**Haptic Communication**

There are various types of communication in existence, among the many lies Haptic Communication. It is a type of communication that relies entirely on touch, common among humans and animals. Haptic communication doesn’t only exist among those organisms, but also between machines and humans. From a mobile device vibrating in a pocket to an electric shock by touching an outlet can be considered examples of communicating haptically in the category of machine. It is hard to notice haptic interaction in a day-to-day life, but it exists everywhere. (Haptics Is Quite Literally The Science of Touch) When playing Fifa’15 on a game console, at the very a last minute chance for you to score the controller vibrates with a proper amount of intensity indicating the severity of the moment; when entering the wrong password to unlock your phone, haptic interaction exists in the form of vibration that indicates that you have entered the wrong password. The purpose for developing such a technology is to bring effective haptic interaction into human’s lives using touch that could potentially help address common human needs with a low and high tech innovation.

Haptic notification is one of the most common types of haptic communication. An incoming message on a cellular device triggers a specific vibration indicating a message has been received on the cellular device. This type of haptic notification system can be extremely helpful for education talks (such as TED talks, professor talks, etc) in order not to exceed the time limit. The most common way of notifying a speaker that he/she has a few minutes left by the moderator is using a visual on the stage (in Ted talks, its on the bottom of the stage allowing visual only to the speaker or in more local talks a moderator uses a piece of paper or cardboard indicating the amount of time left for the talk). Although, this could be distracting to the audience if a piece of paper/cardboard visual was used to indicate the time left as it will be a public visual and a private visual would be hard to notice or easily ignored. Dr. MacLean, Director of SPIN Lab at UBC, and her team invented a piece of hardware that would be strapped around the speaker in a talk as a haptic communicator. (Applied Perspectives on Haptic Interaction with Regard to Attention, Dr. MacLean) Instead of a visual, the speaker would receive haptic cues on his/her wrist when the moderator would like to notify the speaker that his/her time is about to come to an end. The intensity of the haptic cues would depend on the time left for the speaker, very little to no time left would have the highest intensity versus having a few minutes left. Using this haptic notification system would allow a more private communication between the speaker and the moderator. However this poses a question, what kind of effectiveness would this system have on the speaker when the speaker is focused on a particular aspect and/or is nervous? This is where personalization and customization of the device and haptic interaction comes to place. Haptic communication can contain various aspects: frequency, intensity, and rhythm. There is a language gap between the developer of the haptic communicator/ device and the end recipient whom has the access to customize and personalize the haptic feedbacks based on his desires. What a developer might consider a high amplitude continuous vibration, the end recipient might just consider it as “Bzzzzz”. (Improvising Design with a Haptic Instrument, Schneider) In order to tackle this issue, Oliver S. Schneider is currently working developing an application with a haptic receiver attached to the device allowing the user to create a haptic feedback and simultaneously feel the result and customize/personalize it the way the speaker sees fit. This solution would efficiently allow the use of haptic interaction in educational talks.

Haptic communication/interaction can be used greatly to benefit human lives by addressing common needs. At the instant that a phone is vibrating in a pocket it is communicating with its owner signifying some sort of notification or a call depending on the duration, frequency, and intensity of the vibration. This specific example is a common type of haptic communication. However, when a human being is in motion it is extremely difficult for the haptic technology to grab the attention of the owner due to motion. (Improvising Design with a Haptic Instrument, Schneider) Thus, improving such a technology requires the haptic communication to be communicated at the part of the body most sensitive and practical to be received by the owner. Dr. MacLean performed a test and found out the most practical, yet sensitive, place to receive haptic feedback is on the wrist while a human being is in motion. Imagine wearing a Smart-Watch and walking towards a bus station. The Smart-Watch can visually indicate the amount of time and velocity you require for the person to approach the bus stop in time, that’s good and all, but what if haptic technology could indicate through haptic feedback and keep you in the right pace and right direction by just communicating haptically? Not only would this be directing you in the right direction but it would also be doing it in a non-conscious way. This would increase the effectiveness of the day-to-day life of humans, especially in step frequency, by the assistance of haptic technology. Dr. Maclean also performed tests with subjects wearing a haptic receiver on their wrists while listening to music (hard beat techno genre), listening to a podcast (educational, requiring a lot of attention and focus), and when it is silent. As anticipated, subjects listening to a podcast felt little to no feedback haptically in comparison to silent and in motion. (Applied Perspectives on Haptic Interaction, Dr. MacLean) The wrist is also in motion when the body is in motion (say the person is walking, when the person walks the legs and the arms move as well), leaving it inefficient while in motion. Thus the neck, also sensitive, could be the key to advancing haptic technology and feedback. Take the LG TouchPro Bluetooth headset for example, regardless of motion when the phone rings, it vibrates around the neck and touches the collar bone of the owner allowing direct touch capability and allowing haptic feedback to indicate that there is an incoming call. The Gear S, a Smart-Watch created by Samsung to be worn on the wrist, wouldn’t be as efficient as the headset around the neck when the body is set in motion.

Wearing a wearable haptic device could be effective in sports. As mentioned earlier, while the body is in motion, it is hard to see a visual on the wrist while the wrist as well is in motion. Hence, its difficult to see a visual of the speed/pace/time/step frequency of one’s self. A haptic feedback device wrapped around the athlete’s wrist or better yet, around the neck, would be more efficient in sports such as running, rowing, cycling, swimming, step frequency. Majority of the time when a person is running (preparing for a marathon) they have a media player device attached to themselves somewhere and headphones plugged in to their ears for music, allowing auditory distractions and the person is also visually impaired when trying to read something on the Smart-Watch while in motion. Leading to haptic communication being the most efficient theoretical option. If technology/hardware allows, it can even go as far as to signal haptically-unconsciously when to stop/pause for a red light on a street and keep you on track with speed and pace.

In addition, haptic feedback can be effective in the clinical aspects as well. It can act as a physical therapist, indicating how much and what kind of movement was done or should’ve been done. Furthermore it could allow fine-grained activity analysis and guidance in a real-time manner. It theoretically could be beneficial for patients with Parkinson’s, where the haptic device would be assessing the walking quality and indicate any limping, injuries based on movement, and/or a situation in development. This kind of technology is already in existence but Dr. MacLean and her teams are working on an algorithm to allow access to all of these features.

Haptic Communication exists in day-to-day life activities, especially the interactions between machines, such as mobile devices, Smart-Watches, game consoles, and Bluetooth headsets. Using this haptic interaction to its most efficient and beneficial level requires a lot of research and experimentation, something that Dr. MacLean has been researching for the past few years. In present day the technology already exists, it’s a matter of breaking the language barrier in order to allow personalized customization of the end user and using the right algorithm to allow its efficient use for the general public and its clinical use. Personally, I believe that having a device that can deliver haptic feedback to me without me being conscious about it yet still react on it is a huge advancement and for the better. Not only that, it has a great approach for clinical purposes and data analysis.

**References:**

"Haptics Is Quite Literally The Science of Touch." *What Is Haptics?* Immersion, n.d. Web. <http://www.immersion.com/haptics-technology/what-is-haptics/>.

MacLean, Karon. "Applied Perspectives on Haptic Interaction with Regard to Attention." CU Colloquium. CO, Boulder. Oct. 2014. Lecture.

"New Haptic Feedback Tech Makes Touchscreens Poke Back." *TechHive*. N.p., n.d. Web. <http://www.techhive.com/article/236473/new\_haptic\_feedback\_techmakes\_touchscreens\_poke\_back.html>.

Schneider, Oliver S., and Karon E. MacLean. "Improvising Design with a Haptic Instrument." (n.d.): n. pag. *CS UBC*. University of British Colombia. Web. <https://dl.dropboxusercontent.com/u/11730635/new/Schneider-HAPTICS-2014.pdf>.