Moovy: Sensorial Communication Device

Mariana Pinheiro

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MOOVY
SENSORIAL COMMUNICATION DEVICE

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Thesis submitted to the faculty of the
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ABSTRACT

Over time humans evolved and perfected their communication tools. The world today is more connected than ever, and we are able to reach people all over the world using handheld technology such as smartphones, computers, and tablets. Society is living in a digital era and many negative side effects are being identified. The excess of digital immersion can lead to physical harm, such as neck injuries caused by poor postural habits, as well as psychological and social consequences.

Inspired by the historical evolution of communication and concerned about the impacts in social behaviors, this thesis proposes a new language of communication using sensorial interactions. The research focuses in analyzing social behaviors of the Information Age and the positive impact that sensorial interactions could have on the user's well-being. As results of this research this thesis proposes a Sensorial Communication Device that promotes an engaging communication experience.

Key-Words

Communication, Sensorial, Device
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Communication today is instant. The internet has forever changed the way humans socialize. The evolution of human communication has scaled in ways never imagined before. Keeping in touch with friends and loved ones has never been easier. We are surrounded by smart devices that enable us to reach information and people almost instantly. According to statistics from CTIA, an international nonprofit organizations that represents the wireless communication industries since 1984, over 560 billion texts are sent every month worldwide. Just in the US, 6.3 billion text messages are sent per day, which is an average of 20 text messages sent per person. However, before the days of texting, people used to communicate differently.

Being social is a natural quality of humans that have allowed us to evolve and grow as communities. The act of sharing information with others enables communities to become smarter. Our ancestors painted on walls to tell stories and share ideas, perhaps a primitive way of blogging. Chinese soldiers used smoke signals to transmit long distance messages that could be seen as far as 750 km away, and carrier pigeons were sent to transport messages at even greater distances. Eventually, networks of telegraph cables were installed all over the globe, connecting cities, countries, and even continents, making the world a smaller place. The telegraph, the grandfather of the internet, was the first technology that enabled instant communication, it was the beginning of the Information Age.
Today, over 40% of the world’s population has access to the internet (internetlivestats.com), and 33% of the world’s population now uses social media as a communication tool. Texting, sharing images, exchanging voice messages and making video calls are now part of modern society. Although these communication methods are very efficient, the heavy adoption of the internet is resulting in major influences in society and in the human body. According to the online journal PLoS One, 5 to 10% of internet users are unable to control the amount of time they spend online.

Devices such as smartphones, tablets and computers are lacking in sensorial stimulation. The devices we interact with are digital windows limited by the size of the glass screen with poor tactile stimulation. The main methods of communication today rely on the visual and auditory senses, while ignoring smells, tastes, or touch. It’s common to see people hunching over to immersing in their glass screens, barely paying attention to their surroundings, resulting in social, psychological and physical harms.

It is important to be present in the moment and aware of our surroundings. Our senses enable us to understand the external world in receive inputs from our surroundings. Current technology does not motivate the user to move around and explore their environment. It is doing the opposite. It invites the user to be still while immersing and entertaining them with the infinite content that the internet has to offer.

What will future communication be like? What if communication devices were able to translate emotions and stimulate our senses while promote a greater awareness of our surrounding?
EVOLUTION OF COMMUNICATION

INTERVIEWS

Grandma Ilva

Ilva Maria Leitão is my grandmother, she was born in 1939, a time where communication was primarily done by letters. Over the course of her life she was able to experience and see the way communication has evolved. From writing letters and telegraph messages to telephone and cellphones calls. She has even recently experienced her first video call using Skype (for this interview).

Figure 1 – Ilva’s Skype interview

Grandma Ilva was born in a small city in the interior of Rio Grande do Sul, south of Brazil. Back then, there were no technological communication methods available. As a child, she recalls writing letter to her family and friends sharing with them special moments that were happening in her life. Back then, it was the primary communication method used to send long distance messages.
Theses letter could take up to 2 moths to reach its final destination. However, time was not a problem. In the meantime, she used to play outside and interact with her friends and family, sharing remarkable live moments.

When gramma Ilva started dating my grandfather, Raymundo, they used to write letters every day to each other. They lived in cities that were close and these letter were sent by the bus company every day. It was daily messages and updates in a time where instant communication was still not invented.

![Figure 2 - Letter from Raymundo to Ilva](image)

The telegraph was used for quick messages grandma said. For notifications that needed more urgency, like the announcement of the new born son or the death of someone. These were short messages limited by the number of words (just like Twitter). The message would be spoken to the operator that would then type the message using Morse Code. This communication method uses electrical signals to transmit encoded messages. Someone on the other side would receive and decode it into words, passing along the message. It was the beginning of the information era. The telegraph, grandfather of the internet.

It was when she was in her 20’s that the first telephone was installed in her city. The whole city used to share a single phone line. When she told me that I asked: How did you know someone was calling you?
"Well, if the phone was for you, the operator would knock on your door and notify you that there was a call, or you could have also pre scheduled the call. It was a small city, so that was not a big problem."

Ilva Maria Leitão

With time, this technology got popular and telephones became a common object of the household. "Everyone had them" she recalled. As technology evolved she followed and adopted them. Different types of phones, modern shapes and colors, some of them were even wireless that allowed you to talk while walking around your house.

We ended our conversation talking about daily notes, the little notes that people send to each other such as a reminder in the fridge door, or a love note from someone special. It’s a quick way to manually share information and it is used in many times as short reminders. These could be reminders of some activity that needs to be done, or it could be an emotional reminder, of how much you mean to someone. Expressing thought through the use of written words is special, it’s intimate and allows us to express our feelings using manual techniques.

Ilva Maria Leitão
born in 1939
Graciela Tocchetto

Graciela Tocchetto is a Brazilian Graphic Designer born in 1988. Throughout her life she has experienced different communication methods such as letter writing, telephone calls, texting and of course, experienced the boom of the internet and instant communication. Gatti (Graciela) is my best friend for over 10 years now and we have used many different communication methods to keep in touch over time. From letter writing to phone calls, texting, typing, and now taking advantage of social media. I have interviewed Graciela about her experience with these communications methods and she told me about her thoughts on communication now and then.

Before the heavy adoption of the internet she used to communicate with friends by sending handwritten letters. Graciela was one of those friends that I used to exchange letters with every week. Those letters were to express our feelings about the world, about school, about friends, about life. It was a good way to pass our time, sharing our experiences and feelings through the use of written words. It was almost like a secret “blog” between you and your letter friend. This was what we did before adopting the internet. Graciela mentioned:

"My "conversation" was done at that moment, like I was telling you something, but by writing it on paper, without the concern about the time that you would take for you to respond."

During the interview with Graciela, she mentioned that when her grandmother traveled, she used to buy post cards and write something on them about her trip to her grandsons. The most interesting part about it was that Graciela’s grandma waited until she got back from her trip to deliver the post card. This made me understand that writing letters is a way to demonstrate affection for a person, a way of saying “hey, I was thinking of you during this trip”,
independently of the delivery time. It's about expressing feelings and sharing moments, without the concern immediate response.

“When my grandma traveled, she used to write postal cards and gave them to us only when she got back from her trip.”

Graciela Tochhetto

Today we have the advantage of sharing moments with friends and family in an instant. Facebook, Instagram, Snapchat, are some of the many mediums we have to communicate and share moments. We are now able to share any moment of our day with the ones we love. But when it came to writing a letter, you would filter only the most important things, only what mattered most.

“When writing letter had more “filters”. You would only talk about the most important things. We did not tell so many banalities like we do today. Perhaps that could be bad, because you share less, however you share only the most important.”

Graciela Tocchetto

Graciela also told me about her experience with the telephone. She recalled that holding the telephone was something challenging for a long periods of time. You would have to switch from one ear to another because it got kind of “hot”. She mentioned that she also had to be in a specific place to make the phone call. If it was with friends she would go to her room for a more casual talks. But in her room she had to be near her desk to be on the phone because of the wire, limiting her space and comfort.

She recalled the experience of the phone call, where anyone that picked up the phone knew who was calling, usually being close friends, or family. If one of my
dates was calling me for example, whoever picked up the phone knew who was calling, it was less private in a way. Today no one knows who I’m talking to, I think it is better she said.

“I usually did not spend that much time on the telephone. The majority of the time it was to schedule something with someone.”

Graciela Tocchetto

Graciela mentioned that telephone calls were also something expensive. Spending too much time on the phone could raise the telephone bill to high numbers. Calling for cellphones were even more expensive. “Only for emergencies” her mom used to say, “otherwise call on my office phone”. Today we can talk unlimited, it’s more accessible with the use of the internet.

When the internet was first available in Brazil, the weekends were the best times to access the internet. The internet pulse was cheaper during the weekends, and that was when people mostly dedicated their hours to the internet. Gatti remembers that she used to spend her Sundays talking to her virtual friends.

She also remembers having fun with her computer without the use of the internet. She used to download songs and lyrics that she would later use to sing and have fun. With no internet she would also play games on her computer.

“Today we have the impression to be closer, we don’t feel the distance. I have the impression that we share more of life! While writing a letter, we shared only the most important. We were missing sharing on more our day to day with the ones you were close.”
“On the other hand you get to “know” more a person even if you don't just by the amount of thing they share online. People give you “tips” about their opinions on life.”

Graciela and I had our firsts cellphones in the year 2000, and so did many of our friends too. It was a Nokia 5110. Thinking back at that experience, Graciela made me remember a very interesting behavior that kids at that time used to do. Instead of calling someone on their mobile phone (it was expensive), we used to ring the phone once and hang up! Just to have 1 missed call on the other person’s phone. I was a way to send a short “code” or intention of message to symbolize “hey, I was thinking of you”. It was used by everyone back then. We even used it to message that we were on our way, or that we had arrived at someone’s house. It varied from 1 missed call, to many in sequence (so much fun!).

Graciela mentioned, you could send and “X” number of ring tones to someone, but they did not mean anything specificity. It was just a way to maintain the bond with someone. You would give a ring when you were close, maybe one randomly during the day and even before bed at night. You would interpret it the way you wanted, it was not a clear message, it was subjective an open of our imagination and interpretation.

Graciela Tocchetto
Born in 1988
COMMUNICATION DEVICES OVER TIME

Over the course of my life, I have seen technology evolve and communication methods change over time. The first communication device I had contact with was a rotary phone. A shiny red rotary phone that would excite me as a child every time I heard it ringing. I was always a surprise to hear the ring of the phone. Who is calling? Who is it for? I can pick it up! There was a lot of anticipation and excitement involved.

To a 5-year-old child this bright shiny red device was appealing and fun to use. The rotary dialing system was a whole experience itself. Placing your fingers in the round holes of the dialer and spinning the number was a fun and tactile. The typical sounds of the phone rotating helped build up the expectation of the moment of the call. Tuuuu......Tuuuuu...Hello?

This experience was remarkable to generations that grew up having a similar device at home and the rotary phone is now part of history. With the attempt to bring back the special experience of holding the phone against the shoulders and playing with the fun wire is now available as accessories for smart phone. Native Union, a design company that has it's focus on the way user's experience their tech has designed the Pop Phone, a retro style hand set for smart phones. The company Spark Fun Electronics once soled and now shares the process of refurbishing a rotary phone. They call it the Port-O-Rotary. They have found original old phones on Ebay and have embed the technology of a smartphone in them. The telephone is able to receive and make calls with smart phone technology. The tactile experience of interacting with this device is fully functional. It rings the original sound of the loud metallic bells and even has a dial tone for the phone calls. So much fun!
The idea of downgrading smartphones into a rotary phone form is an attempt to enhance the user experience while performing a call and interacting with their communication devices. These attempts to bring back the old days, old habits are also seen in the Pop Phone accessory.

Over the course of time, telephones evolved and some of them were even fun to have and use. Phones gained personality, different shapes and forms. As a household object telephones were seen as decoration objects, reflecting the
user’s personality and way of life. These were the devices used to connect to friends and family.

Mobile phones over time became less and less tactile. Over the course of my life I had the experience of “upgrading” my mobile devices at least 5 times. My first mobile experience was with a Nokia 5110. I loved the idea of communication on the go, and having these device was a remarkable experience. The simple phone was very tactile, the buttons were easy to feel and soft to press. I used to spend hours playing the only game the device had, Snake, a simple arcade game.

According to report on the website The Telegraph, more than 350m Nokia users around the world played Snake. This classic 1997 remarkable game brings back nostalgic memories to many and there are many apps such as Snake ’97: retro phone classic that have the attempt to bring back the experience of playing this fun and simple arcade game. The app simulates the display with dot-matrix display, just like the old screens and emotes monotone sounds. The experience of playing with these apps brings back good memories to those who play, but the tactile experience of actually holding the device and feeling the soft buttons
in your fingers is not substituted but the use of the flat screen of current smart phones.

![Figure 6 – Snake '97, iTunes screenshot](image)

Nokia is known for creating long lasting designs and was the first company to introduce colors to the world of black mobile devices. The Nokia 5110 became popular with the new adopters of mobile phone users, specially the youth of 1998. I recall the experience of popping out the front cover of the mobile device and changing it into different colors. The ability to change the mobile device’s color was fun and reflected the user’s personality into the personal device. I even had a gigantic tiger stuffed animal phone case that gave softness and humor to the ordinary device.
The mobile phone industry was innovating and big companies were designing for the future of mobile communication and predicting what behaviors would look like with the use of this technology. In a promotional commercial of the Sony Ericsson W380 mobile phone, the company expresses concepts of this new emerging life style. The device is used as a communication tool to gather a group of friends and play music, however the actual interactions are still happening in the real world. Once all friends meet up in dance studio, the device is set aside as a music player and friends are interacting with each other.
Figure 9 - Sony Ericsson W380 commercial

Figure 10 - Sony Ericsson W380 commercial

Figure 11 – evolution of mobile phones
Over time, devices gained bigger screens and less tactile buttons. The smarter the devices became, they gained flatter and bigger the screens. We are currently interacting with big flat glass screens that are so powerful and hypnotizing. We are deeply immersing in a digital world.

Computers also followed a similar evolution path. The fall of interacting with an old-school computer was remarkable. The sound of the keys while typing the big tactile letters, and the clicking of the mouse stimulated the user’s senses promoting awareness of their interactions. Now everything is sleeker, more silent.

Computers evolved from big stationary platforms to portable and “lightweight” devices. What once took up the space of an entire desk filled with cords is now portable and lighter. We use our computers on our laps, table tops, desks and even on the go. They are easy to carry around.
The interface of these devices has also evolved and became more intuitive. However, we are still being succeed in to this a digital world that consumes our times and attentions.

From emails to messages, communication became typed and displayed in a digital screen. The internet has changed our verbal communication with increased physical separation.

Let’s bring back the simple tactile device experience, and enhance the way we communicate.

**Emotion + Icon**

Emoticon is a typographic display of a facial representation, used to convey emotion in a text only medium. In the year 1982 Scott Fahlman proposes the first use of an symbolic emotional expression through on one of his email’s to coworkers.

“I propose the following character sequence for jok markers: :-) Read it sideways.”

-Scott Fahlman

![Figure 14 - Scott Fahlman - independent.co.uk](image-url)
The intent of demonstrating felling through the use of typed characters was highly adopted and has evolved over time.

**Picture + Character**

Emoji, perhaps and evolution of the Emoticon, are small digital images or icons used to express ideas, emotions.

They were designed not only to express feelings, but they also symbolize objects and animals and body signs. This allows the user to communicate using only these icons. It is becoming a universal language. Emoji’s are now adopted by millions of internet users and it is changing the way we communicate. Oxford Dictionaries Word have even selected the Tears of Joy emoji the word of the year 😢.
COMMUNICATION TODAY

The Information Age, also known as "Digital Age", Computer Age or New Media Age, is characterized by a shift from a traditional industry to an economy based on digital industry. In this age information is accessible all over the globe due to the rise of the internet. The openness of information is allowing individuals to express themselves, share moments and ideas and explore their personalized needs using hand held devices.

"Technology has started to expand the body’s sensorial capacities and has become a new invisible prosthesis of human body that connect it with the entire world."

— Seçil Uğur
IMPACTS INTERNET ADOPTION

Modern society has adopted smart devices and communication has become instant. We are able to interact with friends by texting, messaging, tweeting, sharing pictures and videos using the internet. However, smart devices are stealing our attention from the ones right beside us.

Internet users spend hours of their day paying attention to the glass screen. According to Pew Research Center survey 36% of 18- to 29-year-olds go online almost constantly and 50% go online multiple times per day. This heavy adoption is leading to changes in social behavior. On the streets people are walking and texting, barely paying attention to environment around them, drivers are distracted by their phones and the number of car accidents caused by the user of smartphones is increasing. Families and relationships are also being affected by the heavy adoption of the internet. It is common to see group of friends present in the same room but lacking on real live social interactions, everyone is immersed in the digital world. We are almost mission out on the world around us.

Being online is now part of the everyday life of a large population.
Incoming messages and alerts are constantly being shown in their screens, inviting them to stop whatever they are doing to check their phones. This is leading to shorten concentration spans and is affecting the way we operate. Multitasking is increasing and is decreasing our attention spans. According to statisticbrain.com the average human’s attention span has decreased from 9 to 8.25% between 2010 and 2015. This fact can be directly related to the increase in the adoption of modern technology.

“Communicating in such a fast-paced environment means our attention spans are becoming increasingly diminished as we process vast quantities of information.”
- Jason King

But not everyone has adopted this fast-paced communication devices. Sean Doran is one of them. Living in the 21st century, surrounded by people on their smart devices, he still uses his old school phone, with no “smartness”. However, I would consider it a smart move of Sean, it leaves him time to be more present in the moment, without digital distractions.

*Figure 17 - Sean’s mobile phone*
"I have Started a long enough at the glowing flat rectangles of computer screens. let us give more time for doing things in the real world...plant a plant, walk the dogs, read a real book, go to the opera"

*Steal like an Artist — Edward Tufte*

Connectivity in the Computer Age is making our world smaller and reaching out to people and data is easy and is part of the everyday life of many. According to the website internetlivestats.com around 40% of the world population has an internet connection today. However, studies have shown that 5 to 10% of internet users are unable to control the amount of time they spend online. In 2010, a study by the UK Post Office revealed 53% of mobile phone users feel anxious when losing their devices or run out or batteries. The research has described this anxiety as no-mobile-phone phobia.

"**Nomophobia is the fear of being out of mobile phone contact.**"

*-Wikipedia*

With the heavy adoption of the internet, and easy access to information has allowed users to perform multiples task at the same time. Texting while working, responding emails while on Facebook, and access to information and data in an instant is causing users to switch between task more often. Multitasking is a common behavior caused by quick access to information. According to the American Psychological Association, switching between task can cost as much as 40% of productive time.

The side effects of heavy internet usage are being still being studied and the dependency on the internet is leading to psychological addictions that can cause

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*Figure 18 - technology affects the brain*
degradation of white matter in the regions of the brain that affect emotion, attention and decision making. The way this works is that social media is providing the user with instant "rewards" with very little effort, like a Facebook "like" or a Instagram "heart". This excites the user's brain and makes it want more and more, becoming and addictive habit.

"Brain areas involving pleasure and rewards mechanisms have more blood flow, and brain areas responsible for visual and audio processing have much less."
- Sree Jadapalle of the Morehouse School of Medicine in Atlanta.

According to CNS Spectrums, The International Journal of Neuropsychiatric Medicine, 1 in 8 Americans suffer from problematic Internet use. This number can get even bigger in China, Taiwan and Korea, where up to 30% of the population may have experienced problematic internet usage.

**COMMUNICATION DEVICES AND OUR SENSES**

The communication devices we interact with today are lacking on sensorial stimulation. A smartphone is composed by a plastic or metal shell and a flat glass screen. It has very limited tactile stimulation. While high resolution content is displayed, the user is simply interacting with a plain piece of glass and are limited by the size of the screen. Over time screens got bigger and with higher resolutions, but still they are causing bad postural habits on users. Users are leaning downwards in order to immerse in their screens.
Headphones and external speaker are accessories that can enhance the user’s sense of hearing. On the other hand, the senses of smell and taste are completely unexplored.

Accessories such as phone cases are used to personalize and create a stronger connection between the user and their device. The sense of touch can be enhanced by the use of these covers. I had the experience of using two very interesting phone cases designed by Marc Jacobs. The silicone phone cases were soft to touch and added a sense of grip to the slippery device. The phone cases also had extensions on the “ears” of the phone character. This allowed me to interact and play with the phone cover, and it even helped me to relive stress and tension in many times.

Figure 19 - soft silicone phone cover
Figure 20 - flexible "ears"
THE INTERNET OF THINGS

The internet of things is defined as the network that enables objects to communicate through the use of the internet. These smart objects are equipped with sensors and electronics that allow for exchange of data remotely. Specially in the house environment, the internet of thing is making our living environments smarter. Lights are controlled remotely through an app, the heat system are atomically adjusted according with the weather with smart devices such as the Google Nest and intelligent guides such the Amazon Echo are communicating with human using voice recognition to control environments and free the user from ordinary task such as switching between soundtracks, answering questions and controlling environments. By adding internet to things and making object smarter allows the user to be more free from hand held devices such as smartphones and tablets, improving their well-being.

Figure 21 - amazon echo, amazon dash, google nest
PROBLEM STATEMENT

Current communication devices are lacking on sensorial stimulation and are hypnotizing the users into digital worlds behind glass screens. By immersing in digital screens users are less likely to pay attention to their surroundings and social interaction can be limited to the interaction with the device. It is common to see groups of people on their phones having tons of social interactions digitally, but lacking on real world interactions and experiences.

Technology has evolved and allowed for instant communication and access to data, however, the devices available in the market today were not designed to explore human’s full sensorial capacities. We are interacting with a glass screen that has no tactile stimulation. We are curving our bodies to immerse more and more in these screens and this can lead to bas postural habits that in a long term could lead to serious neck injuries. We are also loosing awareness of our surroundings. Mobile devices are gaining bigger screens that invite the user to immerse in a digital world while forgetting about their surroundings.

Access to technology in the 21st century is changing social behaviors and could lead negative impacts physically and mentally.

Instant communication can get overwhelming, and incoming notification at all times constantly catches the user’s attention which can lead to less productive activities.
PROJECT VISION

I wanted to expand the bodies capacities, expose emotions and translate them into beautiful colors and patterns. Wanted to bring colors to our surroundings and invite the user to be aware of their environment. However, these would not be random colors, but colors that come from emotions and body movement. Emotions are complex and hard to express. So why not abstract them?

"Emotions are a matrix of feelings in your body, a rich complex matrix of feelings."
actualized.org

I also wanted to feel more. Feel my environment change according to my mood and watch it respond back. Perhaps the user would not be feeling great one day, and the environment would recognize that and respond back with motivational environments. I believe that we reflect to our surroundings all that is within us, and that we should be aware and present in the real world. With the use of the internet of things, smart devices can be designed to promote more freedom and self-awareness to their users.

OBJECTIVES

The objective of my thesis is to design a tactile device that allows for communication through sensorial interactions, promoting an awareness of the user’s body, mind, and environment.
It all started with the idea of expanding digital interfaces into the environment. In 2013, I was taking a specialization course in Surface Design where I was carefully studying and understanding the importance of the surfaces around us. I spent a year and a half immersed in colors, paints, drawings, sketches, designing surfaces for fabrics, ceramics, papers and objects. It was a time for self-expression and tons of manual processes. Handmade patterns were replicated digitally and seeing this beautiful work on a screen made me realize the importance of digital surfaces as well. We are surrounded by digital surfaces in which we interact with every day. Televisions, computers, tablets and smartphones, all virtual windows filed with digital surfaces. For my final Surface Design Specialization project, I created a collection digital wallpapers that would virtually decorate your home environment. The concept
televisions, monitors and computers turning them into digital frames. 
The patterns on the screen would influence on the user’s environment, changing 
it according to their daily activities. The patterns were created to relax, 
energize, and impact in the user’s well-being. This digital interference in the
environment would promote greater awareness of the user’s surrounding
boosting their daily activities while stimulating their sense of sight. In addition,
on top of the device an aroma diffusor would heat up aromatic oils that would
emit scents to stimulate the user’s sense of smell and audio would be played to
enhance the sensorial experience using the sense of hearing.

Figure 23 - digital frames final project
I’ve also created illustrated characters that I envisioned as digital “avatars”. A little digital character that would float around your “screens” and interact with you daily. It would know you and make suggestions to improve your day. Perhaps it was a rainy day out and your personal guide would suggest your red rainy boots with that dress you love. All these ideas come about the urge to expand our screens and free the user from hand held devices.

It was when I started my master’s at RIT that I realized that technology goes way beyond the frame of a digital screen. I was fascinated to learn about projections, holograms, augmented reality, and even virtual reality. This gave me a whole new perspective on the infinite possibilities of designing. During the first semester of the graduate program, professor Dan Harel gave our class the challenge to envision the future of elementary school classrooms. I envisioned an environment with projections on walls and holographic objects to interact with. The result of this research was Rooby. Rooby is a concept of a classroom guide that would engage children in discovering and learning by exploration while interacting with a fun and friendly guide. Rooby has technologies such as laser projections and holographic images. It would project content into the surface of a desk. Using pens, pencils and paint, children would
interact and learn in a mixed media environment, where digital and manual come together. Rooby also had a scanner that would identify things in nature, such as plants, bugs, and rocks, in addition to teaching other interesting exploration subjects. It would invite the child to step outside and discover their world beyond their screens and textbooks. This project was envisioning a future where technology is highly present but in a subtle and constructive way. Creating behavior of self-knowledge and environmental exploration.

**BRAINSTORMING AND IDEATION**

The design process began with a mind map filled with ideas and directions. I wanted to study the relationship between humans and computers today and
design a new direction for current technology. In parallel to that I was also fascinated to design objects that would emotionally speak to the user. I began to deconstruct my thoughts and map out ideas.

Figure 26 - first thesis mind map

I knew I wanted to design an object with technology that would enhance daily activities and improve the user’s well-being. Stimulating senses and promoting an awareness of the user’s surrounding where requirements for this new design.
Figure 27 - Key words for inspiration

Projections and Holograms – Expanding digital screens
I wanted to expand digital screen into the environment while inviting the user to be more present in the moment. As a continuation of my Specialization Course in Surface design, I wanted to create digital interactions by using projections and animation on walls. I had the intent of designing virtual decorations objects and create atmospheres that would interact and enhance the user’s well-being. These animations would be displayed in the user’s surrounding according to their activities. The environment would change colors and project animated objects to relax, entertain and invite the user to be present in the moment. Aware of their surroundings. The idea to expand these digital interactions to the environment would allow the user to relax and not be worried about checking their hand held devices for incoming notifications or to seek information of entertainment. The environment itself would do this job.

During this process I have tested and experimented with projections, holograms and hue lights. I situated environments that were meant to relax, such a virtual burning candle, engage and entertain with games on the wall and to inform and alert with weather forecast and daily remainders. But the tactile interaction was still missing. The objects were still very digital and two dimensional. There was no real interaction between the user and the interface. It was still virtual and intangible.
Aura - Sensing the user

Aura is concept of a wearable device that uses sensors to capture vital signs such as heart beat and translate them into colors and patterns in the environment. Translating and exposing these vital signs promotes would self-awareness and invite the user to reflect about their inner feelings. The wearable device would measure the user's vital signs such as temperature and pulse and sends that information to a color changing lamp. This lamp would then reflect the user's “mood” into their environment, changing colors and beating according to the user’s emotions.

I have imagined Aura for moments of relaxation, where the users would sit back, relax and see it's body expand into their surroundings. I imagined colors and patterns ha would “dance” on the surface of the walls and transform your environment into a reflection of your emotions. It would encourage the user to be mindful and reflect on their inner self.
I have also imagined Aura for meditation. While you practice mindfulness, your environment gently changes according to your level of relaxation. This can help the user to be aware of their body and work towards a relaxing state of mind. This also would promote a relaxing atmosphere that would help decrease the level of stress, which is very common with the fast-paced lifestyle of modern society.

Aura would also combine the mood of whoever was in the environment. Blending colors and emotions. The objective of this was to create an environment that reflects those who are present, creating a fun and engaging atmosphere.
Mood rings inspired aura. As a teen I used to have and love mood rings. It was exciting to see the ring change of color according to my body's temperature. Even though I knew that those “moods” and meaning were not truly reflecting my emotions, it was still fun to be surprised by the different colors during my day. It was something special to look at and promoted a moment of self-reflection. How am I feeling right now? What are my emotions?

**Sensorial Couch – Filtering interactions**

The Sensorial Couch is conceptual smart couch developed to morph according to the user's activities, exploring their senses through the use of vibration patters, lights, smell and sounds. In order to enhance the sensorial experience,
the Sensorial Couch is connected to the internet, and according the user's activities it filters virtual interactions.

The Couch has 3 set up modes: Social, Chill and Don't bug me. The Social mode was designed for activities where the user is available for interactions, in the real and as well as in the virtual world. The couch is set up in a "open" format which allows the users to look around and interact with their surroundings. In this mode the couch is programed to receive notifications from the internet at any time, allowing the user to be fully connected.
The Chill mode is appropriate for times where the user just wants to sit back, relaxed and enjoy the moment, but does not want to be totally disconnected from the world. The couch expands its back, giving the user a greater sense of comfort and privacy without totally enclosing him from the environment. The virtual interactions will be limited to only important notifications, allowing the user to have time to take a break from the world without missing any important messages.

The Don't bug me mode is designed to bring total privacy to the user. For those times where it is needed to "escape from the world", even if it is only for a few minutes. The couch completely encloses the user, and invites them for an amazing sensorial experience with no disturbance from the physical surroundings as well as virtual.

*Figure 33 - sensorial couch - chill mode*
Sensorial Vest

The concept of a wearable vest was designed to enhance the user’s sensations. The vest is equipped with technology such as speakers, lights, and sensors that measure the user’s vital signs. The vest would reflect the user’s emotions by changing colors and creating an atmosphere of self-reflection. A high quality speaker would bring sounds closer to the user’s body, allowing them to feel the vibration of sound directly into their body. The vest would also have the function to alert and notify the user of incoming messages. However, not all messages would be notified, only the pre-selected ones, the wearable would filter notifications and alert the user of only the ones that most matter.
The Notification Buddies is a series of glass figures that were conceptually designed during my Glass elective at RIT. The concept behind these buddies is that they are able to "sense" that a close friend is sending a message and alerts you with light patterns. The buddies are able to filter incoming messages from your phone and only lets you know of the ones that most matter.

The Buddies are connected to an app that allows the user to filter notifications by creating groups of people. Each time someone special sends a message, The Notification Buddy will shine and bring color to its surroundings. The user can also link colors to each friend for easier identification. This concept allows the user to enjoy their daily activities without being concerned to check their mobile phones for notifications from those they love.
Smart Toys

The concept of designing smart toys came from the idea of promoting a more intimate experience between the user and their technological devices. Smart Toys was a concept inspired in the Designer Toy or Art Toy movement that has started in the 1990’s. Designers and artist tell stories by designing collectible toy characters most of the time designed for ages 14 and up. These toys are usually design with the concept of juxtaposition, where elements that don’t belong together are seen in the same toy. These pieces are fun, they tell a story and communicate something special to those who have them. Using a similar concept, the creation of the Smart Toys concept would also follow the principal of bringing fun and exciting stories to everyday objects.

I designed a character name Long Ears. Long years is a technological toy that would engage the user to explore their surroundings and interact with a fun object. This toy would have sensors such ad temperature and pulse and while the user is interacting, squeezing and feeling the toy, it would be sensing the user’s vital signs and would invite them for activities that enhance their well-being. These activities could range from exercises that would encourage the user to move around or relaxing moments of self-awareness.
This physical interaction between the toy and the user would promote affection for the object and this would encourage the use of the device and practices that enhance the well-being.

“As an owner uses an object and interacts with it more and more over time, so this personal attention applied to the object endows it with a special meaning for the owner.”
— Love + Sex With Robots - David Levy

“As the owner invest more “psychic energy” in an object, more meaning is attached to the object, it becomes more important to its owner, and the stronger is the attachment that the owner feels for the object.”
— Love + Sex With Robots - David levy
Figure 40 - smart toy models
SENSORIAL EXPLORATION

“And I found that of all the senses the eye was the most superficial, the ears the most haughty, smell the most voluptuous, taste the most superstitious, touch the most profound and philosophical.”
— Diderot, ‘Letter on the Blind’, 1749

As part of my thesis research, I’ve performed a sensorial test with a group of five participants. This experiment was made with the intent of understanding preferences and reactions to the textures I had designed. Four different textures were made out of clay for this experiment. The users were asked to describe what they were feeling and what words popped into their minds as they interacted with the pieces.
I set up a dark room with only a hue light. Individually the participants were invited to come in the room and pick a color that would represent their feelings, at that moment. The color blue was used to describe serenity, greens and yellows were used when representing tiredness and purple was comforting.

The participants were asked to interact with the objects in front of them and say out loud the words that came out of their head while feeling each of the stones. During this interaction, the participants used many words related to nature, animals and landscape to describe the textures. The different types of bumps were noticed and the preference was for textures that allow the hand to flow easily, like the "wavy" texture.
Textures that, at first glance, seemed more "aggressive" were surprisingly well accepted once the user started interacting with them, being described as fun and good for squeezing and scratching. At the end of each session the participants were asked to give a name to each texture pebble. Some names were repeated by the users, such as boomerang wave and sunflower.

![Texture names](image)

**CONCEPT SELECTION**

After months of experiments and concept creation, I have selected the concept of designing hand held device that would allow the user to communicate through the use of sensorial interactions. I was set to design a tactile hand held device that would be playful and fun to interact with. This device would be connected to your environment and communication would happened between the user and their surroundings.
Clay modeling

Clay models were designed to study ergonomics and the comfort of the device. I designed different shapes and textures and using Sculpey clay. I was able to play with forms and test how they felt in the hand. This technique gave me quick answers on what felt good in the hand and I was also able to understand the scale of the product. I was able to study the way different shapes behaves with interaction such as pressing to activate buttons, squeezing and the potential flexibility of the forms. The “bunny” shaped form was the most appealing to all those criteria. It was fun to play with, had different ways of activating the device and had a lot of personality to the form.
Figure 46 - clay models

Figure 47 - comfort test

Figure 48 - comfort test
Silicone molding and casting

With the selected form made out of clay, I was able to create silicone molds and cast flexible silicone copies of it. I made the “ears” of the device solid and the body of it hollow to fit the components. The solid part of the device was playful and good to press. The hollow body was squishy and similar to a stress ball. During this process I learned and develop techniques of mold making. The biggest challenge was to make the device hollow. I used to spin the mold around for 3 min so the silicone would cover the surface around the device leaving the middle hollow for components.
In parallel to playing with silicone molding and clay models, I was also learning about engineering. I had the pleasure to collaborate with Thiago Lima, an Electrical Engineering Graduate Student. Thiago introduced me to the basic coding language. I was then able to understand, create and modify basic tests for the development of the Sensorial Communication Device. I experimented with temperature sensors, vibration motors and RGB lights.
It was on a Saturday afternoon in a cold winter day that at the Construct Lab, RIT, when Thiago helped me to design the first prototype for the Sensorial Device. We used a Light Blue Bean with an RGB light that would change according to the temperature. This was designed to “sense” the user’s temperature and reflect a color that represent that body temperature. It also had a list of friends that the prototype would identify while detecting movement. Throwing the device up X numbers of time would reach a specific

![First working model](image)

row the device up 3x.

With the prototypes in hand I was and test the variation of temperature and colors and study the relationship between mood and body heat. I tested a group of 6 people using the temperature sensor of the prototype, a Fit Bit heartbeat monitor and a Plutchik Wheel of Emotions

![First working model](image)
This wheel is an infographic that uses colors to illustrate variations and intensities of human emotions. I measured the participant’s temperature through the use of the prototype, its heart beat using the Fit Bit and asked them to pick a color/emotions from the wheel to describe the moment. I was able to detect that user’s that selected feelings such as fear and apprehension had lower body temperature at the moment then when feeling, love or serenity. These were simple experiments that have no scientific proof to them, but it was important to evaluate the reactions of the users while interaction with the prototype and picking and identifying their emotions. Many of them found it hard to pick a color on the wheel that represented their mood. I have learned that sensing only the body temperature of the user’s hand is not enough to evaluate mood changes. With the use of more accurate sensor such as skin conductance, variations in stress levels and mood swings could be identified easier. By analyzing the variation of the sweet of the hand skin conductance can be a measure of emotional and sympathetic responses. This would be the ideal technology to use in the development of this product.

During the Spring semester I was immersed in a Physical Interface class with professor Shaun Foster in which I was able to continue to develop prototypes and test concepts for this thesis. I continued to develop and refine the physical prototype, adding a pulse sensor to enhance the reading of vital signs as well as a Neopixel ring to visually enhance the effect of the device’s lights.

While testing lights I embedded RGB LEDs into the silicone “ears” of the device.
It was interesting to see that the mass of silicone helped diffuse the light and it sped over more evenly. However, the variation of colors and the visual effect were still limited by the number of LEDs. During my research for electrical components I learned about Neopixel Rings. These rings are composed by 12 LEDs that are all connected together and are all controlled individually using only one pin of the microcontroller. This optimized the amount of internal connections and allows for playful and fun visual effects. The blending of the colors mixing and changing created a very appealing visual effect when placing the ring on the silicone device.

It was clear that the Neopixel Ring would allow for the creation of infinite color combinations that would swirl, mix and create effects that would stimulate the user’s senses.

I was also very interested in capturing vital signs and reflecting them into the physical world. Using a pulse sensor and an Arduino Uno microcontroller I was able capture my heart beat and link it to colored lights. The lights were programed to flash and beat according to my pulse rate.
I was also able to visualize the frequency of the beat through the use of a serial monitor on the computer screen. Having this technology, I was able to experiment and test the variation of my heart beat while visualizing it live. The last step of this process was to embed the components into the silicone shell. Pulse sensors are more accurate when reading from the tip of the finger, so I casted the pulse sensor directly into the “ears” of the device where the user could place their fingers comfortably.

For future development of the device I want to partner with engineers and developers to continue the development of the prototype. I want to explore different movements and program that to become a new communication language. I also would like to refine the vital signs sensing capabilities of the prototype by incorporating skin conductance sensors.
07

INTRODUCING MOOVY!

Figure 59 - Moovy, sensorial communication device
Moovy is a “sensorial communication device” that allows the users to express and share their emotions with the ones they love through sensorial interactions. The device is equipped with an accelerometer that detect the user’s movements. It recognizes movements such as throwing the device up, spinning, shaking and squeezing. Moovy also has sensors such as pulse and temperature that measures the user’s well-being.

All of this data is collected and translated into sharable experiences. The more the user interacts with the device the more it accumulates data on the user.
Through the use of Bluetooth technology, the device is connected to the environment's light. Using an innovative light system such as Philip’s HUE light, the user’s interactions are directly reflected into the environment in the form of light patterns. The user’s entire environment changes according to movement and vital signs. This experience promotes awareness of user’s feelings and their surroundings. These interactions could also be shared. Imagine sending your heart beat to the ones you love, and sharing your environment’s color with those who are far.

Moovy is connected to an application where friends could be added and data is collected. The app was designed to be simple and to have limited features, so the user can truly just enjoy only the tactile device. Through the application the user can add friends and see a timeline of interactions. Once the application is calibrated with Moovy, there is no need to use the app for interactions. The user and enjoy the tactile device and detox from the digital screen.
Moovy was designed for close relationships, for the ones that matter most. To add a friend is simple. First, the user connects Moovy to the application through a Bluetooth connection.

Then it’s time to perform a Movement Code. Movement Code is the sequence of movements that when performed Moovy identifies which friend the user wants to interact with. Instead of dialing a boring phone number, the user performs a fun and intuitive Movement code such as throwing the device um 2 times followed by a squeeze. Once the code is calibrated with the app, the user can use this movement to reach out to friend without the use of the smartphone.
Once the Movement Code is performed, the user can then share interactions with that friend. Movements can be programmed to signify interaction, perhaps waving the device is an indication of a Hello. It is up to the user’s creativity and interactions to create codes that speak to the other side of the “line”.

Figure 65 - waving “hello”
Vital signs could also be shared. It is promoting a more intimate communication between the user and their friends, it is like sharing their emotions in an abstract and fun way.

Figure 66 - sensing pulse

In the “ears” of the device there have flexible sensors that are used as “buttons” to send or receive a messages. The user can flex the silicone device 2 times and Moovy sends the message.
On the other side of the “line”, when a message is received, the user’s entire environment changes colors to alert about the incoming message. This allows the user to engage in their activities without the worry about checking their smartphones constantly. The environment itself will be the one performing the notification by simply changing the room’s color.
When the user that is receiving the message accepts it, their whole environment changes colors and reacts to express the incoming message.
Moovy was designed to be a personal device that engages the user to interact and be aware of their feelings and surroundings. It’s soft silicone body promotes a tactile sensorial experience and is inspired by stress balls. With squeezing and manipulating the device, the user is able to relax and feel their “moods” in their surroundings.

“As an owner uses an object and interacts with it more and more over time, so this personal attention applied to the object endows it with a special meaning for the owner.

— Love + Sex With Robots - David Levy

The app also collects data on the interactions and places it into a timeline of emotions. This data can be accessed by the user and they are able to have a greater understanding of their interaction and well-being.
“You need to find a way to bring your body into your work. Our nerves aren’t a one-way street - our bodies can tell our brains as much as our brain tell our bodies.”

Steal like an Artist — Edward Tufte

Figure 71 - Moovy + environment color
USER SNEARIOS

Moovy’s main application is to create unique communication moments between friends and loved ones. Moovy was designed for home environments, where family and friends can communicate through the use of sensorial interactions. Perhaps mom has baked a cake and instead of screaming that the cake is ready, she can send a pulsing light that would alert her family of the goodness she has prepared. It can also be used to enhance communication for long distance relationships. Imagine feeling the heartbeat of the one you love in your environment, or sending a sweet remainder in the form of a color to say goodnight.

Moovy can also be used for therapy. This tactile device can engage users to communicate using non-verbal languages. The device can be relaxing and stress relieving and can promote moments of self-regulation. An example could be children with Autism, that have a hard time expressing emotions and communicating, by interacting with Moovy their “feelings” could be exposed by colors and therapist could understand the best way to approach their patients. The device can also be used to help the user to calm down in stressful situations. Let’s say that the user is nervous before an important presentation or speech. They can reach to their pockets and interact with Moovy. The device would react back with calming lights and vibration patterns that can help the user’s to be calmer and prepared to face their activities.
By adding other technology to the device, such as a GPS tracker, Moovy can be used to share locations. Let's say that you are going to visit a friend, instead of texting that you are on your way, or getting close to your friend’s house, Moovy would send a light signal that could get more intense the closer you are to your friend’s house.

These and many other applications could be applied to this product. We are living in the Digital Era where we are surrounded by smart devices that are immersing us more and more in a virtual world. The concept of interacting with
a tactile device that uses the user’s senses to communicate and promote awareness to their surrounding could be beneficial to the future of communication devices. By using Moovy to communicate the user is free of digital screens and more present in the moment. I hope that this device will inspire designers and creators to design products that engage the users to be more present in the real world.
CONCLUSIONS

The development of this thesis research is proposing a new language for the future of communication through the use of tactile devices. Today, technology allows us to be connected with the entire world using smart devices, but they limit the user’s ability to express themselves. Bringing motion and movement to communication will allow for more intimate and “real” interactions.

I believe that through the use of sensorial interaction such as the one proposed in this paper, users will be more aware of their surroundings and more present in the moment. I hope to inspire designers, engineers and those who love to dream about the future, to design for more human interactions.
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