Expanded Skin

Nora N. Khan, Writing Critic, Department of Digital + Media

Shona Kitchen, Thesis Committee Chair Department Head,
Department of Digital + Media

Aly Ogasian, Thesis Advisor Associate Professor,
Department of Digital + Media

Takeo Watanabe, Guest Critic The Fred M Seed Professor,
Department of Cognitive, Linguistic and Psychological Sciences,
Brown University

Body
Self

Jarring Feedback
Others

Expanded Skin
Beyond

Abstract

Our digital interfaces have been degrading human sensory intelligence by limiting our body to only vision and the first two fingers. Despite the high level of available technologies, we do not fully utilize them due to our lack of awareness of its applicability in more various aspects than just media being consumed. It is also because of its inaccessibility in terms of human–computer interaction (HCI) beyond our sense of sight and touch screens. Those technologies have been key elements in all of my works, since my ultimate position is to redirect the technology in a way that could enhance human sensory intelligence.

I believe that the digital environment around us has already arrived at a point where the current technologies create an enhanced sphere of human sensory experience. My practice is focused on how to restructure the invisible interaction system between humans and the digital medium and expand our sensory experience through the interaction. I defamiliarize and reframe the invisible interactions into clear inputs and outputs to raise autonomy in this relationship by connecting our physical body to some synthetic body as an extension of our own. Mostly, I translate the sense of self by observing and analyzing our body gestures and designing a framework for an intensification of a sense. This practice ultimately aims to design the extended skin ego, our actual skin's sense of self, by repurposing the technology from a separate entity to extension of our experiential being.

In this book I will share framing anecdotes, specific scientific foundations such as octopi consciousness, and my experiments that were designed in the R&D process. The results from experiments will be given as a proposal.

Introduction

I first witnessed the process of death at the age of 10 when my grandfather passed away. I still remember what his hands felt like when I held them. They were barely warm, dehydrated and lifeless. The skin had no tension to go back to the first place and stayed as I pushed. While watching him closely, I thought that our body itself is a death. Before, I considered the body as a life only. I was not aware how our body could be restrictive by aging and decaying. Since then, the fact that I am slowly losing my bodily functions to sense as a live body has become a concern. The fear of this time-limited medium between myself and the world made me obsess with all the senses and crave for more live sensory experiences.

Most of my art practices have been expressed through my body as a medium which is limited in terms of time and space. My physical body alters to a medium by emptying myself out and placing the vacant physical being in the works to explore the physicality of human beings, especially the simultaneous interactions of diverse body senses. By creating external links to the body, I design the expanded human sensory experiences.

Skin Ego
Our Actual Skin's Sense of Self

In this book, I focused on the skin covering our entire body. Through skin as a medium, by touching and being touched, a self creates its own ego. Our skin is the first step of the bottom-up process of being conscious and, at the same time, it takes up the largest area of our body. But still, it is limited and restrictive in terms of time and space. To feel through skin, most of the inputs should touch the skin.

Expanded Self

I use digital environments to expand our sphere of human sensory experience in order to counter the degraded sensory life created by current digital tools. Our digital interfaces have been degrading human sensory intelligence by limiting our body to only vision and the first two fingers. I often find myself spending most of my day on the small screen of a smartphone. The more I become accustomed to this interface, the more I become addicted to that little gripping screen with the small motion of my thumb scrolling down the screen. Despite the society's high level of technical advancement, we do not fully utilize the available technologies due to our lack of awareness of its applicability in more diverse (personal) aspects, rather than just being consumed as it is, and its inaccessibility in terms of human–computer interaction (HCI), beyond our sense of sight and the touch screens.

Nonetheless, those technologies have been key elements in all of my works since my ultimate position is to redirect the technology in a way that could enhance the human sensory intelligence. I believe that the digital environment around us has already arrived at a point where the current technologies create an enhanced sphere of human sensory experience. I defamiliarize and reframe the invisible interactions between human and the digital medium into clear inputs and outputs to raise autonomy in this relationship by connecting our physical body to some synthetic body as an extension of our own.

Mostly, I translate the sense of self by observing and analyzing our body gestures and designing a framework for an intensification of a sense. This practice ultimately aims to design the expanded skin ego, our actual skin's sense of self, by repurposing the technology from a separate entity to extension of our experiential being.

In this thesis, I will share framing anecdotes, specific scientific foundations such as octopi consciousness, and my experiments that were designed in the R&D process. The results from the experiments will be given as a proposal.

BODY

Body
Self

It all started with a very specific memory of a friend who has congenital hearing loss and sat next to me in first grade. I will call her L, and there will be no further personal information about her in this book. I choose not to reveal the friend while delivering my perspective on my experiences with her.

Little less than a year of time with her had a significant impact on the early stage of my cognitive development. At age 6, she introduced me to hearing loss; before, it was outside of my knowledge. As a little kid, meeting a friend with hearing loss made me realize that I took my senses for granted. In my childish mind, imagining that I might lose one of my senses made me feel afraid of any possible unexpected moment of disconnection, so I was keen on seeing and detecting movement around me. I often put myself in her situation and imagined what the world would be like through her own way of sensing.

Her way of sensing the simultaneous information surrounding her was actually more diverse and deeper than I expected. Since sound information was lacking, I imagined that her understanding of a situation would be limited without hearing, but the truth was her sensibility developed with the need for survival and became increasingly sensitive with every little detail of her surroundings, such as an echo of the ground, the direction of the scent of each person, object, place, and a shadow on the floor and wall. Among all of the crucial elements in her sensory system, I focused on the two elements in this book: the rumbling of a wooden floor and the body language from the back side of a person.

Rumbling of a wooden floor.

I thought she might feel vulnerable in an open space without walls that was crowded with strangers. However, contrary to my expectations, she seemed calm as usual. However, often there were the moments when she suddenly grabbed my wrist robustly and asked "Who?" This indicated that there was someone running towards us from behind. She told me that she could guess the situation from the vibration of the floor. From my current perspective, I assume that she felt nervous. She looked calm, but actually she was paying keen attention to the tactile feedback provided by her feet, especially that of the resonance of the floor. The school's floor was hollow and wooden. This old wooden floor creaked and even bounced when we walked on it. Since she could not receive any sound or visual information from behind her while walking, her sensory area had been extended onto the floor, as if she were a spider on her web.

Body language from the back side of a person.

Since she could not know what people were saying when they faced away from her, she read people's body language. She could tell if a person was in a good mood or not, or if people were having a private dialog so that she did not intrude. She told me not to go closer to a group of friends when they covered their mouths and kept looking around while talking, or their gestures looked restrained and relatively small. Also, she used to focus on people behind me while she was talking to me. I asked her why she kept looking around her while talking and she answered that she was worried about anyone listening in on us. Later, she could guess correctly what they were talking about just by observing their gestures. The accuracy of her guesses was proportional to her level of intimacy with the person. As individuals' language habits vary from person to person, she must have stored the distinct physical gestures of each person in her database.

Amplify and Translate the Sense into a Different Sense.

Although those two elements were just a small part of her cognitive process, each of the elements shows the heart of my experiential perspective on her sensory intelligence. First, I gained an appreciation of how a single sense can be enhanced and augmented when other senses are limited. I learned that the lack of a certain body sensor does not deprive the sense but rather helps to deepen the functional spectrum of the rest of the senses. I designed experiments for the applicability of this newly introduced correlation between our senses. This has been connected to the tactile communication study in my art practice. Second, from her way of reading people's minds though their gestures, I designed a framework of a new language with my body movements. Those two attempts gave me insights into a new way to sense and communicate through our bodies.
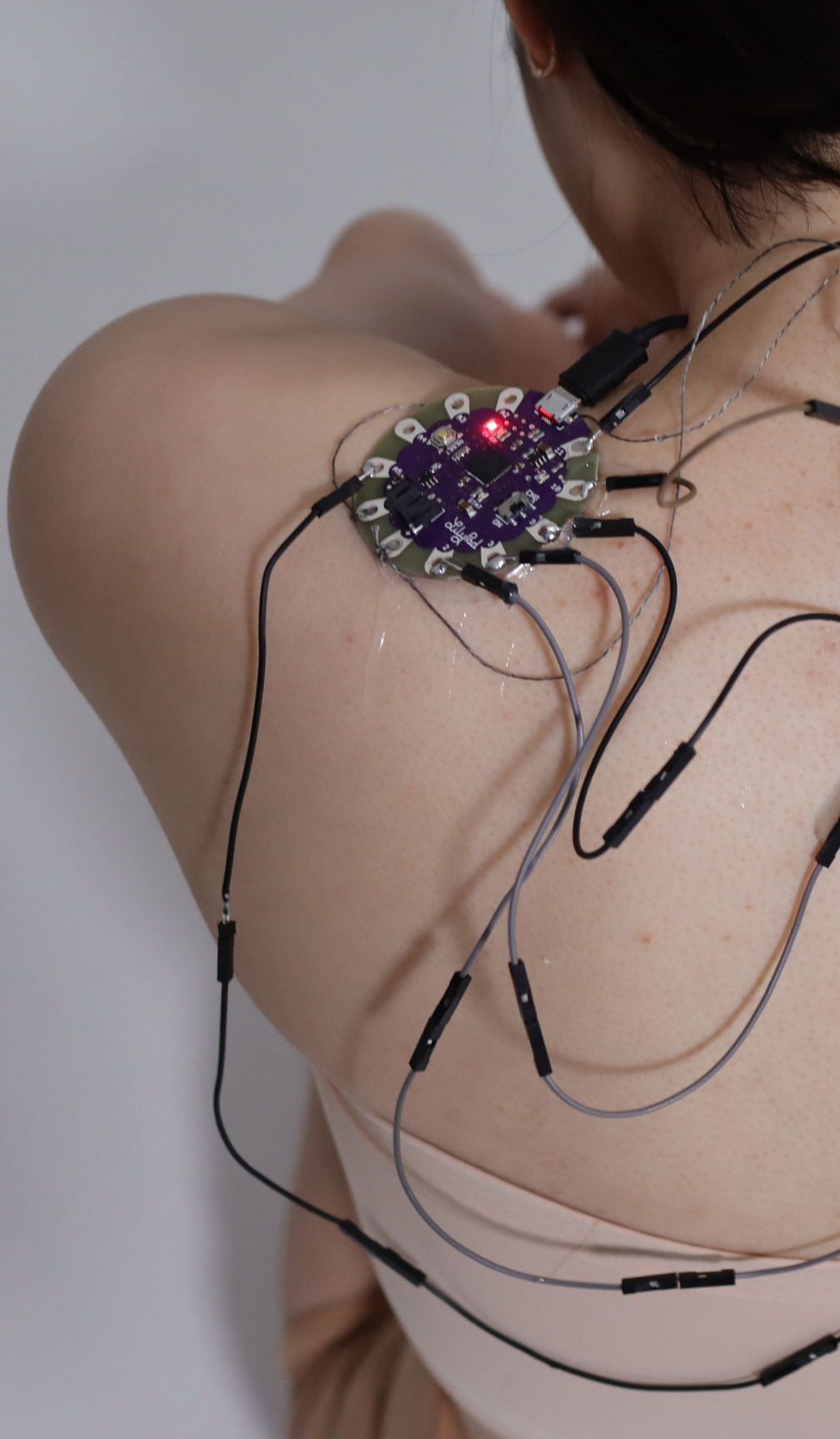
Body Gesture as a Language

I chose body gesture as a main medium to create a lack of direct feedback such as verbal communication and rich visual information that I used to have. To visualize and analyze my body gestures, I used a machine learning system called poseNet. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. The poseNet is a machine learning model that allows for real-time human pose estimation. From the poseNet system, I removed a real-time image from the footage and left only the mark of an estimated pose in a skeleton structure. Also, I made the history of the real-time markings fade out slowly so that I could document the traces of my movements.

These are the documented body movements, each of which I choreographed by me under conditions I set up beforehand. I had to have a system of this new visual language to be a communication method. Thus, I carried out different attempts to read patterns out of the set of my movements. In this process, while looking at the documented images and matching words, I found out more than just the expression of the meaning of a word itself. I could observe the performer's abstract feeling toward the word, and that feeling was a performer's emotional expression of the word based on her mental state at that moment. Moreover, I could deeply relate to the simple linear structured skeletons when their momentary movements were recorded in the trace connected movements.

Although these images have no colors, facial emotions, or verbal communication, through this filtering system, people can solely focus on body language. This simplified communication lets people catch details about their counterparts' emotions and the changes of their mental states.

Paying Attention   Realize and Paralyzed   Refuse and Escape   Disregard

Rise and Awake   Regression and Being called   Self disunion

A glitch in my machine learning system left room for the audience to project their own emotions into the human-like shapes and translate the animation from their own experience of body movements. Without any music or dialog, in the silence, people only focused on the animated skeleton's mimicry of human-like movements. In that silence, I predicted that people would be able to relate to that quasi-human creature, while feeling empathy with their own states of mind. I began to design a dance performance that could be a two-way communication between me as a performer and the people around me.

Tactile Sonification
Translation of Touch into Sound

Evoking the memory of my friend who gathered tactile information from a hollow wooden floor, I choreographed a performance on a wooden floor and behind a screen. Outside of the screen wall, I attached a contact mic as a device to amplify people's touch on the backside of my 3D printed face so that people could communicate with me by touching the surface of the 3D printed face, which had a lot of tactile information about my face. From this translated touch as a sound form, I could guess the motion and emotion of people's virtual touch by paying attention to the frequency or the intensity of the friction sound.

There were more contact mics on the floor around the border between the inside and outside of the screen wall to amplify the resonance of the footsteps near the screen. The amplified resonance described not only the distance between me and the people but also the speed and intensity of our movements. I actively reacted to the resonance feedback made by people from outside the screen when they walked through to the borderline. As a reaction, I used my whole body to generate sound feedback through my body gestures by varying the way I walked on crawled over, or touched the floor. Even though the two groups were physically remote, there were invisible links of shared tension and emotion.
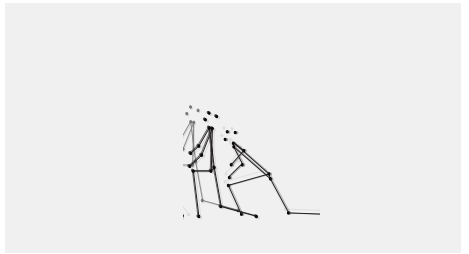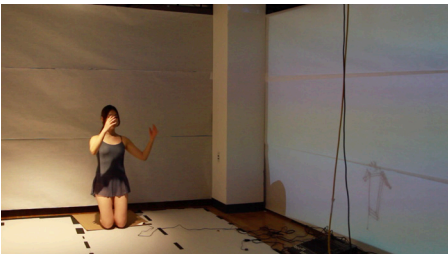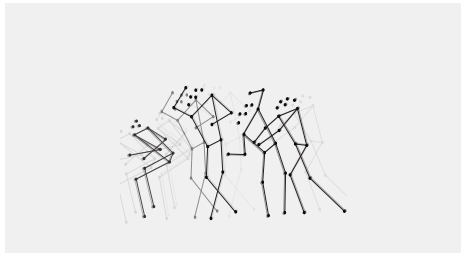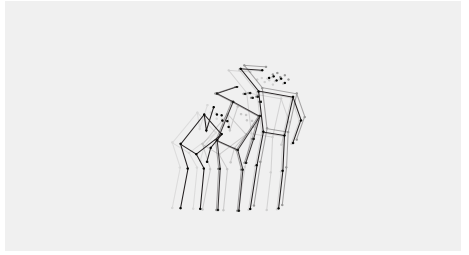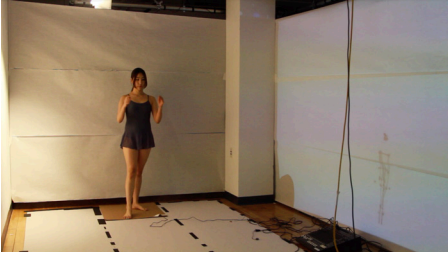
Modern Dance Performance with Contact Mic (2019/ Spring)

Through my experiments with the new framework of communication in the performance, I found that the machine learning system I trained could awaken new sensory areas. It could link the performer and the audience through the sound which was generated by my movements and interactions. Ultimately, I hypothesized, by repurposing the technology from a separate entity to an extension of our experiential being, this kind of biomimicry AI could function as an extended body. It could offer expanded sensory experiences by not only taking biodata but also utilizing it to create enhanced spheres of human experience.

The performance comprised a contemporary dance form and focused on nonverbal communication among random people by letting them only communicate through reading my physical gestures, which had been translated by the poseNet system. Machine learning systems cannot understand humans' abstract emotions and unpredictable changes in our states of mind. I adopted contemporary dance in this performance to manifest the unforeseeable and abstract states of mind that we humans have. By translating our abstract body expressions into the poseNet machine learning program, I could extract pure body gestures in a simple linear structure of our skeleton. This filtering system was used to express a struggling self who was just introduced to the new settings of communication and cognition by allowing the glitches in the machine learning system. Through observing the glitch in the poseNet, I explored this simple linear pose estimating system to process not only the shape of a body but also the data of the expression of complex human emotions. This project redirected the machine learning technology to expand our sphere of sensory experience in communication in order to counter the flattening filter system created by poseNet, which degrades our sensory intelligence more than a captured linear structure of a skeleton does.

JARRING FEEDBACK

Body
Others

Most people give verbal communication superiority over any other communication tools because it is effective and convenient while conveying content clearly and immediately. While language is indeed an effective and powerful system, I believe that it cannot express certain essential parts, instinctive sensorial feelings between us. Since I believe that verbal communication creates layers in the process of our complex states of mind passing through our conscious system that builds a finished sentence to convey our thoughts out loud to others, I often feel some distance between me and a person, especially when I am having a conversation with someone with whom I am not sufficiently intimate.

Rather, I often find myself having more genuine communication with people when verbal delivery is absent.

Kars, Turkey/5 Local Girls

In late Spring of 2014, I was climbing a hill in downtown Kars, Turkey, to watch a beautiful sunset. Also walking was a group of local girls, but we did not really notice each other on the way. When I arrived on top of the old fortress, the girls were having snacks. At that time, I had been traveling alone for more than 8 months, so they reminded me of myself and my friends back in Korea. Unexpectedly, one of the girls invited me to sit with them and share their food. I willingly joined them without any hesitation. However, the girls and I lacked a common language. I could speak Korean and English, and they could speak Turkish only. There was an uncomfortable silence and all of us were just murmuring in our own languages. Thankfully, a catchy melody popped into my head which I had often heard in Turkey. The lyrics started with "Ankara, Ankara, Ankara." Actually, that was the only part of the song I could sing, but they immediately recognized the tune. On top of the old fortress, one of the girls played the song on her phone, and everybody started to dance. With a stranger, no matter how hard one tries to convey a message, it bounces back. However, as soon as intimacy grows between the two, the conversation suddenly goes really smoothly by triggering each other's interest. Even the speed of understanding is related to the intimacy level between them. We opened our minds through the popular song, and we started to communicate with body gestures and facial expressions.

Sense Dialogue

We became increasingly sensitive to each other's gestures, which eventually allowed us to communicate about simple things. When I tried to explain the word "boyfriend," I made a heart shape with my hand and pitched my voice low, and they were embarrassed just by understanding the word "boyfriend" because they were not allowed to have boyfriends unless they met through their parents. They reacted by frowning and talking in frustrated tones about their mothers and the conservative culture in which they lived. Even though we were from quite different cultural backgrounds and had no common language, we laughed at the same things, we danced at the same song, and we listened to each other's stories not through our brains but through our hearts. When the orange sun dipped down near the horizon, we slowly walked down as if we all knew that this would be our last moment. Down the hill, I got warm hugs from each one of them and then we parted.

While traveling in 17 countries and 39 cities, I had a valuable learning experience of nonverbal communication, especially when the city was not a tourist place where there were no English speakers. The only way to communicate was with my bodily gestures and facial expressions. I could only communicate when I gave up trying to understand their language or make them understand my language. We focused on each other's movements, even tiny things like wrinkled brows or the frequency of repeated movements.
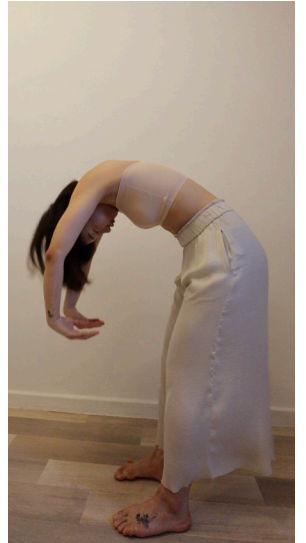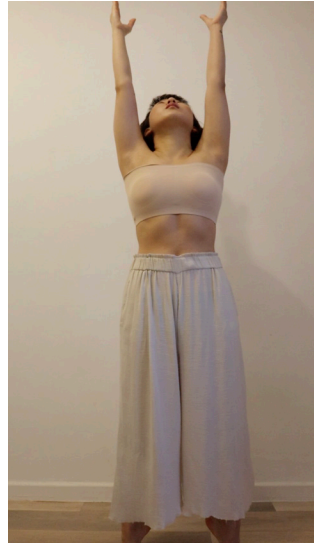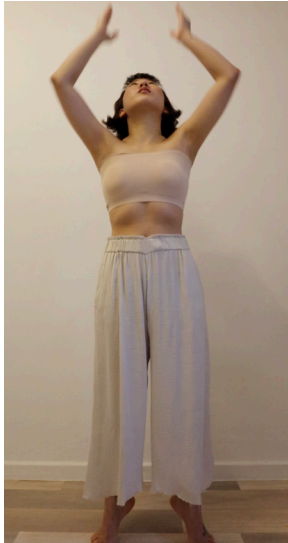
Jarring Senses
Modern Dance Practice in a Dark Room

Connected to the performance I introduced in Chapter 1, I conduct-
ed related experiments that intentionally set a malfunction in the
prime senses on which we are accustomed to relying and induced
people to awaken other senses which were dormant. Among the
experiments, the modern dance experiences influenced me the
most in terms of awakening latent senses. While I was focused on
the communication through the amplified tactile sensory feedback
between people and a performer who was in the separate space, in
this practice, I focused on the communication between a malfunc-
tioning body that lacks the ability of communicating visually and
verbally in the same room.

When I was in a team of contemporary dancers, I observed moments
when an essential bodily communication occurred as an interaction
between the dancers. To build trust as partners who needed to sink
in the same tempo and share delicate emotions in the performance,
we danced in a dark room, trying not to touch or bump into each
other. The dark room was a setting for the jarring feedback between
the dancers. The reason for training ourselves not to touch each
other in the dark room was to slow down all the cognitive activity
and pay more keen attention to each other's movements while in this
jarring communication. In the darkness, we sharpened our latent
senses to replace the other senses that were blocked. Without any
certain form of language, but through body temperature, emotional
exchange, sweat, breathing, and muscle movements, we gained the
feeling of trust and interaction. These abstract feelings of trust
built by the interactions with physical intimacy strongly appeared
among the dancers.

The experience of non-verbal communication awakened my sensory
intelligence and provided an opportunity to see our communication
system from a different perspective. We tend to give oral and written
communication precedence over other mediums because of their
ubiquity and precision.

However, without verbal communication, this malfunctioning sen-
sory communication throws people out of their comfort zones and
ultimately leads to deeper emotional connections between them.

By forgoing language and focusing on the body, its temperature, breathing rhythms, muscle movements and sweat promote deeper emotional connections between people. Every little sensory reaction delivered sensitively leaves highly instinctive sensory memories when one of our prime sensors is malfunctioning. Among these stored sensory memories, I focused on the haptic memory, which is the form of sensory memory specific to tactile stimuli.

Haptic Memory
Accelerometer Drawing

To explore aspects of the haptic memory, I designed a framework for a haptic sensory experience combined with a sense of space. I developed this framework in a website that people could easily access with their smartphones.

The interface of this website is really simple. As soon as people access my website with their smartphones, the accelerometer data of their phones move the coordinates of a matching circular mark on the screen in real time. The moving coordinates of every mark leave a temporal trace for about 2 minutes while slowly fading out. When the mark touches the boundary of the screen, a user receives haptic feedback from the short vibration of the phone. Since the system of the accelerometer is far different from just moving in a 2-dimensional screen, people experience a jarring moment while they get used to this new 3-dimensional sense of space. To document the process of adapting to a new sense of space and haptic memory combined, I designed a participatory performance with five participants roaming around in a room with their phones connected to my website. The participants were asked to think of a simple shape and draw the pattern with the matching marks on the screens. They were not allowed to see the screens of their smartphones while they were in the performance. We shared the recorded screens after the performance, and I could hear a lot of fruitful feedback from the participants while watching them together.

Since people could not see the screens, there was a lack of vision in the virtual space, but only the haptic feedbacks of the edges of the virtual space sent to their hands as a vibration feedback of the phones. Participants said that this small haptic feedback did not replace vision but instead, they felt that their phones were a part of their bodies that expanded in virtual space and linked to their physical bodies virtually by giving tactile feedback to their nervous systems as all other bodily parts do. From the participants' feedback, I got an insight into how to restructure the invisible interaction system, between humans and the digital medium to expand our sensory experience through the interaction.

As the participants had to meet the jarring moment of understanding a new sensory system and adapting to it, to build trust in the object that can possibly be a person's extended body, I found that jarring feedback with a lack of any prime senses serves as a catalyst in the early steps of the process. Through the practice, I explored the applicability of haptic memory being superior to any other senses since the tactile memory remains for the longest time among other sense memories. Also, the tactile sense is processed through the skin, which has the largest area of our body, and I found that feedback varied by the area of the skin. Furthermore, since the tactile interaction required touch, it was labeled as the most instinctively instant and intimate sensory type by all of the participants.
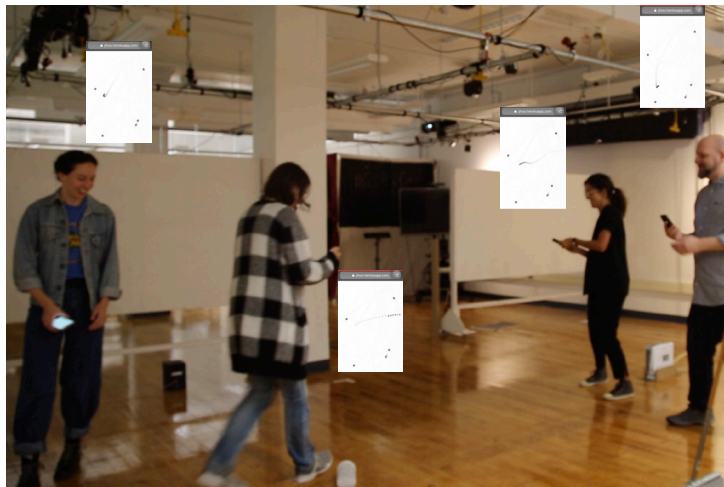
EXPANDED SKIN

What is consciousness?

Is it just a concept?

Or is it shared with the non-human?

Autonomous Arms of the Octopus

In the movie *Finding Dory*, Hank the octopus always succeeds in escaping from the cage by applying its multi-tasking skill using its autonomous arms. The multi-tasking skill is not a magical power that Disney designed but has a scientific basis. Unlike humans, who are neuronally centralized by mapping all the perception process to the brain, an octopus is neuronally decentralized by spreading more than half of its brain through the whole body and especially to its arms. Octopi, the most well-known species with its distinctive perception system among the non-human creatures, are proof that the concept of consciousness embedded in our minds is not the case for every living organism on this planet. Even though our concept of consciousness is distinct from that of the octopus, I believe we humans also have become digitally octopi-ed through our digital environments. For example, there are a social networking service and AI system in our digital gadgets, but we are not aware of them.

Why should we limit our perception capability to the body? Is there any sense that is not human but possibly applicable to the human experience? Thanks to advancements in science, many applicable technologies which can be our extended senses are possible. However, today's emergent technologies are degrading our sensory intelligence and make us highly reliant on our visual and auditory senses. By redirecting those technologies, we can use them as a way of extending our sensory experience and use technology in a way that is not extractive but instead enhances our perception capability. We can create quasi-sensory extensions of our bodies to extend the limits of our normal sensory experience.

It seems the concept of consciousness and the brain are bound up with each other so that people can never think of one without the other. Even though the concept that consciousness happens with intelligence and is processed from brain to body is prevalent, the truth is that consciousness has less to do with pure intelligence and more to do with our nature as living organisms. The brain has no idea what is going on in the world, but it just speculates through signals from the senses and makes its best guess.

As much as our perception depends on electric signals coming into the brain through our bodies, the perceptual predictions flowing in the opposite direction also have a significant effect on our physical experience. The world we experience comes as much from the inside-out as from the outside in, which means that we do not just passively perceive the input, but we actively and constructively generate the consciousness.

According to cognitive scientist Anil Seth, since hallucination is uncontrolled perception, perception is also hallucination but controlled. We perceive objects as the cause of sensations, but when the brain uses predictions to control and regulate decision making and comprehension, we experience how good or bad that control is going. So, our most basic experiences of being an embodied organism are deeply grounded in the biological mechanisms that keep us alive.
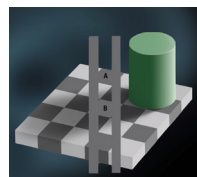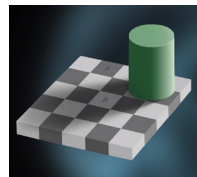
Consciousness as Controlled Hallucination/Anil Seth

There are some related experiments on how the brain perceives what is and what is not part of its body. The first one is called "Rubber Hand Illusion." As shown below, when the participant has focused on the fake hand that is getting the same input with the real hand, the brain thinks the fake hand is also part of its body. So, when the fake hand gets a sudden attack, the participant feels that the attack is toward his real body.

The second experiment is called "Hand Movements." This is about showing the participant's real-time hand movements through virtual reality while the virtual hand is flashing in time with the heartbeat. Participants feel the virtual hand more belongs to them when the flashing is in time with their own heartbeats.

From these two experiments, Anil argues that the prediction of the internal state of our bodies is not about figuring what is out there but about control and regulation of what our brains guess. From his argument, I found many possibilities of perception beyond the biological and physiological capability of human beings. If it is possible to make participants believe that external factors like fake hands and virtual beings are also parts of their bodies, why should we limit our perception capability to the body?

I researched how to restructure the interaction system, between humans and the digital medium, and expand our sensory experience through the interaction. To visualize the invisible interactions between our world and my possible autonomous beings around us into clear inputs and outputs, I designed "extended skin ego," our actual skin's sense of self in a non-human medium. To raise autonomy in this relationship and connect our physical bodies to some synthetic body as an extension of our own, I had to redirect the technology and set up an experiment on how to create a bond between them through different materials and behavior study.

To create the skin ego on the extended body, we need to build trust in it to gain awareness and to perceive the extended skin as a part of our bodies. The presence of awareness and sensory connection are essential elements in my experiments.

To design the framework for building those psychological factors, I formed a solid and well-knitted relation structure between four core elements:

Body(self) − Invisible Feedbacks − Extended Skin − Others

Based on the framework I created with the relationships between these four elements, I designed experiments on how to create a bond between the body and the extended skin. By building up a trust that it is a part of the body, the extended skin obtains its ego. The skin ego lays autonomy in various forms, and I revel in this infinite realm of human sensory possibilities.
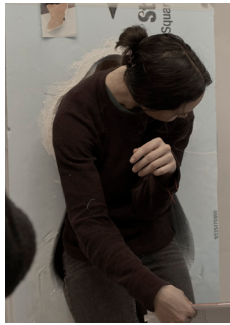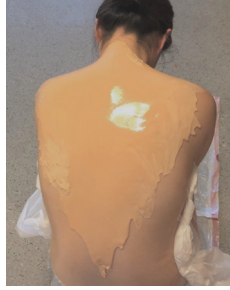
FUTURE PLAN

Beyond the limit

The final goal of this practice is to create an extended body with a quasi-feeling of human sense linked to a web server to provide real-time feedback. I defamiliarized and reframed the invisible interactions into clear inputs and outputs to raise autonomy in this relationship by connecting the physical body to some synthetic body as an extension of our own.

Among different technologies, I explore the impacts of biotechnology combined with machine learning, which will make it easier to access people's private biodata than the people themselves. By applying biohacking with body sensors, such as sweat sensors, blood pressure sensors, and eye-tracking programs, I am researching how much information can be easily obtained from people's biodata and exploring the boundaries of the privileged access of individuals' private biodata as it is related to human dignity and sovereignty in our near future. The use of data is centralized because it is not easy to access; only selective people can use it. Biodata are private, and we should be the primary owners of our own biodata. By hacking our own biodata and linking them to a web server that gives us real-time feedback, we can create quasi-sensory extensions of our bodies to extend the limits of our normal sensory experience. The goal of this process is to decentralize the use of data that have been obtained without our awareness and used to power mass surveillance while accumulated to be fatal mass data.

I want to intervene as an artist by redirecting the way biodata are being used. The goal of this practice is to create a framework using biohacking technology to awake new somatosensory areas, which means any possible sensory experiences that happen through the physical body. Ultimately, by repurposing the technology from a separate entity to extension of our experiential being, this bio-mimicry device would function as an extended body part and offer synesthetic experiences that not only take biodata but utilize them to create enhanced spheres of human experience.

BIBLIOGRAPHY

1   Daniel C. Dennett. Consciousness Explained. Little,
       Brown and Co. 1991.

2   Peter Godfrey-Smith. Other Minds: The Octopus, the
       Sea, and the Deep Origins of Consciousness. William
       Collins, 2016.

3   McKenzie Wark. Molecular Red. Versobooks. 2015.

4   Bert Holldobler and E.O.Wilson. The Superorganism:
       The Beauty, Elegance, and Strangeness of Insect Societ
       ies. W. W. Norton & Company; 1 edition. November 17,
       2008.

5   Daniel C. Dennett. From Bacteria to Bach and Back:
       The Evolution of Minds. W. W. Norton & Company; 1
       edition February 20, 2018.

6   Jackie Wang. Carceral Capitalism. Semiotext. February
       23, 2018.

7   Didier Anzieu. The Skin Ego. Yale Univ Pr; First THUS
       Edition edition. March 1, 1989.

IMAGES

This book was polished by Louis's magical touch.