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Making Visible, Speculating a New Way of Relation

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Abstract

This thesis is an attempt to bridge art, design and science around environmental concerns through the lens of two artistic projects including *Augmented Plastic Air* and *Everyone Speaks*. As such my multimedia Masters project explores the questions surrounding how humans perceive, feel, interact, relate to, and communicate with their socio-natural surroundings, and what environmental imaginaries these interactions produce. Through a speculative design methodology combined with scientific and artistic research, I first pay attention to the invisible property of microplastics – the presence of which in the environment threatens humans and nonhumans alike which we are only beginning to understand – and follow their trace. Looking closely at making visible the invisible brings me to the second project which is about our relationship to the living world. *Everyone Speaks* tries to imagine alternative ways of communicating with nonhumans, starting with my house plants. While the former deals with how we live with the dangers of the Anthropocene, the latter offers hope.

Introduction

My first project, *Augmented Plastic Air*, takes microplastics floating in the air as the primary concern. Having a starting point from the question of how close humans are to plastic pollution, it envisions a speculative reality filled with invisible toxic substances. The installation, consisting of printed fabrics and video, magnifies the impact of plastic on the atmosphere and aims to explore the plastic particles that are prevalent in their surroundings. *Augmented Plastic Air* in progress is done in AR applications, which serves as a technical tool to enhance our sensory capacities by making the invisible visible, or the imperceptible perceptible. The use of AR and the experiences of plastic pollution in a familiar environment is to draw attention to the ways in which humans come to understand their socio-natural world, thereby enabling self-reflection considering broader sociocultural aspects.

My second project, *Everyone Speaks*, envisions new ways of living with nonhuman beings such as plants. This work erases definitive boundaries between humans and nonhumans and seeks a way of expanding our perceptions and consciousness of their beings. In his book, contemporary philosopher Timothy Morton argues that the current challenge is to move away from an anthropocentric viewpoint and acknowledge the equal reality of all beings (Morton, 2017). But we have never had the chance to become nonhuman beings, how can we imagine establishing extensive relationships with them? With the speculative idea of human-plant communication, this work combines the tech aesthetics of Arduino programming and the application of Max software program to visually demonstrate interconnectedness with plants.

Project 1. Augmented Plastic Air

Invisible threats

This project started and developed with my interest in discourses related to the climate crisis and air pollution within the complex of climatic phenomena. Take Seoul, South Korea as an example, where I used to live in, the city is plagued by air pollutants caused by yellow dust and plastics litters. Particularly yellow dust, known as Asian dust, refers to airborne dust and pollutant particles transported from China and Mongolia to Korea (Kang & Kim, 2014). Dust contains a variety of harmful pollutants, including particulate matter and microorganisms, and it is one of the factors that contribute to air pollution in Korea. As of January 31, 2023, wearing a mask will no longer be mandatory, but Koreans still wear a mask as a personal choice to protect themselves from these contaminants. I was one of them.

After coming to Norway, I was impressed by its pristine nature and clean air. But at the same time, I often saw plastic litter or oil spills in certain areas. And one day, I actually get to experience pollution. It was winter vacation in 2022. Staying for a week in Stavanger with my family, we went fishing in a nearby fjord. While a three-hour fishing session, two mackerels were caught. After coming back home, we cut the fish in half to grill it, but there was a small particle inside the fish. We suspected that it might be from marine debris or plastics litters but did not exactly know what it is. This event later became a motive for starting my project.

Microplastics in Media

Recent research shows one adult consumes five grams of microplastic every week which is compatible with the weight of a credit card (De Wit & Bigaud, 2019). In addition, exposure to microplastic through ingestion or inhalation can cause health and environmental effects, such as cell damage (Vethaak & Leslie, 2016). The media continues to warn against microplastics. So where do microplastics exist? How do they affect us? Can we see and feel them? Microplastics are often mediated in media since most of them lack "tangible visuals". It subsequently made people completely miss the link between plastic use and microplastic pollution (Henderson & Green, 2020). Even if its issue appeared in the media, statistical graphs, and media images only give people the perception that plastic pollution is a "far away" or "on-screen (Henderson & Green, 2020)" problem. Their invisibility and imperceptibility affected knowledge gaps between the public understanding of microplastic pollution and the actual impact.

Conceptual Framework

Microplastics as Hyperobject

As mentioned, the invisible threats around us tend to be overlooked since they are immediately imperceivable or invisible. But at the same time, I thought it might be our inability to cannot look and realize beyond our own existence. Not seeing beyond our existence means a limitation to our existence as humans. Timothy Morton defined the concept of the Hyperobject in his book "Hyperobjects: Philosophy and Ecology after the End of the World (Morton, 2013)." He illustrates Hyperobject is difficult to grasp since it is so complex, massive, and distributed across space and time relative to our human scale. It is normally used to characterize black holes, and the Solar System, but it could also designate all the radioactive materials on Earth, the plastic in the ocean, and global warming. On his notion I understand microplastics as hyperobject. They are entities that cannot be directly observed through our senses, but instead can only be perceived through statistical language or technological extensions of our sensory abilities, by using additional instruments (Evelyn Meynard, 2019). I thus suggest the need for perceptible visuals that makes the unseen microplastics visible using a technological tool.

Investigative aesthetics

I develop this project through an investigative aesthetics approach. Regarding investigations of microplastics, the experimental processes must require scientific expertise. However, the entire investigation process in terms of recognizing, exploring, and visualizing collected plastic particles requires a technical and aesthetic approach. In this project, I first focus on the collection of microplastics. I also include the process of photographing, documenting, and making the invisible visible through technological knowledge in my practice. New information discovered in the investigation process has a potential story in that it shapes its relations to everything that can be understood through investigation (Fuller & Weizman, 2021). For example, each microplastic may contain different kinds of plastics that come from different regions or countries. Why are they here? What it looks like? Does it look like plastic particles? Or does it have a beautiful shape as it came out of a seashell? Investigative aesthetics can relate to all these questions.

Method

Collection and separation the microplastics

The story of my discovery of finding plastic inside the mackerel in Stavanger tells us that the invisible threats of contemporary pollution might be unexpected but part of our daily reality. With this realization in my mind I felt that pollution was actually not far from me, and decided to develop my own project on this topic. In this early stage of process, I collaborated with, Yeon-jun Kim, a master's student at University i Agder (UiA) who is studying microplastics and their impact on Coastal eelgrass. In February 2022, I participated in a field experiment organized by the department of Coastal Ecology at UiA with Yeon-jun, whose aim to was to gain a deeper understanding of plastic contamination in the environment in Norway and investigate its traces. We collected samples in two separate locations, one from air and one from the sediments around Grimstad, Norway. With those samples, the experimental processes for collecting microplastics were conducted in the laboratory at UiA for a month.

At the last stage of the experiment, we collected over 100 particles. The microplastic particles which we collected in Grimstad, and which I then, with the guidance of scientists, brought to the foreground and photographed. The act of photographing and documenting microscopic images was a time to concentrate on their shapes and colors. When looking closely under a microscope, some were full of bright colors and looked like rocks. It was completely different from my perception of plastic, and it set the direction to move forward with the question of why they exist and how to make these little things visible. Each particle captured under the microscope later forms the material basis for my work *Floating Forever* and *Augmented Plastic Air*, which I will turn to next.

Floating Forever

Floating Forever (2022), the first artwork I developed with a focus on the scale of microplastics, serves as a starting point for reflection on how my work has evolved throughout my project. It introduces that the night sky we see is not a sky full of stars, it rather reflects the outcomes of the desire for pursuing the convenience of plastic use. Humans create a ton of garbage and highly contribute to the toxic cycle every single day. Abandoned plastics are broken into small and small pieces and corroded, eventually flowing into the air as new entities: microplastics. On printed fabric, there are many types of microplastics that might be from fibers, film fragments, bottle caps, and ropes. The particles are magnified to a human visible scale, giving us a lens through which to see. Until you realize that these are microplastics floating in the sky, each plastic can be seen as a star in the beautiful night sky. But this seemingly familiar night sky is actually an ominous warning that

reflects what the actual reality is, in which the political, historical and cultural discourses are intertwined.

Speculative reality

The speculative approach is a method that is used to work in a structured way to explore, investigate and imagine possible worlds or futures (Dunne & Raby, 2013). In designing *Augmented Plastic Air*, which is my second work, I employ the speculative methodology for crafting a version of a possible reality that is already ongoing. To design the possible reality, I use AR applications (Augmented Reality) that act as technological instruments to suggest perceptible visuals, either by making the unseen microplastics visible or by expanding our sensory abilities in an AR environment.

After developing *Augmented Plastic Air (2022),* I shared the QR code with anyone who is interested in my project. People filmed the space where they are, and each piece of footage was sent to me back. The participatory video includes different people, all of which are people living in Korea or Norway. In the footage, people hold the cameras with their own hands and explore their surroundings. Things that were originally invisible begin to be seen in the AR environment and its experience draws their attention to the ways in which audiences come to understand the world around us. When the camera is placed in the hands of the potential audiences, it becomes a way to intensify participant reflection and voice (Liebenberg et al., 2012), thereby enabling audiences to cultivate self-reflection. Self-reflection is not a separate activity from the action but rather can be understood as the first step of action. In this vein, AR can play a strategic tool to promote dialogic engagement regarding plastic pollution, making participants consider broader sociocultural aspects of them.

Self-reflection and Discussions

By dictionary definition, a border is an artificial line that separates geographic areas. Are microplastics limited by geographical borders? In *Augmented Plastic Air*, the composition, connecting the local environments in Seoul and Trondheim, has its own story. It is to highlight connections among geographic locations, reflecting on my personal geographical position. I moved from Korea to Norway, and the plastics caused by me also moved across geographic locations with me. Most microplastics can be transported across long distances by wind, river, and weather patterns. They travel far from their original place where they were discarded and further across national and continental borders. This suggests that plastic can travel anywhere, and eventually turn around and come back to me. It encouraged me to realize that my own behavior might have implications for a geographically different environment. This individual realization also gives me access to new

perspectives in terms of what I thought regarding their presence, and thereby, I could affirm my personal connection to the issues. In other words, microplastics are not limited by geographic borders, but migrate across "geographic borders". They are roaming around us, working with us, and enveloping us. They are free to move across the globe. The nature of microplastics is not static, but fluid, dynamic, pervasive, and ubiquitous, invading across borders and even attacking on a global scale.

A border separates not only geographic areas but also can separate invisible zones. Above I continued to mention their invisible properties. After all, the reason we cannot see microplastics is because of their scale – it is too small to be seen. But we really have to think about how we know that scale is small. We could have simply called 'plastics smaller than 0.5mm', but we named it microplastics. We could have simply called 'plastics smaller than 0.2mm', but we named it nanoplastics. In terms of its scale, the plastic is already 'bordered' rigidly. In my work, I intended to make the 'rigidly-bordered-invisible' plastics visible. It is my attempt to blur the artificial borders. Microplastics are now visible as they enlarge in size. They just have crossed the "visibility border".

Relations between two projects

My artistic practice has come to embrace more aesthetic concerns over time. And to talk about that shift, I again turn back to the plastic talk.

Humans obtained most of the substances from nature. In order to replace the use of natural resources, the first synthetic plastic was invented by John Wesley Hyatt (Jiang & Jiang, 2013). This invention seemed to make human manufacturing no longer dependent on nature, giving a benefit to both humans and nature. However, in the post-war years, plastic was no longer considered a positive substitute. Plastic, which seemed to help nature when it was discovered for the first time, is now beginning to bother nature in other ways by being dumped on nature. Humans know plastic is a huge problem, but our convenience and dependency on using plastic make it challenging to let go. Some try to eat less meat to preserve the environment but still consume plastic while buying paprika. Humans are literally in the midst of a tragedy where we are confused between the convenience of using plastic and the mindset of protecting the environment. Humans are in, to quote Lawrence Buell, "a crisis of the imagination (Buell, 1995)". The current environmental crisis comes from the cultural and imaginative barriers that prevent us from understanding the environmental problems we face.

I would like to go a step further in that critique by pinpointing our inability to envision a sustainable future, and this viewpoint of anthropocentrism more broadly, as the problem preventing us from

opening inventive stories that imagine alternative ways of living. One very good illustration of this is environmental imagination, which is the capacity of individuals and societies to imagine alternative ways of interacting with the natural environment. It is to reimagine relationships with other beings in new ways. This requires a break of the fixed paradigm and instead tapping into our imaginaries.

Project 2. Everyone Speaks

When I started getting interested in the concept of environmental imagination, I came across a very interesting article about plants. The article suggests that people sometimes express their angst by screaming when under extreme stress and that plants can do the same by making sounds as well as releasing smelly chemical compounds (Nicoletta Lanese, 2019). For example, the smell we sense when we go to woody mountains or forests is the one that might be released by plants. It means that plants can perceive their environment and respond to those perceptions. They do not have language but obviously have been delivering messages to us in their own way.

Conceptual Framework

Nonhuman Aesthetics

I want to outline two theoretical perspectives that aided me in understanding human-nonhumans relations. According to feminist scholar Donna Haraway, our identity as humans is not fixed but rather constantly evolving through our relationships with other species. She suggests that we exist in a state of perpetual *becoming-with*, where our identity is intertwined with the symbiotic relationships we have with other species, ultimately shaping who we are as individuals and as a species (Brittz, 2020; Haraway, 2003). Anthropologist Anna Tsing expresses, "Now that we are beginning to imagine an environmentally engaged humanity in which other forms of life are everywhere, involved in shaping everything, we need to know what more-than-human-socialities are being made (Tsing, 2013)". From her perspective, humans can be considered to be one component of a larger system that includes nonhuman beings such as animals, plants, ecosystems, and technology. The more-than-human world encourages us to shift our focus from the human-centered worldview and to recognize the interconnected relationship with the natural environment and the nonhuman entities within it. Humans are not the only entities with agency, value, and importance in the world. Humans can influence and can also be influenced by other beings that have their own values, agency, and intelligence. It suggests that humans are just one of many interconnected beings that form a complex and dynamic web of life on our planet. There is no one direction going from one type to the other, but it is rather a mutual influence.

The conditions of human existence include humans, the natural world such as animals and plants, minerals, and eventually this earth planet where humans live. Human beings are deeply embedded in the natural world as a part of nature, and to live in this natural world in harmony, they need to interact with and depend on other beings closely, including plants and animals. We should view nonhuman beings not as objects or potential resources, but as living beings with unique qualities. It is necessary to notice their existence and respect their vitality, either by recognizing the inherent value of nonhuman entities or by advocating for their rights. There is, however, a physical limitation. How can humans understand the social worlds of beings that cannot talk to us? Humans have never had the chance to become plants, what it means to imagine establishing extensive relationships with them? What might look like if plants talk to humans with languages?

Method

Speculative communication with plants

To answer the series of questions, I use speculative design methodology to stretch my imagination and develop new systems of mutual communication between plants and humans. The speculative design "Enables us to experience some emotions in contexts that we would not ordinarily encounter, and to think of ourselves in ways that usually we do not (Oatley, 2011)" Therefore, the idea of a speculative communication system came from thinking about what possible futures can be imagined for a more sustainable ecosystem. "You Speak, I Speak, Everyone Speaks!" Starting from this conception, embodying the speculative idea of communication with plants can play a significant role in broadening the scope of my imagination. It also serves to reimagine our socio-natural environment itself, as well as our relationship with the plants within it.

In designing the communication system, I try to "personify" plants. There is a big difference between what I say "personify" plants and the view of Anthropocentrism. A personification of plants is not just "humanizing" plants, but it is an aesthetical viewpoint that is used to give nonhuman entities human-like qualities, such as ability to speak, feel and perceive. Even though it will never possibly happen and is considered abstract, as long as it is imaginative, the idea can outline a new type of relationship between humans and plants. Thus, the personification of plants is a first step toward the recognition of their existence, and toward playing around with the speculative idea.

Human-plants interaction

The installation, which connects the Arduino device to plants, involves data visualization and sonification. In envisioning the design, the most important aspect is to consider the human-plant interaction, which refers to a holistic way of considering the world, where people, animals, plants, minerals, the natural world, and the Earth planet coexist as being in dynamic and interconnected relationships (Randle & Stroink, 2018). Here I use technology to enhance our consciousness and sensibilities. Combining the tech aesthetics of Arduino programming and the application of Max software program, the installation visualizes the interconnectedness with plants.

In the work, consisting of house plants, Arduino, headphones, and laptops, humans serve as environmental data from a technical aspect. Each leaf is equipped with a contact sensor that can detect human electrical signals and interprets data values. Plants internally have their own electrical value, which generally varies depending on the environment. When people touch the leaves and the data value surpasses a specific threshold value, the laptops connected to the leaves output sound. Working on it, the greatest achievement is the ability to interface with plants and reimagine our relationship with the living world. Responding to human touch and making sounds shows that plants can be aware of our presence, and the design ultimately leads to understanding human and nonhuman relationships, by giving plants language. What plants make sounds here means they generate a frequency that is below 20Hz or higher than 20kHz. But in this work, I was not intended to identify those actual frequencies plants emit. Rather it was to understand the plants world that we could not comprehend as humans, making sure whether plants are genuinely responding to human presence.

Technique

Technically, the crocodile clip, which acts as a bridge between Arduino and plants, interprets data values coming from each plant in synchronization and in real-time. The crocodile clip serves as a kind of interface and allows me to read each data value that enters the plant through the Arduino program without a frequency meter.

As working on it, the first observation was that the voltage difference when touching a plant with objects such as wooden pencils and plastic bottles was very fine. The second observation was that data values of plants without human electrical signals generally record under 100. But it can be different from plant to plant.

After confirming that the plant could accept the electrical signal, the next step was to do programming for sonification so that when the data value reached 100 or more, the sound could come out as if the plant was talking. To make it, a software application was created in Max Sound Programming (MSP). To apply the same code in the MSP environment, I first constructed six basic subdivisions (six clips - six subdivisions). Each of the six subdivisions is compatible with the six crocodile clips connected to plants. Plants accept the electrical signal, and Arduino programming reads the data value numerically, which is then applied to the MSP environment to output sound when the data value is over 100.

Sound

When designing this speculative human-plant communication, I personified plants in an attempt to endow plants with human-like traits, such as the ability to speak, feel, and perceive. Here, the ability to speak here is the sound. The role of sound is not only a means for plants to communicate with humans as a language but also has the intention of creating a non-hierarchical relationship between humans and plants. Since plants do not have language, giving them language in this work acknowledges their intrinsic value. Through the sound, the potential audiences begin to recognize plants as beings and wonder how they might greet a plant and how they communicate with a plant. It also leads us to examine what kind of relationship we can have with living worlds and, therefore, to reflect on what it means to recognize plants as worthy of attention.

Conclusion

Interaction between art and science can be realized when an artist becomes a knowledge producer or at least in dialogue with science through the combination of scientific and artistic methods. To produce knowledge, in my first project, I framed the actual environment surrounding us, envisioning a speculative reality full of invisible substances such as microplastics. As for how things might look, what steps I went through, and how they were built, I could say the whole process was done in a scientific and aesthetic way.
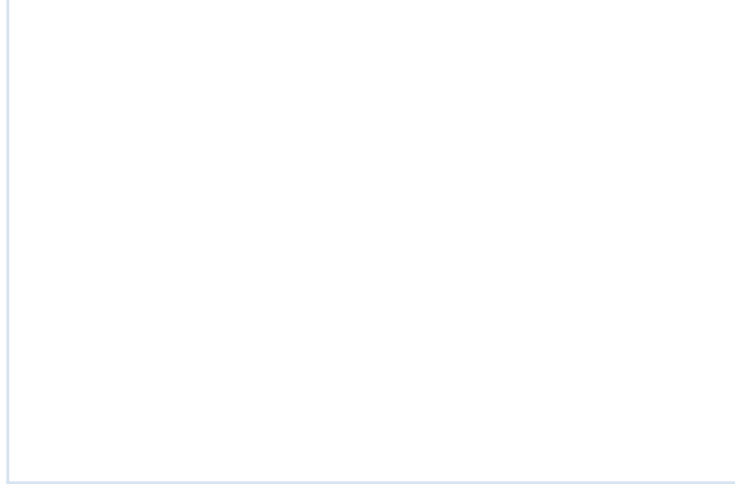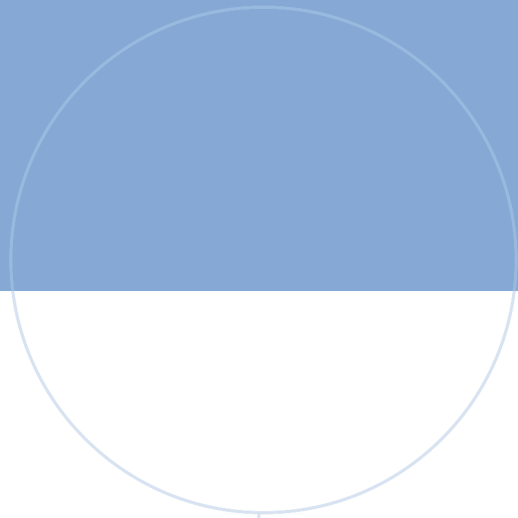
I wonder how *Augmented Plastic Air* will achieve sustainable social impact in terms of its aesthetic, societal and technical aspects. Speculative reality and public involvement will play a significant role. Audiences experiencing invisible pollution in an AR environment allow creating different connections that can be felt, experienced, imagined, and embodied to them. By allowing plastic pollution in the air to be perceived and experienced indirectly, speculative reality serves as an aesthetic technique that contributes to the emergence of new imaginations that can influence desirable future norms. It can also open the door for our imaginations to help raise awareness of the consequences of our behavior, which is something that science might not do.

Through speculative design methodology, my second project imagines new systems of mutual communication between plants and humans. It lies somewhere between an ideal dream and impossible unreality. But it is not a matter. More importantly, imagining an ideal dream made me feel that anything was possible and worthwhile, and again, will make me imagine in a broader way.

My work targets everyone: the general public, the media, scientists, researchers, organizations, cultural institutions, etc., since we need both environmental action and imaginaries for a better world. No specific code is required to understand this project. Nor do we need the specific notions of art historians in the 1970s. Instead, I aim to reach the public by visualizing problems surrounding us more accessible. I believe that recognizing the problems around us through a visual approach can be the first step to action, and this reflection leads to more environmental imagination.

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