"SixthSense" Technology—Wearable Technology and the Future of IT

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Introduction

Technological innovations are occurring every year. These innovations are occurring during exponentially—the technological world of big data, computers, cell phones, and countless permutations thereof, are evolving every year. However, there are little well-known technologies that span the gap between the digital world and the physical world—i.e., wearable technology (which is distinct from simply carrying technology with you). Specifically, three items that are still relatively unknown, but could be examples of the future of information technology as we know it, are: SixthSense Technology, Samsung's Galaxy Gear Smartwatch, and Google Glass.

One man, Pranav Mistri, has been at the forefront of trying to invent, sell, and successfully market wearable technologies. Mistri is an Indian computer scientist who, in 2009, developed "SixthSense" technology while pursuing his Ph.D. at MIT. Currently, he is one of the most sought after tech inventors in the world—he is currently head of Samsung's Think Tank team and inventor of the Samsung Galaxy Gear Smartwatch (coming out Fall 2013). The focus of this paper is to briefly discuss Mistri's first invention—SixthSense technology—and then use it as an archetype to discuss social, legal, and ethical concerns of other wearable technologies in the future.

SixthSense Technology

Specifically—SixthSense is primarily composed of a pocket protector, a mirror, a camera, finger-tip sensors, and a cell phone (Mistri, 2010). See Figure 1 below.

*Figure 1.*Mistri displaying the wearable components of SixthSense technology. Retrieved 28 Sep 2013, from www.pranavmistry.com/projects/sixthsense/#PUBLICATIONS

Mistri describes his invention as follows: "It uses the above components to essentially use project a digital image and then manipulate that image using sensors attached to the user's fingertips (Mistri, 2010). In other words, instead of manipulating a LCD screen you can "project" what you would normally see on a cell phone onto a wall or object. Then instead of touching the object, you move your hands and fingers and then touch your new "screen".

Mistri further describes his technology: "Both the projector and the camera are connected to the mobile computing device in the user's pocket. The projector projects visual information enabling services, walls and physical objects around us to be used as interfaces; while the camera recognizes and tracks user's hand gestures and physical objects using computer-vision based techniques. The software program processes the video stream data captured by the camera and tracks the locations of the colored markers (visual tracking fiducials) at the tip of the the user's fingers using simple computer-vision techniques. The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces. The maximum number of tracked fingers is only constrained by the number of unique fiducials, thus SixthSense also supports multi-touch and multi-user interaction" (Mistri, 2010).

This image of Mistri below shows him using his hands to manipulate his "screen" (Figure 2).

*Figure 2.*Mistri demonstrating how to project and manipulate data anywhere. Retrieved 28 Sep 2013, from http://www.pranavmistry.com/projects/sixthsense/#PUBLICATIONS

Potential Benefits

Some of the potential benefits of SixthSense become clear—using normal human gestures and movements to create your own type of Graphical User Interface (GUI). This improvised GUI can be utterly convenient—to project a display onto a wall, or your hand (to make a phone call) rather than look at a small hand-held device, such as a cell phone (see Figure 3 below). Even surfing the web can be done in life-size pictures, instead of a cell phone.

*Figure 3.*Mistri demonstrating making a phone call from the digital projection on his hands. Retrieved 28 Sep 2013, from http://www.pranavmistry.com/projects/sixthsense/#PUBLICATIONS

Another benefit of SixthSense technology is giving the user the ability to access vast amounts of information in real-time. For example, the camera technology can recognize objects, such as people, products at the grocery store, etc. Anything that has an electronic signature (barcode or even facial recognition software for humans) is scanned by the software and the camera and then displays information in front of the user. The quickness of the information being displayed can aid with decision making (reviews on an item to purchase in near real-time). This software is open source code, available for download (Nafissa, 2012).

The foresight by Mistri cannot be understated. According to Gerber, wearable technologies of all sorts will become extensions of ourselves; a way to "augment reality"; and lastly, even unlock big data (Gerber, 2013). Yonck describes the future as a future of technology as largely the evolution of interfaces. He says "The marks of a good interface are its

intuitiveness, ease of use, and ability to handle tasks more efficiently. As interfaces have progressed, the trend has been toward ever more natural implementations, resulting in devices that can better integrate with the way people work and play. Over time, these progressions will likely lead to organic user interfaces, which will allow our tools to become even more intimately part of our lives. Eventually, this may even lead to the development of a true exocortex, an additional aspect of our memory and processing that would exist outside of our bodies. The result would be a tremendous increase in our effective personal knowledge and the intelligence we could bring to bear on a given task or problem" (Yonck, 2010).

Legal, Ethical, and Social Concerns

There is the question of the ubiquity of data at everybody's disposal—what if when your SixthSense unit picks up somebody's personal information when you are walking by them, and a screen pops up displaying that information? In other words, the visual aspect, connected to the Internet, and its ability to run searches so quickly can potentially be harmful to human interaction. It potentially could run search queries on everybody you walk past and then display their personal information. Clearly, there is still much research that needs to be done on privacy and these futuristic technologies. Google Glass, a wearable technology similar to wearing regular eye-glasses, has caused privacy concerns to be raised already. In June 2013, privacy groups issued a letter to the CEO of Google to answer questions regarding privacy considerations (Taylor, 2013). The future is uncertain regarding legislation required to keep some modicum of privacy for the individual.

Socially, there is some research done on impact of current technology. The key question is: will there be an even worse negative effect on human relationships as the world becomes even more digitized? Williamson describes five ways technology has negatively impacted families

currently: 1) school performance drops with children who are continually using technology; 2) quality time with the family becomes less; 3) a less empathetic generation—lack of respect and care for others; 4) blurred boundaries—not knowing when to leave "work at work"; 5) the inside generation—children who, figuratively speaking, don't climb trees (Williamson, 2013). These five things are only with current technologies—certainly we should be concerned about newer technologies in the future. It is not hard to see the downside of futuristic technologies: as we become more dependent on technology, we become less dependent on each other as human beings and the human familial structures that govern us.

Conclusion

The SixthSense technology and other wearable technologies such as the Galaxy Gear Smartwatch and Google Glass do not have a consumer base yet (Baar 2013). However, they probably will—as the world becomes increasingly digitized. Evidence for this is clear: President Obama in 2013 announced 100 million dollars in funding for futuristic technologies. Gray cites one example: "Brain Research Through Advancing Innovative Neurotechnologies (BRAIN); The age of neurotechnology has officially arrived" (Gray, 2013). This presidential investment makes a compelling case for the future of wearable technologies. "Many examples of transformative neurotechnology are making their way to market now. Brain-computer interface (BCI) devices with electrodes embedded into headgear can read the faint electrical activity along the scalp. You can control a computer, robot, or drone with the power of thought" (Scott, 2013). If there are already medical advances in neurotechnology, and this technology is even being funded by the government, certainly the average person at home will have similar technologies at their disposal in the near future due to inventions and businesses.

SixthSense Technology is one example of wearable technology. It certainly is not the only example—Google Glass and/or many other technologies may soon be popular. Regardless, it is becoming increasingly clearer that there is an effort to "span the gap" between the digital world and the physical world. This effort is manifesting itself through technological innovations and government funding in related fields. Students of IT and IT experts should realize that the mere possibility of projecting a digital Graphical User Interface onto a wall or object and ease of access to information will most likely also come to businesses and the workplaces. The business world and government sectors will continue to upgrade technological platforms. These upgrades will very likely involve wearable technologies. The SixthSense technology developed by Pranav is an example of a technology that will likely evolve into a norm for society one day, even if the current technology in SixthSense isn't successfully marketed. Students of IT and IT experts should realize this one thing about the future: the trend is moving toward more technology, not less. Norman sums it up rather well:"Can wearable devices be helpful? Absolutely. But they can also be horrid. It all depends upon whether we use them to focus and augment our activities or to distract. It is up to us, and up to those who create these new wearable wonders, to decide which it is to be" (Norman 2013).

References

Baar, A. (2013). Consumers Not Sold On Wearable Tech. Retrieved on September 28, 2013, from http://www.mediapost.com/publications/article/209024/consumers-not-sold-on-wearable-tech.html#axzz2gDaD10AP

In this article, Baar attempts to ascertain whether or not consumers are sold on the idea of wearable technology. The two main points he was making was concerns about privacy and comfort level of potential wearers-he concludes there is some work to do on the marketing end of wearable technology; also the product has to be comfortable.

Gerber, S. (2013). How Will Wearable Tech Impact the Startup World? Retrieved on September 28, 2013 from http://mashable.com/2013/05/27/wearable-tech-startups/

In this article, Gerber forecasts the impact of wearable tech on the startup business world. His predictions all stem around the idea that the future involves augmented reality, which will affect personal, family, and therefore business life.

Mistri, P. (2010). SixthSense: Integrating information with the real world. Retrieved on 28 September 2013, from http://www.pranavmistry.com/projects/sixthsense/#PUBLICATIONS

This came from Mistri's personal web page, where he outlines his SixthSense technology. He describes the components and usefulness of SixthSense—they involve hardware and software that are both useful to society, according to Mistri.

Nafissa (2012). TEDBlog-Technology. Retrieved on October 1, 2013 from http://blog.ted.com/2012/01/05/sixthsense-get-the-open-source-code/

This blog is from the famous "TED talks" blog, where they proudly discuss "ideas worth spreading" and they hold conferences every year. In this blog, they include a link to the free open source code for Mistri's SixthSense software.

Norman, D. (2013, Sep). The paradox of wearable technologies. *Technology Review, 116*, 101-103. Retrieved on October 1, 2013, from http://search.proquest.com/docview/1433119548?accountid=14541

Originally published as a magazine in the Sep/Oct 2013 edition of the *Technology Review,* Cambridge, United States. In this magazine article, Norman describes the paradox of wearable technologies by discussing the benefits and negative side effects of current and future digital technologies. There is still much to discuss regarding the negative impacts of wearable technology.

Scott, G. (2013). The neurotechnology revolution has arrived. *The Futurist, 47(5)*, 6-7. Retrieved on October 1, 2013 from http://search.proquest.com/docview/1425865465?accountid=14541

Originally published as a scholarly journal in *The Futurist, Vol. 47*, Sep/Oct 2013, Washington, U.S. In this journal, Scott discusses the future of neurotechnology, which involves the human mind. Scott, as a futurist, focuses on the power of human thought and the ability to control digital objects, such as robots, avatars, etc. This discussion is vital to the wearable tech discussion because it focuses on "spanning the gap" between the human and digital worlds.

Taylor, J. (2013). Privacy authorities issue Google a 'please explain' on Glass. Retrieved on September 28, 2013, from http://zdnet.com/privacy-authorities-issue-google-a-please-explain-on-glass-7000016982/

This article from Taylor discusses privacy concerns for Google Glass. Privacy will be a major concern as the world moves toward increased wearable technologies. If not done right, nobody will be safe from undue technological developments.

Williamson, K. (2013). 5 Ways technology has negatively affected families. Retrieved on October 2, 2013 from http://tlc.howstuffworks.com/family/5-ways-technology-has-negatively-affected-families.htm

Williamson's article demonstrates the obvious breakdown of familial norms that have held the nuclear family together for so long. The danger of technology is startlingly clear to parents: if not regulated, the child can grow up insulated, without exposure to the outdoors, and without care for other human beings. Too much dependence on technology is a bad thing.

Yonck, R. (2010). THE AGE of the INTERFACE. *The Futurist, 44(3)*, 14-19. Retrieved on October 2, 2013 from http://search.proquest.com/docview/218577167?accountid=14541

Originally published as scholarly journal in *The Futurist, Vol.44*, May/June 2010, Washington, U.S. This journal edition, written by Yonck, discusses the progression of the Graphical User Interface (GUI) which has evolved over the last half-century. The SixthSense technology takes the cell-phone screen and projects the GUI onto any surface. This could be where the next evolution of the GUI is headed. Yonck gives many examples and much technical language.