

IAT 884 Tangible Computing: Prototype Proposal

Flex-n-Feel: Emotive Gloves for Long Distance Relationships

Research Problem

Physical separation between loved ones can create a feeling of dislocated and lost. It's essential for distance separated couples to support and maintain their relationship with a sense of connectedness to feel each other's presence. These couples tend to rely heavily on technologies such as video communication [9,10]. These are mostly limited to textual, verbal or visual mediums. This separation leads to an absence of the physical being of the partner in one's daily life, making them lose the opportunity of haptic experiences from affective touches [11]. Affective touch, like kisses, holding hands, hugs or close physical proximity are critical for physical and mental well-being [3]. They play a significant role in expressing an important part of intimacy that is better expressed through sensory evocations rather than linguistics. This is a serious problem in general as it strongly affects the intimacy and connectedness of the romantic relationship [11].

Research Goals

The goal of this research is to design and implement a sensory augmentation tool that communicates the sense of touch. Further with the help of a field study, we would determine if mediating affective touches can strengthen emotional closeness between long distance couples.

Domain

This work will derive from two major fields of human computer interaction (HCI) and interaction design. We have already seen tangible interaction research has gained visibility within the HCI community, showing promise to support activities such as learning, problem solving, and design. Successful tangible design depends on many factors including physical form, social settings, and aesthetics, in addition to well-designed software and electronics. This research will be based on two view points Data-centered view and Expressive-Movement-centered view [6]. The data-centered view explores different types of couplings and transversals between the digital information and the physical artifacts. While the expressive movement centered focuses on the design the interaction to create meaning through the interaction itself [6].

Related Work

With emerging protocols and channels for communication technologies, several remote communication tools like email, phone calls, online texts, audio and video chat are often adapted for facilitating and maintaining connections for LDRs, in spite of the fact that they were primarily meant for task-oriented communication and collaboration [need help]. As these tools cannot fully address the remote lovers' emotional needs and encourage intimate interactions, there are a growing number of attempts to develop affective technologies specifically for mediating intimacy. Gibbs et al. [4] introduced the term "Phatic Technologies" to describe these affective tools. With a focus on strengthening, establishing, and maintaining bonds. In the context of mediated intimacy, these technologies can be categorized into two groups: those which are mediating non-physical dimensions of the intimacy and those which are inspired by human physical intimate behaviors.

There have been various studies to focused on supporting partners in long distance relationships in the HCI research field. Prototypes have focused on interconnected physical or digital objects that users interact with to cause an effect on a remote partner's object. LumiTouch showed how people communicate with each other emotionally by tangible form [1]. Couples were able to hare simple messages through vibrators, color signals and thermal feedback by using Cubble [7]. These provide a basic level of awareness information mostly akin to knowing that a partner is thinking about you.

Prototypes have been designed for partners to feel physical interactions directly on their body. For example, a rings that vibrate on one's finger based on a partner's heart rate [12], interconnected beds to 'feel' one sleeping [2], hugs

over distance via inflatable vests [8], and gloves to experience holding hands [5]. Here it represents either explicit acts (e.g., touching or hugging) or implicit ones (e.g., heart rate, sleep patterns). Recently Apple watch introduced Digital touch feature to connect spontaneously with other Apple Watch wearers.

Motivation

The concept behind the sense of touch transmitted using a piece of wearable computing, opens up the possibility to sending emotional touches to a remote loved one. This will help reflect upon how the design concepts could be used for other interactive systems to facilitate a sense of touch. It will provide deeper consideration of paradigmatic approaches to interaction design in the arena of long distance relationship.

Research Question

What are the important characteristics of vibrotactile sensations in a wearable glove to strengthen the emotional closeness and intimacy between long distance couples?

Vibrotactile means a combination of touch and vibration. This research will examine what properties of vibrations can create a feeling of touch between long distance couples.

Nature of Prototype

The proposed device, called Flex-N-Feel, is a vibrotactile glove. The basic concept of the glove is to translate the flexing actions of fingers into vibrational sensations. This prototype will be based on the metaphor of resting hands as shown in Figure 1(Appendix 1) This will be isomorphic to their natural action of flexing fingers and touching their partner. The other remote partner would feel this effect as tickling of fingers on his/her skin, much like the physical touch. Flex-n-Feel is composed of two gloves. One of the glove will sense the flexions of fingers with the help of flex sensors placed on each finger. The other glove will receive these flex actions and covert them in to vibrational patterns on the top of the hand.

Flex-N-Feel will specifically focus on the amplitude, frequency, spatial, and temporal properties of vibration. The vibrations will be mapped to represent fingers. Each finger will be mapped to three spatial vibrations on the skin. We will use the temporal property to simulate a tickling effect of a finger on the skin i.e. the three tiny vibration motors would be vibrating in a sequence with some time delays which will be isomorphic to the tickling effect of finger. Figure2 (Appendix 1) depicts the touch-to-vibration mapping. We would adjust the amplitude and frequency for each finger's vibration to let the user perceive the differences between fingers.

The placement of sensors on the both the gloves will be very natural to our interaction of resting hands. The flex sensors (input) are located on the fingers to replicate the same action of touching someone. The actuators (output) would be located on top of hand (back of the palm), as this area gives the most contact surface on the hand and resembles one hand resting on top of other hand.

Validation Approach

Since emotional closeness is a subjective experience, the focus should be on qualitative results. The data should contribute to the meaningful qualities of the prototype. I plan to conduct a two-phase semi structured interview process (1) Understand the existing communication habits (2) Their experience of using the device.

In the beginning, each partner will be interviewed individually about their communication habits and how the currently used communication channels support emotional closeness. Next, Flex-N-Feel would be given to long distance couples to be used over a week, during which they would be free to use it as much and in any way they want to appropriate it. During this period, we would record quantitative data on by logging the time, duration, intensity of the feedback. After this week, we would conduct a semi-structured with the couples together to understand how it impacted emotional closeness.

Participants: All participants should be in a long distance relationship for at least 3 months. The study participants should consist of 6-8 couples (12-16 persons). The flex sensors would be given to half males and half females to remove any biases. The participants should not be informed about the device in advance; they should be only told that the study is about the topic remote-intimacy.

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