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Ubiquitous Computing: Where are they now?

Ubiquitous computing is the term coined by Mark Weiser in 1988 at Xerox PARC while serving as a director of the computer science laboratory. Ubiquitous computing is the idea that computers are seamlessly embedded into our everyday lives and, combined with the idea of calm technology, step in and out of “view” to quietly aid with everyday tasks. It is comprised of three parts- systems, experience and sensors. Systems such as software applications work to create pleasurable and meaningful experiences through the use of location and context aware sensors. Beginning in the 1970s, a group of talented scientists began their work at Xerox PARC and strived to create a “sandbox rich enough” in the confines of their laboratory that would one day contribute to the many computers per one person that many people get to experience to day. Thus we were ushered into the modern age of ubiquitous computing (Krumm).

Every morning when I wake up, the first thing I do is check my phone. I press my thumb to the home button, it senses my unique fingerprint ID, and unlocks on my command. The main screen, home to several software applications alerts me of the weather for the day, notifies me of traffic in my area and how long it will be taking me to get to my usual morning destination, and reminds me of any events or assignments I have coming up. All this information is acquired just by using my fingerprint to unlock the screen, which, nonetheless, my phone was able to accurately sense that it was indeed my fingerprint and not some other person's.

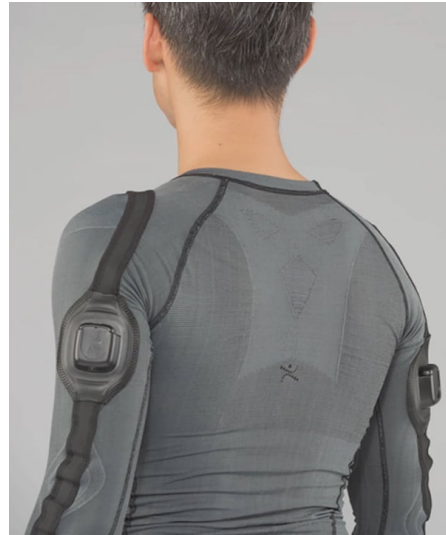
The PDA, personal digital assistant, was the original “smartphone” that laid the foundation for the development of the beloved technology we have come to know and use everyday. One of the earliest PDAs was the release of the 1989 Casio Business Organizer Scheduling System (B.O.S.S) that served as a mixture between an organizer, phone, and mini-computer – this being among the few pocket sized computers that could be easily transported without any hassle. In 1996, Palm Incorporated released the first successfully marketable PDA. In 2002, T-Mobile released the Sidekick that was able to offer customers both the QWERTY keyboard and built in version of AOL’s instant messaging system. It was also able to alert people of notifications through the use of LED lights. This was the closest example of the modern smartphone until 2007 when Apple released the iPhone featuring its touch screen technology (History of PDA).

As can be seen, both the PDA and the Apple Smartphone had keyboard and touch screen capabilities, both with a display. Once originally gray scale, the iPhone has retina displays of such high quality of about 300 pixels plus per inch. It’s many capabilities can be traced back to the original features first seen in the B.O.S.S. yet have been improved with higher connectivity to the Internet, Bluetooth capabilities allowing for wireless communication connections with other devices. The iPhone and like devices are continuously evolving and changing to meet the growing needs and demands of people.

After I wake up and check my phone in the morning, the next thing I do is get dressed for school. As I’m packing my belongings for the day, notebooks and laptop in backpack, phone in pocket, and the newest device I include is my wearable activity tracker.

Since the turn of the twenty first century, wearable technologies have had an increasingly growing presence in people's everyday lives. In accordance with Mark Weiser's vision of many computers to one person, yet another device was added to the list of computers on any person at any given time; this became known as the activity tracker. Activity trackers', such as the well-known and popular business Fitbit, purpose is to collect and record data from daily activities. A Fitbit is a wearable device attached around the wrist that through a tiny sensor tracks heart rate, step counts, overall daily active minutes, and sleep patterns. The Fitbit and like devices revolutionized the way we looked at data. Most often, before the Fitbit, the only people who kept track of their daily exercises were people serious about fitness and health. However the Fitbit automatically records this information and sends it to be stored in the users own personal app via Bluetooth. The information is recorded without having the user have to type or write anything out, while still holding people responsible for their activity levels they need to reach. However, its data is flat, a mere two-dimensional capture of the basic activities you performed throughout the day.

To combat the limitations of the Fitbit and like devices, Heddoko, an emerging business of wearable technology, has developed an advanced biometric clothing system that is able to 3D capture a person's full body movements. It consists of two types of sensors, the capsule sensor, which is the larger box like feature on the clothing and smart fabric sensors



within the garment. Unlike the earlier versions of biometric clothing, Heddoko's clothing has a more relaxed fit allowing the wearer to have a wider range of motion. In addition, other features the clothing has to offer is moisture control, the ability to be washed, and being a durable fabric that will not easily tear.

This is the first component of the technology; the second is the application that records movement, captures movement precision, and completes injury profiles and analyzes all the data for a complete and comprehensive guide (Heddoko Suit).

Heddoko's vision for wearable technology is concurrent with ubiquitous computing. I believe the motion capture clothing is also a good example of calm technology because it closely resembles that of everyday wear. Of course it still has some bulky sensors and a larger battery pack, but I believe in less than a decade, wearable technology will be significantly improved and more marketable for everyday wear. The ever-improving ergonomics of biometric clothing will soon make the bulky wrist watches that Fitbit offer a device of the past because biometrics will so seamlessly incorporate sensors that it will look exactly like the plain clothing people wear everyday

now. The applications are plentiful, as for innovators of the fashion industry have already begun to explore this idea, researching “smart” fabrics that can help to regulate body temperature and perhaps even relax muscles and so on and so forth.

Continuing with my morning routine, the last thing I do before I leave my house is have a bowl of cereal for breakfast and then try to leave the house on time, but I can never seem to find my keys.

In the continuing efforts to convert homes into smart-homes, Disney Research has created an RFID light bulb to create an interactive home experience. From the top down, the RFID light bulb contains an E26 light bulb, 3D printed bulb body, power supply, RFID reader and compute module, 5V fan and baffle, LED and antenna board, and diffuser. RFID pads are in the cone shape below each reader and allow for infrastructure monitoring, localization, and embedded sensing.

For example, when I have my morning cereal, I never check the expiration date even though drinking spoiled milk is a rotten experience. With the RFID lights , it can sense the milk beneath it and change colors alerting you about the expiration of the milk. A green light signals it is safe to drink, while a red light indicates that it’s spoiled. In addition the RFID lights are helpful for finding misplaced objects such as keys, and can



assist me in being on time for work so I don’t have to waste time searching for a small object. This technology has a corresponding dashboard application that makes the location of objects known from the app. Furthermore, small paper like sensors on the door can track the opening and closing of doors, and even drawers throughout the house.

Aside from the more practical advantages, tacks are also embedded in the pages of books create even more immersive story telling experiences by setting ambient lighting to match the mood of the book (RFID Light Bulb).

Disney's RFID lights continue the vision set out by projects such as Georgia Tech's Aware Home and Olivetti's research in systems such as the Active Badge Location System. The Active Badge location system set the precedent for the technology of the RFID lights, making it known that you can track the location of "non-smart" objects such as people and more common objects. It used an infrared beacon to track the badges of employees to know where they were at all times. The signal was a unique ID that was received by sensors, one sensor being located in each room. With the development of Disney's technology, there are many sensors per room and increase the overall accuracy and interaction with people, however the idea of tracking objects is fundamental to both designs (Krumm).

As can be seen, I think we as the collective human race have made a lot of progress in the field of ubiquitous computing. There is an ever increasing number of smart devices that one person can own. On the other hand, in some respects, I think we are farther from his vision of seamless integration because it is an age of screens. Our primary action with technology is that of staring at screens of phones and personal laptops. In a world where we are so connected, the screens of our phones and laptops are creating walls around us as those are preventing full immersion into the world and the people around us. The technology at times is too visible and in turn makes us as people invisible. However, the advancements in biometric clothing and the RFID lights is something that Weiser would be proud to see integrated into everyone's home and

lifestyle. I think it is important to remember that technology should be working in favor of us, to assist us and provide a calming effect, and as long as this vision continues to prevail, I believe ubiquitous computing to continue to expand and take on life forms that have yet to be imagined.

Works Cited

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