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RESEARCH STATEMENT

Interactive textile wearable music controller created as a case study for using boundary objects in a transdisciplinary design process [17]

I am both a researcher and a designer with interests in both understanding and creating and facilitating others to be creative in collaboration. I have worked as a fashion designer, educator, and research scientist exploring the intersections of disciplines and cultures. As a designer my curiosity lies in the usability of technology, placing the human experience at the heart of the design process. As a researcher I study the human factors, preferences, and technical reasons for why some devices or methods of interaction function better than others.

I have published over **35 peer reviewed publications** in the subject areas of wearable technology and animal computer interaction garnering **over 1200 citations**. Acting as PI, Co-PI, or Co-Author I have received funding for **over 18 grants** including National Science Foundation and National Endowment for the Arts grants bringing in a total of **$2.67 million** for projects I have supervised in some capacity.

DESIGN AND RESEARCH METHODOLOGY

Trained as an industrial designer (BS, Georgia Tech) and as a fashion designer (MA, Domus Academy, Milan Italy) I employ an iterative design process. This affects both my design and research work. Being educated in programs focused on human centered design and human expression have instilled a care for the user (or wearer) beyond the simple function of an object in my research.

As a Principal Research Scientist and earlier as a doctoral student, I create and run usability studies to find out how well technology functions and also how well people can use technology. Aside from usability studies, I employ other methods such as semi-structured interviews, focus groups, and participatory design exercises to form robust understandings of not only how well people can use technology, but what they prefer.

WEARABLE TECHNOLOGY / ON-BODY INTERFACES / ELECTRONIC TEXTILES

While I am interested in the many aspects of Human Centered Computing, I have found a strong affinity to wearable technology. Wearable technology is at the intersection of so many domains and it affords the opportunity for both research and design innovation.

Much of my personal research including my Ph.D. work has focused on how to create and best use electronic textile on-body input interfaces. In an iterative cycle, I have moved from researching manufacturing techniques and human factors associated with textile interfaces to creating prototypes and observing the prototypes in use. I also use these prototypes in a collaborative participatory design process.

Perhaps the best way to understand my methodology is to follow the arc of one of my research projects. The Electronic Textile Interface Swatch Book ESwatchBook (Figure 1A) started as a small usability study on "Gropable Textiles" [8]. The research question in this initial study was to learn if raised embroidered textile interfaces were easier to use while walking than flat interfaces, and if multi-touch or single touch interfaces worked best. Here I was interested in gathering data and proving to myself quantitatively that the human factors surrounding using textile touch interfaces on the body functioned in the manner I assumed they would. We ran users on the system and looked at the data recorded by the technology to find out the difference in performance between each task.

The next evolution of this work was to use what we had learned to create a set of fabric swatches with touch interfaces. Here I am taking the quantitative information gained from user studies and using it to inform the design process of an artifact for people to interact with, touch, feel, and wear. We then authored another paper about the design process of creating the fabric interfaces and how well they worked (repeatability of use within a lab setting) [5, 19]. After the lab-based quantitative user study on usability and function, my focus moved to acceptability and perceived usefulness. Our research team took the ESwatchBook and conducted a series of workshops pairing fashion designers and computer scientists into teams to create projects using the ESwatchBook. Through observation, discussion, and surveys we tried to ascertain the experience and usefulness of having the ESwatchBook for a fashion/computer team trying to work on a wearable technology project [14]. This work moved into creating case-study opportunities for transdisciplinary groups to use the ESwatchbook and other boundary objects in a performance driven design process [2, 17].

As my research progressed in this area I began an endeavor to create other methods and boundary objects for designers and scientists to work together in the form of Wearable Technology Body Maps (Figure 1C) [12].

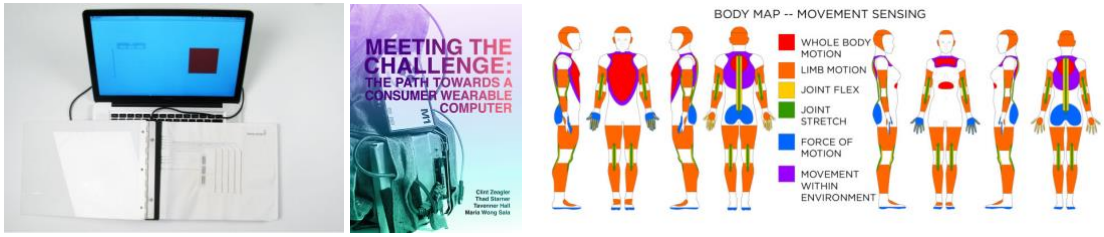

Figure 1. A. The Electronic Textile Interface Swatch Book [5]. B. Meeting The Challenge: The Path Towards A Consumer Wearable Computer, a free e-book [21]. C. Wearable Technology Body Maps [12].

My dissertation in Human Centered Computing from the Georgia Institute of Technology focuses on the former and is a quantitative user study returning to the concept of textile interactions on the go [11, 20]. The study of over 100 participants compared textile interfaces with different textures (including vibration) to determine which type of interface could be found and used more effectively without visual attention. This type of knowledge might be interesting to designers creating interactive garments, or possibly designers invested in creating more accessible versions of interactive textiles [16].

TRANSDICIPLINARY CREATIVE COLLABORATION

I am intrigued by transdisciplinary collaboration because of my diverse educational experience. Wearable technology projects often require teams with disparate skill sets, coming from disciplines with very different practices and cultures. Often the types of people drawn to work in these dissimilar careers are also diverse in other ways.

Bringing people from different backgrounds together (both disciplinarily and culturally) to work together on a project excites me. There is not only the opportunity for true innovation from the combination of such expertise, but it also affords me the opportunity to observe and create methods to better facilitate transdisciplinary collaboration. I have found the prescriptive use of boundary objects to be one successful method [2, 12, 17]. I am interested in continuing to create such boundary objects and researching their use in action towards aiding in inclusive transdisciplinary collaboration in true co-creative human centered design [4, 10, 13].

ANIMAL COMPUTER INTERACTION

While most of my work has been in the area of Human Computer Interaction and Wearable Technology, I have had a separate but similar research effort in Animal Computer Interaction. Using the same iterative design process and usability study methods, I have worked as design lead on projects that might be considered “animal centered design”.

The FIDO project or “Facilitating Interactions for Dogs with Occupations” explores how human centered design concepts and principles might be applied to creating interfaces for canines. This includes research into wearable technology interfaces for working dogs [6, 7, 15], usability aspects of touchscreen interfaces for assistance dogs [1, 9, 18, 22], and design methodology for working on canine centered computing [3]. The research has been rewarding, and not just because I have been working with pups. Allowing service dogs to better communicate their

trained knowledge to handlers and the people around them can be valuable in saving lives, especially when considering search and rescue, bomb detection, and disaster applications. I am interested in the ways dog interactions mimic human interactions when it comes to standard HCI laws (such as Fitts's Law). Knowledge like this can aid in the design of interfaces specifically tailored to animal interactions.

OUTREACH AND PROMOTION OF RESEARCH

Aside from academic research I also find it important to expose, translate, and share my research with the public. To this end I have authored a free e-book (Figure 1B) on the history and evolution of wearable technology [21]. I have also curated and designed four iterations of a traveling exhibition on the topic of wearable technology "On You: Wearing Technology". The exhibition was displayed at the Computer History Museum in Mountain View, the Deutches Museum in Munich, and the Museum of Design Atlanta among others reaching **over 50,000 visitors**.

Figure 2. On You: Wearing Technology exhibition, photo by Zane Cochran of dress from associated research [2].

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