personal data of user is being stolen if these devices are unsecured [16]. Not only that secret video capturing, picture capturing of people, properties etc. is also a privacy issue [1]. Anyway, it is also solved by implementing anti-malware, anti-software technology into it. By these innovations' factors supporting that 'these are useful' are increased as compared to that 'these are hazardous'.

There may be several benefits and applications of it in several categories which may include:

- **Disable People:** Disable people are the ones who are mostly get benefited with this. Smart glasses are the new trend which helps to roam both indoor and outdoor without anyone's help. Not only that but also new face recognition option is enabled in it to recognize people easily every time. It also gives identification about danger situations too.

People who are suffering from deaf are also get benefited in a way that the other person's voice is transformed into the speech. We can simply say that these devices act as artificial organs which they are not enabled with.

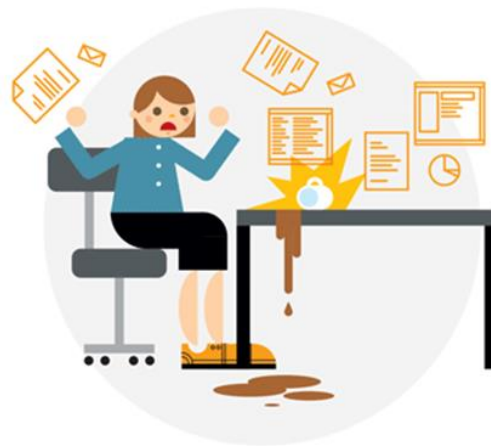


- **HEALTHCARE:** Although there are several devices that emerged into the medical world based on this technology. Different types of indicators and monitors are also introduced which helps to know the patient condition and reach him/her as soon as possible to save lives. Besides that, in near

future some special type of integrated technology that are imparted into patient's body which treats user accordingly in case of emergency.



- **TEXTILES:** We have gone through several Wearable technology in textile sector also. But, in near future we are going more ahead of present technology, which means introducing the piezoelectric and novel fabrication materials into textiles of users. This technology seems to be more interested for many companies and they started to invest on it due to its several features which may include flexibility, washability. Mood shirts is going to be future advancement which monitors user's physiology and help the other people to respond according to your mood.



- **SAFETY APPLICATIONS:** Till now there are several safety applications based on this technology still there are more to come. Out of that

one of the future technologies for safety application is monitoring sensors that track employee body positions and find whether any risk is going to happen. Besides this another new devices are emerged which not only identifies risk but also make an alarm sound in need and helps in riskless management.

- FASHION: As we know humans are fashion lovers. They are always ready to take new advancements in it. One of the future advancements in fashion world is that normal looking earrings used to track temperature of user body, Heartbeat, Oxygen levels. Besides Bluetooth ear buds this technology will dive you to the next level.



technology which enables virtual three-dimensional drawings. Shoes with integrated sensors will keep your feet cool as necessary.



- ENTERTAINMENT: In this busy world humans are tired due to lack of entertainment. Intelligent earrings are going to a new technology which predict your mood and plays the music in accordance with that.
- EMBEDDED EQUIPMENT: There are several other equipment like Shirt buttons with embedded GPS which tracks your body movements. This will guide you to move to other places and gives you suggestions and warns you in dangerous places. Integrated microchips in nail polish are future

CONCLUSION

In conclusion, this Wearable technology had gained fame besides other technical applications electronic chips, computers, sensors. The main applications of this technology are mainly in Textiles, Healthcare and Electronic devices. Although this technology is just at the beginner stage and still there are more to come into advancement. The main aim of this study is to designate how this technology will be a new era for present as well as our future life. In this paper, it is stated that this Wearable Technology enables the Disable people to work on their own, Doctors to treat patients, Authorities to make system more secure and safe, Fashion lovers to get benefited. To summarize the future will be more sophisticated, quick, safer, comfortable by using this Wearable Technology.

REFERENCES

- [1] Ackerman, E. (2013). Google Gets in Your Face Google Glass offers a Slightly Augmented Version of Reality. *Spectrum IEEE*, 26–29.
- [2] Binkley, P. F. (2003). Predicting the Potential of Wearable Technology. *IEEE Engineering in Medicine and Biology Magazine*, (May/June), 23–27.
- [3] Bonato, P. (2005). Advances in wearable technology and applications in physical medicine and rehabilitation. *Journal of Neuro engineering*

- and Rehabilitation, 2(1), 1–4. doi:10.1186/1743-0003-2-2
- [4] Bonato, P. (2010). Advances in wearable technology and its medical applications. In 32. Annual International Conference of the IEEE Engineering in Medicine and Biology Society. August 31 - September 4. (Vol. 2010, pp. 2021–4). Buenos Aires, Argentina. doi:10.1109/IEMBS.2010.5628037
- [5] Brady, S., Diamond, D., Carson, B., O’Gorman, D., & Moyna, N. (2006). Combining wireless with wearable technology for the development of on-body networks. In International Workshop on Wearable and Implantable Body Sensor Networks (BSN’06) (pp. 31–36). Ieee. doi:10.1109/BSN.2006.16
- [6] Chan, M., Estève, D., Fourniols, J.-Y., Escriba, C., & Campo, E. (2012). Smart wearable systems: current status and future challenges. *Artificial Intelligence in Medicine*, 56(3), 137–56. doi: 10.1016/j.artmed.2012.09.003
- [7] Dunne, L. E. (2004). *The Design of Wearable Technology: Addressing the Human-Device Interface through Functional Apparel Design*. Cornell University.
- [8] Fortmann, J., Heiko, M., Boll, S., & Heuten, W. (2013). Illume: Aesthetic Light Bracelet as a Wearable Information Display for Everyday Life. In *UbiComp 2013* (pp. 393–396). Zurich, Switzerland. doi: dx.doi.org/10.1145/2494091.2495970
- [9] Hartmann, H., Trew, T., & Bosch, J. (2012). The changing industry structure of software development for consumer electronics and its consequences for software architectures. *Journal of Systems and Software*, 85(1), 178–192. doi: 10.1016/j.jss.2011.08.007
- [10] Kortuem, G., Segall, Z., & Bauer, M. (1998). Context aware, adaptive wearable computers as remote interfaces to 'intelligent' environments. In *2012 16th International Symposium on Wearable Computers* (p. 58). IEEE Computer Society.
- [11] Kurwa, M., Mohammed, A., & Liu, W. (2008). *Wearable Technology, Fashioning the Future*. Flextronics. Retrieved May 13, 2014, from http://www.flextronics.com/Documents/White_papers/WT_Fashioning_the_Future_FINAL_AE.PDF.
- [12] McCann, J., & Bryson, D. (2009). *Smart Clothes and Wearable Technology* (1st ed., pp. 1–445). Oxford: Woodhead Publishing Limited.
- [13] Muensterer, O. J., Lacher, M., Zoeller, C., Bronstein, M., & Kübler, J. (2014). Google Glass in pediatric surgery: An exploratory study. *International Journal of Surgery*, 12(4), 281–9. doi: 10.1016/j.ijssu.2014.02.003
- [14] Nugroho, J. (2013). *A Conceptual Framework for Designing Wearable Technology*. University of Technology Sydney.
- [15] Okwu, P. I., & Onyeje, I. N. (2013). Ubiquitous Embedded Systems Revolution: Applications and Emerging Trends. *International Journal of Engineering Research and Applications*, 3(4), 610–616.
- [16] Popat, K. A., & Sharma, P. (2013). *Wearable Computer Applications A Future Perspective*. *International Journal of Engineering and Innovative Technology*, 3(1), 213–217.
- [17] Profita, H. P. (2011). *Social Acceptability of Wearable Technology Use in Public: An Exploration of the Societal Perceptions of A Gesture-Based Mobile Textile Interface*. Georgia Institute of Technology.
- [18] Rutherford, J. J. (2010). *Wearable Technology: Health-Care Solutions for a Growing Global Population*. *IEEE Engineering in Medicine and Biology Magazine*, (May/June), 19–24.
- [19] Sanganee, D. (2013). The effects of wearable computing and augmented reality on performing everyday tasks. *Research Topics in HCI* (pp. 1–15).
- [20] Tao, X. (2005). *Wearable Electronics and Photonics*. (X. Tao, Ed.) (1st ed., pp. 1–244). Cambridge: Woodhead Publishing Limited.
- [21] Watier, K. (2003). *Marketing Wearable Computers to Consumers: An Examination of Early Adopter Consumers’ Feelings and Attitudes toward Wearable Computers*. Georgetown University.
- [22] Hoş, Sibel. 'Giyilebilir Teknolojiler Hayat Kurtarıyor'. *Turkcell Blog*. N. p., 2014. Web. 20 May. 2014.

<http://blog.turkcell.com.tr/giyilebilir-teknolojiler-hayat-kurtariyor>>

- [23] LiveScience.com, 'Will Wearable Tech Bring Humanity A 'Sixth Sense?'. N. p., 2014. Web. 20 May. 2014. <<http://www.livescience.com/42490-wearable-biosensor-technology.html>>
- [24] Rinkworks.com, 'Things People Said: Bad Predictions'. N. p., 2014. Web. 20 May. 2014. <<http://www.rinkworks.com/said/predictions.shtml>>.
- [25] Samsung.com, 'Samsung Gear'. N. p., 2014. Web. 20 May. 2014. <http://www.samsung.com/global/microsite/gear/gear2_features.html>
- [26] Taylorwessing.com, 'Introducing... Wearable Technology'. N. p., 2014. Web. 20 May. 2014. <http://www.taylorwessing.com/globaldatahub/article_intro_wearable_technology.html>
- [27] Philips.com, 'Philips Design SKIN probe receives prestigious "best of the best" in red dot award: design concept 2007'. N. p., 2014. Web. 20 May. 2014. <http://www.newscenter.philips.com/main/design/about/design/designnews/pressreleases/skin_red_dot2007.wpd#.U4ZXGPI_t_>