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APOSEMA: Exploring Communication in an Apathetic Future

Abstract

Aposema is a wearable device that speculates on a near-future scenario in which human face perception abilities have been compromised. In this world, everyone wears a device on their face that reads facial expressions and guides social interaction. The device is composed of three elements: The first is the sensory input from the face muscles, followed by a data analysis. The second is the physical output—a soft, colored, robotic inflation pattern. The colors represent the emotions corresponding to the facial expression, and the form change represents the emotional intensity. The third is an augmented reality layer that provides a decrypted emotional analysis to help guide interaction. Aposema is a personally customized device made of silicone and incorporated electronics. The fabrication process involves parametric design, 3D printing, hand casting, and physical computation. This design is proposed as a critical object and a provocation responding to the changing nature of communication in the digital age.

Keywords

Wearable Design, Speculative Design, Face Perception, Soft Robotics, Augmented Reality

1. Introduction

Aposema is a wearable device that is worn on the face (Figure 1). It is proposed as a piece of speculative design and a physical, critical object positioned in the intersection of art, science fiction, and product design [11], [16]. Its goal is to provoke thought and raise discussion regarding the challenges and opportunities for communication that our society may soon encounter as wearable technology evolves in the near future [12]. Motivated by the digital revolution, the information technology age, and more recent developments in the wearable technology industry, Aposema explores an imagined oncoming crisis and the increasingly extreme responses we might take to mitigate it. This scenario draws from our extensive use of personal digital devices and social media. As part of the digital revolution, our communication habits have changed, with individuals increasingly choosing technological alternatives over unmediated in-person interaction [2].

2. Narrative as Design Compass

We imagined a scenario inspired by last century's science fiction cinema and literature to guide the design. Aposema speculates on a near future where we rely on technology to replace our once-natural instincts. In an age of genome engineering and emotion recognition algorithms, our ability to read facial expressions has

been severely reduced, limiting our capacity to develop relationships and leaving us struggling to empathize. In this world, we attempt to compensate for this impairment with a wearable technology device.
As we developed our narrative, we explored several research areas of wearable devices for guidance. Our starting point was previous work that used soft robotic wearable devices as instruments for speculation on future scenarios, such as Ava Aghakouchak's and Maria Paneta's Sarotis [1]. In addition, we looked at previous work that used wearable devices to guide social interaction, for example Behnaz Farahi's Caress of the Gaze [6]. Finally, we based our design on previous work that explored facial expression recognition through wearable devices, such as Jocelyn Scheirer's, Raul Fernandez's and Rosalind W. Picard's Expression Glasses [7].

3. The Three Parts of Aposema

Aposema is proposed as a body extension providing its wearer with an emotional and cognitive extension [3], [17]. It is a device that reads facial expressions and analyzes emotional states to guide social interaction. It is composed of three parts (Figure 2): The first is the sensing part or the input. A system inside the device, composed of a programmed microcontroller and biometric sensors, reads the facial expression and integrates it with other sources of personal data about the user (Figure 3). The device then creates an analysis aimed at replacing the natural complex process of natural face perception [4]. The second part is the presentation of information on the facade of the device. The encrypted analyzed information is presented as a soft, colored, robotic pattern. When the person

Fig. 1. One of the final design iterations of Aposema (Source: Aposema, design by Adi Meyer, Sirou Peng, and Silvia Rueda, the Interactive Architecture Lab, the Bartlett School of Architecture, University College London, 2017)

wearing the device encounters other people, the third part—the decryption—comes into action: the device decrypts the soft robotic patterns on devices worn by others. An overlay of augmented reality viewed through a lens incorporated within the device provides the wearer with a decrypted analysis of other devices around them, which enables and enhances interpersonal understanding (Figure 4). The three elements of the device form a system meant to compensate for the loss of the ability to read facial expressions (Figure 5).

4. Replacing Face Perception for Social Interaction

The device aims to replace the complex process of natural face perception through simplification. Face perception is, at its root, an individual's understanding and interpretation of the human face when encountered as a visual stimulus. The ability to process information

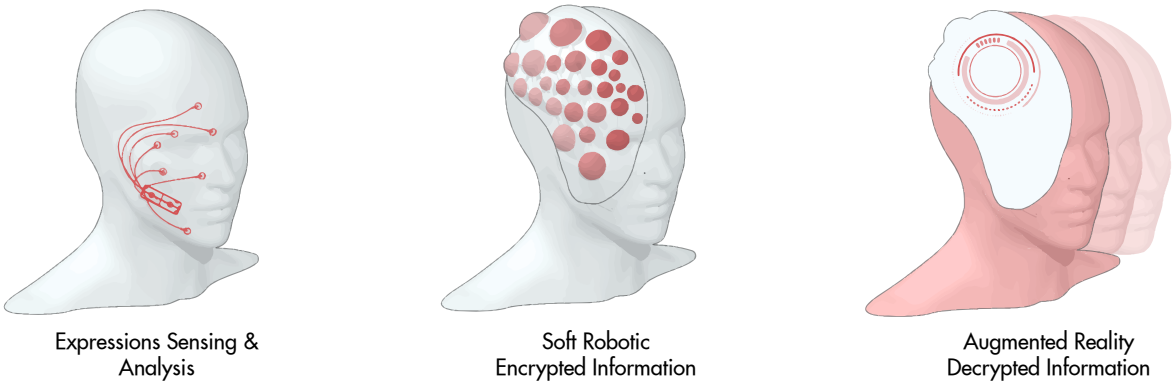

Fig. 2. The device is composed of three main parts. (Source: *Aposema*, 2017)

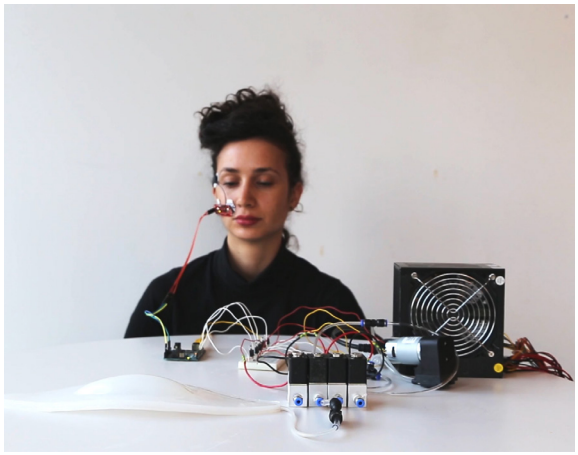

Fig. 3. (Left) Sensors integrated within the device read facial muscle movements and analyze them. (Source: *Aposema*, 2017)

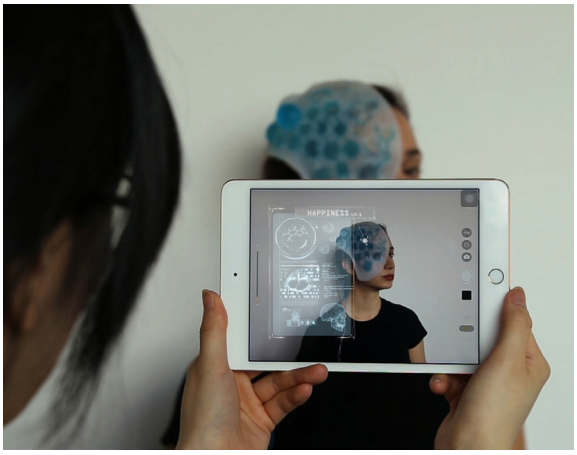

Fig. 4. (Right) An overlay of augmented reality provides a decrypted analysis of other devices. (Source: *Aposema*, 2017)

from faces by recognizing facial expressions involves extensive and diverse areas of the brain [4], [8-10]. The sensors in the device read facial muscle movements, process them, and translate them into simplified emotional states according to the universal emotions identified by psychologist Paul Ekman. Ekman ascertained six universal core emotions—that is, emotions that are perceived and expressed in a similar manner in every human culture. These emotions are disgust, sadness, happiness, fear, anger, and surprise. Through his research, Ekman classified facial expressions by motion cues corresponding to these distinct emotions [5].

After the wearer's expression is read and interpreted, an emotional analysis is presented on the device. The facade of the device is made of silicone and has a colored pattern with inflating pockets of fluid. It reacts when the wearer interacts with another individual, representing emotion by changing color and shape. Each color that appears on the device represents one of Ekman's universal emotions, and the degree of shape change indicates the intensity of feeling (Figure 6).

The device constantly scans the wearer's environment, recognizes soft robotic patterns presented on other devices, and decrypts them in real time (assuming that, in this future world, we are all wearing those devices). The goal of the lens over the eye area of the device is to provide an augmented reality overlay that equips the wearer with further interpretation and an emotional analysis of encountered individuals (Figure 7). Alongside the analysis, a prescribed guideline for social interaction is provided. When the device recognizes an expression of anger, it might suggest pacifying hand gestures; when it recognizes a sad expression, it might suggest comforting words. Through this two-way transfer of information, the device facilitates a new form of expressive communication.

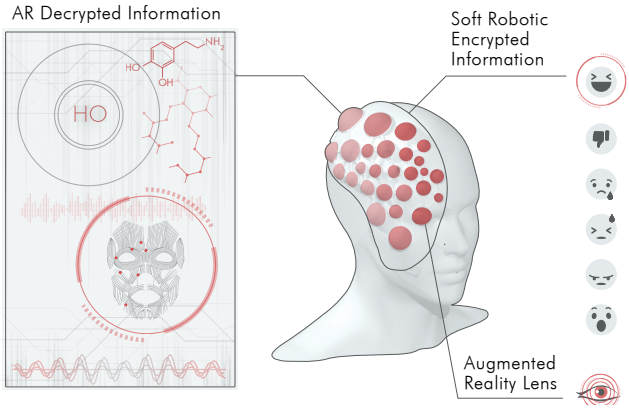

Fig. 5. The elements of Aposema (Source: ***Aposema***, 2017)

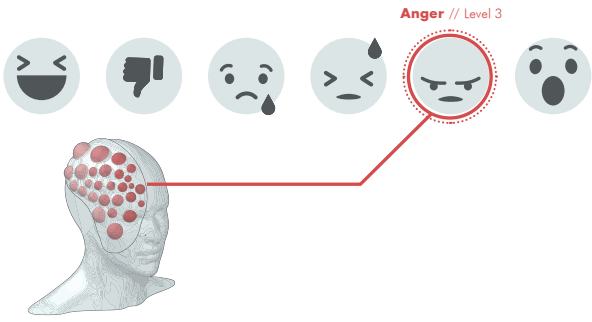

Fig. 6. Each color presented on the device corresponds to one of Ekman's universal emotions. (Source: ***Aposema***, 2017)

5. The Technical Process of Fabricating Aposema

The technical process of producing Aposema began with creating a three-dimensional scan of the wearer for optimal personal customization. Once the scan was produced, the device was digitally modeled using parametric tools to guide the pattern design. The digital model was then translated into a physical object by 3D printing a series of molds in which the device would be casted. In parallel, a circuit was designed, and a microcontroller was programmed to sense facial muscles and translate them into physical and digital outputs: the soft robotic inflation and the augmented reality layer (Figure 8).

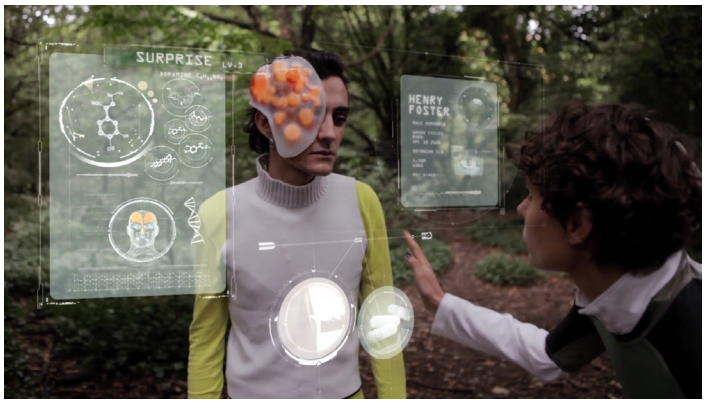

Fig. 7. The soft robotic pattern is read through an augmented reality overlay, equipping the wearer with further interpretation and an emotional analysis of encountered individuals. (Source: ***Aposema***, 2017)

6. Learning from the Past to Imagine the Future

Aposema derived its name from nature's aposematic visual warning system and from mask-making traditions. Aposema's notion of dynamic representation is based on Kwakiutl dynamic tribal masks from the 18th-19th centuries. It interprets the concept of dynamic representation through a physical object by utilizing advanced technologies for emotional representation in a device that, like the masks, physically transforms and is worn on the face. The Kwakiutl Indians of North British Columbia produced spectacularly designed masks that were a constant feature of their rituals. Their masks were viewed as a way to change the wearer's identity; they contained a dynamic transforming element, as they could be opened to reveal an inner layer [13-14]. The dynamic quality of these masks was an important precedent for Aposema. The Kwakiutl masks helped us imagine an abstraction of current wearable technology to throw a spotlight on our changing relationships with the virtual and physical worlds.

Although the speculative scenario that drives Aposema is grim, in a sense, it resembles our current reality. It is not to be mistaken for a technophobic dark prophecy. It is merely a provocative narrative aimed at addressing the issues accompanying the rapid technological advances that our society has been experiencing in the decades since the digital revolution. While we acknowledge the contribution of digital devices to our well-being, the way that individuals consume information has deeply changed, and we as a society hold the obligation of overseeing the impacts of this transformation. We must be aware of the extent to which our communication paths are managed, directed, and manipulated so that we can assess the challenges and opportunities presented by future developments in wearable technology.

7. Conclusion

We are more connected than ever, yet our connections rely on brief, rapid exchanges of information. Connections in the near future will be shaped in unpredictable ways. This development may have consequences that we do not yet have the ability to comprehend. As a piece of speculative design, Aposema encourages further research on the influence of digital

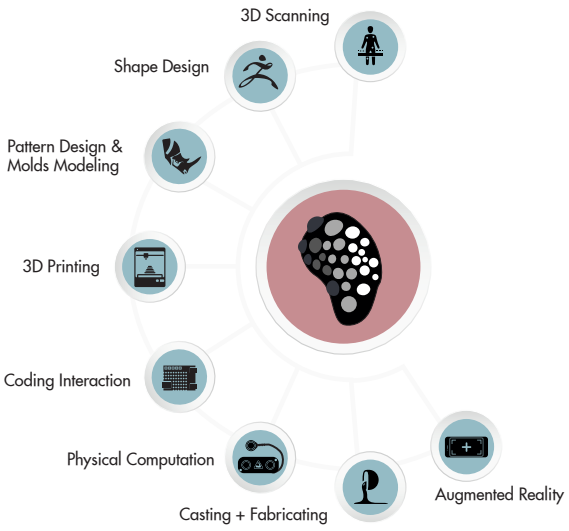

Fig. 8. The stages in the process of fabricating Aposema (Source: ***Aposema***, 2017)

devices and wearable technology on our interpersonal connections, as well as the ethics of wearable design related to possible violations of privacy as the device collects personal data. From increasing surveillance to the rapid growth of intelligent wearables, the human experience of our immediate environment is changing. These technologies combined with social media play a pivotal role in shaping our relationships [15]. The conclusions of this research should be taken into account when designing products that have deep implications for our social and psychological well-being.

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