the rest is construction: An Interactive Installation Evoking Somatic and Cognitive Effects of Anxiety

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CHI'16 Extended Abstracts, May 07-12, 2016, San Jose, CA, USA
ACM 978-1-4503-4082-3/16/05.
http://dx.doi.org/10.1145/2851581.2891084.

Abstract
This paper describes *the rest is construction*, an interactive installation which seeks to emulate the experience of living with anxiety to a viewer through haptic and visual interactions. The use of haptic and display technologies will be discussed, particularly as they relate to the visual and technological aesthetics of the piece.

Author Keywords
Interactive media; digital craft; haptic interfaces; real-time visuals.

ACM Classification Keywords
J.5 Arts and Humanities.

Introduction
The viewer in this installation is encouraged to look through a bespoke viewing device resembling a camera to watch a series of tableaus displayed on a computer monitor. The monitor itself has been stripped of its polarizing filter, so that only by looking through the camera can any image be seen. As the participant holds and looks through the device, several visual scenes progress forward, unfolding a loose narrative; however, if the camera is not held steady the image will distort and step backward. Thus, only by remaining still,

Figure 1: Setup for *the rest is construction*: un-polarized monitor and custom viewing camera.

Figure 2: View through the camera interface.

relaxed, and calm can one view the piece from start to finish.

Concept

Anxiety disorders come in many forms including Generalized Anxiety Disorder, Social Phobia, and Panic Disorder, to name just a few. The symptoms of these conditions are equally as varied— it can be said that anxiety, broadly speaking, consists of two primary facets: the cognitive and the somatic [6]. Cognitive anxiety often manifests as a sense of worry or a racing mind, commonly experienced before stressful events. Somatic anxiety--the physical symptoms--is typically experienced through an increased heart rate, perspiration, and muscular tension.

the rest is construction explores one particular somatic symptom: impaired motor performance (shaking, trembling, tremors), and the cognitive effects that come with attempting to cope with or neutralize it. Because anxiety is essentially a psychological state in which one perceives an imminent threat to their safety, the brain enters "fight or flight" mode [10], wherein higher levels of muscle activity and rigidity cause fatigue at a faster rate, quickly leading to decreases in performance and a higher physical demand in order to accomplish a task [8]. Studies have demonstrated that as the complexity of a fine motor task increases, the degree to which that gesture is impaired by anxiety increases as well [2]. In essence, the more delicate a task is, the more likely someone experiencing anxiety is to tremble when carrying it out. Furthermore, because an individual experiencing anxiety is physically and mentally "on alert" for threatening elements, the condition has a compounding effect that feeds into itself: being anxious causes more anxiety [6].

In order to capture these somatic/cognitive elements of an anxious state, *the rest is construction* presents a physical challenge to the participant: hold the camera to your eye as steadily as possible in order to view scenes on a monitor. Because merely lifting an object is unlikely to produce shaking (gross motor functions, unlike fine, are less impaired by anxiety [5], particularly in an individual with no anxiety disorder), the lens must be actively held to the eye, requiring much more focused, continuous control of the fingers and hand. If a user is unable to hold the camera steady, not only will the images on the screen begin to distort and regress, but the camera itself will vibrate at corresponding intensities. As with the cyclical and compounding nature of anxiety and its symptoms, the camera's internal vibrations will be detected as further trembling, which will feed back into the intensity of the vibration itself. Only by holding the camera completely motionless, or setting it on a stable surface, can one regain control of the system.

Aesthetic Considerations

Screen

Experiencing psychological and physical stress is highly intimate and reflexive, and long-term exposure to such conditions can have drastic influences on how one perceives and engages with the world. In order to reflect this state, in which one seems to be experiencing reality in a vastly different way than individuals around them, inspiration was drawn from privacy monitors.

Privacy filters are simple sheets of plastic, either polarized or composed of micro-louvres [11], available at any home goods store. Placing them over a computer screen directs the light in a focused direction,

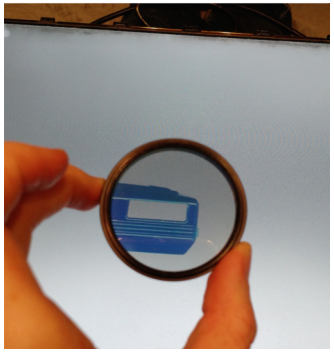

Figure 3: Polarizing lens revealing image on de-polarized monitor.

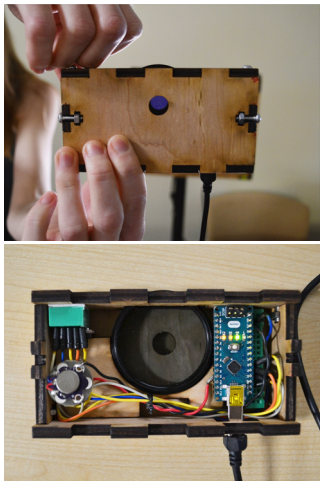

Figure 4: Close view of laser cut camera interface (top) and enclosed electronics (bottom). Photos by Jessica Anderson.

preventing anyone standing off-axis from seeing content. Older LCD screens have two layers of polarizing film built in; an image is produced by sending light through one polarized filter, which directs the light at a focused angle through a liquid crystal [9]. Applying different levels of electrical current to that crystal will cause it to twist or untwist, essentially rotating the light itself. The light then reaches a second polarizing film—if the angle of the film matches the angle of the light, it will pass through and appear as a bright white pixel. If angles don't match, it will appear dim or black, depending on the phase relationship [4]. By stripping one of these layers of film off of a monitor, white light is passed directly to the human eye. Sending an image to the screen will produce no apparent change unless viewed through something that can re-polarize the light.

This installation, therefore, will at first glance appear as a blank white screen, even though it is continuously presenting images. This "world" can only be peered into by a viewer exercising enough patience and curiosity to explore the installation more intimately.

Camera

The device used to interact with the monitor is designed to inherently inform participants of its function, and invite bystanders to handle and explore it. The enclosure is modeled in raw materials after a simple, generic camera, with a Zeikos Polarizing Lens and all necessary electronics mounted inside an inviting and familiar package.

The result is a highly personalized object which is small enough to be manipulated comfortably while still requiring two hands to use effectively. Within the camera enclosure is a polarizing lens (a common accessory used by photographers and videographers), which effectively reveals the un-polarized image on the monitor. The lens must be rotated to the proper phase relationship with the screen in order to expose the image; this is possible through a slot at the top of the device.

Interaction

Motion Detection

In order to detect the user's movements while holding the camera several sensors are used. The ADXL337 accelerometer requires low power and provides three degrees of movement, and is built to be easily mounted into projects (an important factor when working with limited space) [1].

Haptic Feedback

The LilyPad Vibe Board [7] is a vibration motor specifically developed for use with wearable technology—it is durable, powerful, and compact. Requiring only two connections, power (5V) and ground, it is easily incorporated into the camera as a way to provide viewers with haptic feedback. The motor is capable of variable control, allowing for dynamically-updated interactions between user and system.

Microcontroller

An Arduino Nano microcontroller is used in this project, mostly due to its compact size, price point, and comparatively robust input and output capabilities.

Programming

The Arduino microcontroller is programmed with its eponymous software to facilitate the input of accelerometer data and the powering of the vibration motor. When measuring raw values from an

accelerometer, the signal-to-noise ratio can be an issue, which is addressed with the implementation of a low-pass filter. The weighting of such a filter requires some experimentation to balance accuracy with smoothing, but for the purposes of this project the *presence* of motion is more important than the precise angle of it, enabling the favoring of higher noise reduction at the cost of tilt-degree resolution.

Cycling 74's software environment Max/MSP/Jitter is used for the majority of the visual programming in this project, driving both the interpretation of the sensor information and the manipulation of the visual system.

Conclusion

the rest is construction combines relatively minimal and straightforward technologies with hand-crafted objects in order to produce an intimate, interactive experience that evokes the somatic and cognitive impact of anxiety. The viewer is encouraged to engage physically and emotionally with a world that lies on the other side of a white screen, one that only they can see. What they take from the stillness or the movement is unknown to the rest of the world.

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