Haikeus: Transmuting Ecological Grieving into Action*

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Combined with the unprecedented stress of the COVID-19 crisis and the increase in social unrest, human-caused environmental disasters are having a profound impact on well-being, resulting in a dramatic spike in mental health issues. Studies are emerging daily around concepts of ecological grieving stress, depression, anxiety, and a host of emotions that are surfacing and increasing in our modern times. From eco-nostalgia to eco-anxiety and eco-grief, our responses to climate change, environmental devastation, and social unrest can prevent us from taking positive action, often leading to existential crises. Our proposed project, Haikeus: Transmuting Ecological Grieving into Action, works directly at the interface of some of humanity's wicked problems, which are complex, challenging to solve, and hard to fully understand. The aim of this project is to bring awareness and motivation for transmuting such an emotion into an action through the power of creativity. We further argue that the established methods could facilitate a more nuanced understanding of organizational barriers to communicate its potential value to proceed with the change.

CCS CONCEPTS • Human-centered computing • Interface design prototype • Digital-bio prototype

Additional Keywords and Phrases: Wearable haptic, ecological grief, transmuting, biomaterial, ecological disaster

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1 INTRODUCTION

At the intersection of wicked problems (i.e., climate change, food or water insecurity, housing crises, financial strain, or poverty), sits an overwhelming reality that humanity is struggling to live in balance with ourselves, one another, and our planet. We are seeking to directly focus on the emotional responses to this intersection through artistic, humanistic, and

scientific exploration. We will then transmute such emotions into action through the power of creative performance, visual design, community engagement, and outcomes that seize the moment of shared ecological grieving.

The deployment of biomaterials and bioinspired prototype in design tend to mitigate eco-anxiety and eco-grief. Within this context, honoring the Manifesto for Sustainability as a critical factor and questioning the materials of the future for this project, we choose completely biodegradable materials such as polyhydroxyalkanoate (PHA) and alginate as bioplastics. These are 100% degradable and already becoming popular in cities throughout Europe and the United States for ecological reasons. PHA is produced by fermenting raw vegetable materials with a series of bacterial strains. For example, PHAs can be used for injection molding to build automobile parts and for many other uses. Specifically, PHA is extracted from bacteria such as pseudomonas. Additionally, alginate can be extracted from naturally occurring materials such as brown seaweed.

1.1 Project motivation

In Haikeus, translated from Finnish as “a sense of simultaneous sadness and gratitude,' we suggest that humans are experiencing sadness and the latter, gratitude, is a needed practice. Haikeus is a visual design inspired by biomimicry, taking reference from nature and using biomaterials. The design uses organic lines organized in a form of a veil or a shield where digital meets bio-embedded with technology to add value to the wearer to feel and experience the presence of nature, in the form of gentle touch. At the same time, this experience brings another layer of complexity and awareness about environmental disasters. The continuous lines represent the connectivity of life, all things being interconnected as a metaphor for human and nature coexistence.

2 FABRICATION

2.1 Wearable Technology and Sustainability

Blurring the lines between bio and digital, we introduced Digital manufacturing / 3D printing with biodegradable filament and wearable technology embodiment.

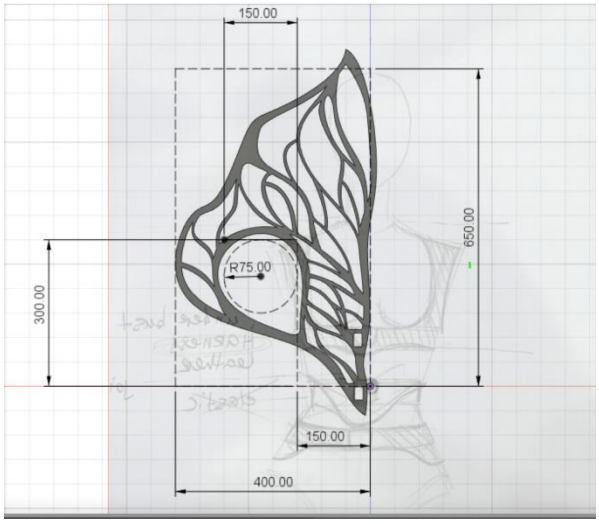

Figure 1: Haikeus 0.2 3D modeling

2.2 Technology

Haikeus explores a different future where the embedded technology transforms the shield from static to a living object on the body. Designed with the functionality of haptic feedback, and additional sensor devices, this shield transition into active devices that can react to environmental extreme conditions. Hence these "living" accessories can provide a "gentle touch" on changing location and appearance according to the intensity of the light source and enabling a multitude of presentations of self-grief. Simply put, haptics is a technology that allows one to receive tactile information through their sensations, by applying forces, vibrations, or touches. Haptics simulate an object or interaction from the virtual system, producing the feeling it's real. Vibrotactile feedback is by far the most common type of haptics. In this project we used a circuit-playground microcontroller, light sensor, and vibrating coin shape sensors: vibro-stimulators applying pressure to the receptors of human skin. These receptors resemble an 'onion' layer structure and can accept vibrations of up to 1000 hertz. The Device is programmed to output haptic feedback when a particular action is performed from the light source. In addition, can be paired with existing mobile devices to become personalized on-body assistants to help provide a comforting effect. There is also the opportunity to add additional sensors to connect the wearer with their surroundings during the grieving process. For example, a UV light sensor would connect the wearer with the strength of the ozone layer above them and shield them from the ionizing radiation. Or an airborne particulate sensor with a carbon dioxide sensor could connect the wearer with the local combustion of fossil fuels and the wider rising trends in the background carbon dioxide levels. The components are attached to the feted harness belt, where they generate haptic changing feedback, displaying life-like qualities, hugging, shifting, and reconfiguring to the needs and preferences of the wearer, also assisting in the fluid presentation of self. While this design uses haptic motors, other actuators can also be used to assist the user in the process of grieving. For example, motors could actuate the veil and dynamically conceal and reveal the persons face based on environmental conditions. We predict innovative wearables that possess unique qualities of the living and the crafted, creating a new on-body ecology for human wearable symbiosis. Haikeuse's wearable device is more concerned about its user's emotional health and it uses vibrations to help users feel relaxed and energized. If the device is controlled

from a phone, where users can select from a suite of vibration patterns and intensities, compared to deep breathing — both help create a meditative sensation and help the wearer feel sane and grounded

2.3 Sustainability and Biodegradability

Haikeus seek a symbiosis of high technology and artisanal craftsmanship, combining 3D printing with biomaterials and referencing the intricacy of the alginate entanglement of life. The prototype of the design was prepared and printed using 3D printer. The PHA resins were used as ink and printed at the desired design. The alginate derived from brown seaweed was used in this project. The alginate powder (8.34 g) was homogenized in water (100 ml) followed by the addition of glycerol (8.3 g). The weight portion of glycerol was varied to prepare rigid (0%), normal (5%), and elastic (10%) composites. Finally, the composite solutions were poured in the 3d-design prototype, and okra seeds were manually placed onto the alginate composite before drying.

In this project, we emphasized the development of a novel biodegradable alginate bioplastic as an alternative to traditional plastic. Furthermore, composite films were found to fully degrade and possessed better properties and comparable material properties to PET and PLA. Ultimately, these results support biodegradable composite as a viable alternative for synthetic materials best fitted for the use of renewable materials innovation. In a natural design, biomaterials are compatible with human nature. The bioplastic composite was poured to the 3D printed frame embedded with okra seeds.

Figure 2: Bioplastic composite poured onto the 3D printed frame

3 CONCLUSION

Display The current design was achieved by deploying a combination of flexible and rigid materials to maintain the desired shape according to the geometry of the human body. The lightweight prototype of the design (less than 600 g) provides the wearer with the feel of comfort. The current prototype was simply designed to relieve the eco-grief. The materials derived from nature are compatible with humans' nature when they are prepared in simple designs. Therefore, our design maintained the sense of compatibility with nature and integrity with the human body. Although the current design mainly relies on biodegradability and connectivity, the design can be symbiotically investigated. In particular, the presence of okra seeds leads to reviving nature when the prototype is dug in nature for biodegradation.

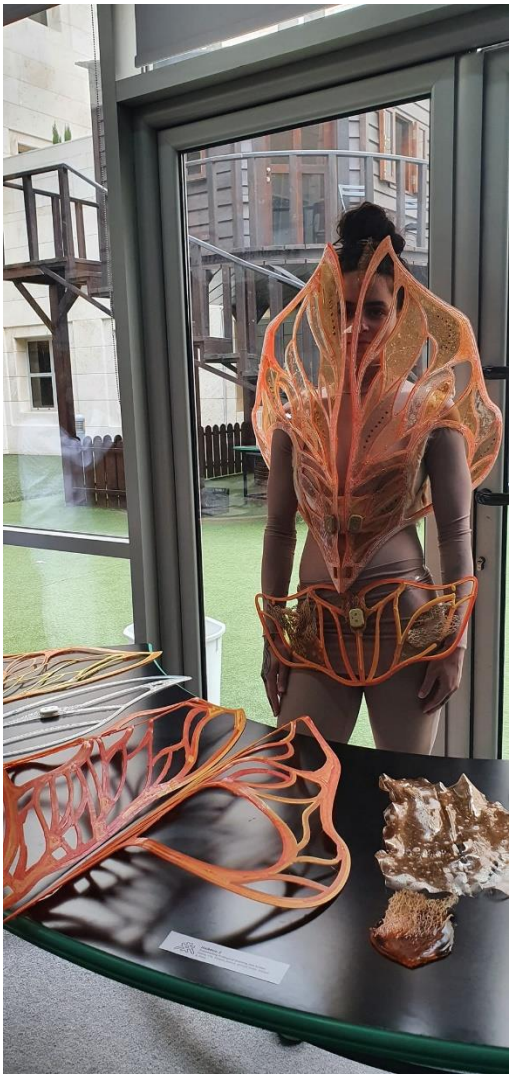

Figure 3: Haikeus 0.2 worn on the body

It is important to note that the durability of materials and in-depth characterization would be later performed according to designs and functionalities.

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