Affect Space: Semantics of Caress

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Abstract

This project focuses on the development of a language of interaction based on affect space and the semantics of caress. Affective computing is in nascent stages of development. In order for interactive systems to be genuinely intelligent, we must enable the development of interactivity that can recognize, understand, and even express non-rational states such as emotion or intention[1]. Emotional intelligence systems, [as distinct from artificial intelligence systems] suggest the development of qualitative models for data flow and data-architecture, the inclusion of models for navigation through liminal space [where boundary conditions are fuzzy, transparent, or fluid], and the development of languages of intimacy, gesture, and the extension of tactility. An initial focus of the work is the notion of 'tactics of caress'.

Keywords:
interface design, multi-modal device design, remote sensing, networked wearables, sensory extension, collaborative sensing environments, whole hand input

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Introduction

This project focuses on the development of a language of interaction based on affect space and the semantics of caress. In order for interactive systems to genuinely model intelligence, we must enable the development of interactivity that can recognize, understand, and even express non-rational states such as emotion or intention[2]. Emotional intelligence systems, [as distinct from artificial intelligence systems] suggest the development of qualitative models for data flow and data-architecture, the inclusion of models for navigation through liminal space [where boundary conditions are fuzzy, transparent, or fluid], and the development of languages of intimacy, gesture, and the extension of tactility. An initial focus of the work is the notion of 'tactics of caress'.

This project builds a suite of inter-related networked devices within a collaborative sensing environment. Initially we are prototyping several wearable or portable input and output devices to explore the 'affect space' and semantics of *caress* with the goal of developing a networked performance environment. Previous work in gestural languages generally focus on the pragmatics of interaction such as manipulation semantics (reference needed: MacKenzie, Mulder, McNeil.

Central to the creation of the suite of devices is the **gestural interface toolkit (GIT)**. The toolkit integrates input and output devices and networking necessary for encoding, transmitting and synthesizing caress. A key input technology we explore is the advanced optical fabric, 'Smart Fabric' being developed by Tactex Controls Inc. The Smart Fabric is based on Tactex's Multi-touch Controller (MTC) that measures hand movement space so that touch can be transformed and recognized qualitatively: a stroke can be differentiated from a caress, for example. While the movement space of a caress has meaning in the physical domain, it also has meaning in an emotional domain as well. We are working with Tactex 'Smart Fabric' to design a range of form factors for wearable or portable application of this technology. We also integrate more typical inputs such as trackers, data gloves and bio-sensors including heart-rate detection.

In the output domain, input 'affect data' such as gesture, caress or physiological data such as heart-rate can be transmitted to a remote location as 'gestural output'. An initial output prototype is a wearable 'hug' device which caresses the surface of the wearers body in response to input data

A central functional property of the Gestural Interface Toolkit (GIT) is the development of a prototype intention grammar. Gesture | Intentionality of the giver/sender can be recognized by analyzing the physical dimensions of input affect via caress and bio-sensor data. At 'the heart' of this project is the key notion that interface and device design can benefit from knowledge expressed within disciplines that incorporate experiential or body practice as a means to accessing and constructing knowledge. This knowledge

is codified and exists in the forms of specific technical methodologies within the fields such as somatics, theatre, dance, bio-kinesiology, and non-western physical forms such as butoh. The giver/sender communicates through a language of interaction based on 'tactics of caress' sensing environment, devices and intentional grammars. We investigate this phenomena in networked performances, interactive installations and other pragmatic applications described in section X.X.

Contemporary research in neuroscience and the cognitive sciences suggest that the sensori-motor systems of the body are inter-connected to such as degree that the body can be seen as a 'fluid' system, capable of re-configuring functionality.[Varela[3], Damasio[4]]. This metaphor of the body as fluid, re-configurable and networked provides the basis for the system design of our research. Various methodologies incorporating experiential body practice share the existence of definable processes based on the direction of attention in order to affect, alter or produce body state. Within Somatic disciplines, for example, retraining of perception through attention is produced through application of directed movement in the body [Sweigard[5], Benhke[6], Bartinieff[7], Cohen[8]]. The concept of 'repeatability' of body-states, suggests that through the direction of attention along with a definable set of procedures the body can be trained to access or construct specific body states. 'Tactics of caress' borrows from these physical metaphors notions of re-configurability, direction of attention, state-space and networked connectivity. Our multiple configurable and networked selves are the blueprint for devices, networks and collaborative sensing environments.

1.1 Language of Caress

To develop the language of caress we look both from a top down, affective perspective and a bottom up perspective looking at the semantics of whole hand input and body gesture.

The affective aspects of caress involve the relationship between the sender and receiver. The giver can touch the receiver. The *intent* of touch is critical to the sense of the caress. The giver may actively or passively caress with the intent to soothe, love, hurt, be sensuous etc. The intent with other caress gestures can be identified as well. These intentional gestures can be analysed to form a prototypical intentional grammar. Caress is an experiential phenomenon. As such, the exploration of the affective space provides directions artistically, technically and experimentally.

The pragmatics of gesture form the basis of a bottom-up approach to understanding caress. Whole hand gesture pragmatics can be classified into grasping, claying, chiseling [Mulder, 1998]. Other manipulation semantics can be found in [Kendon] [MacKenzie][MacNeil]. Defining whole body gesture pragmatics is one of the objects of this project, specifically with respect to caress.

1.2 Technologies for Caress

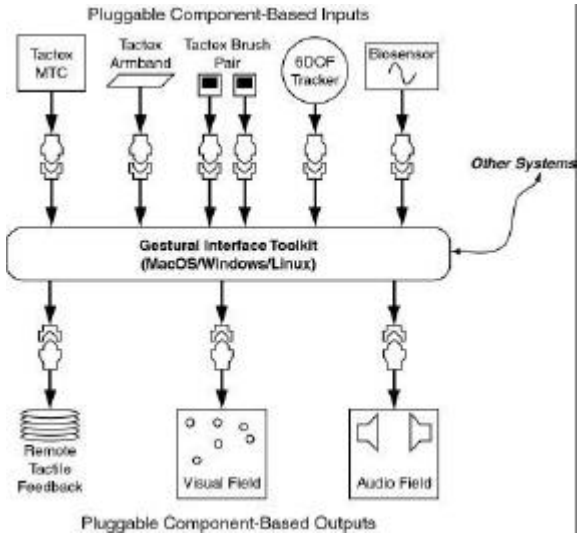

Figure 1

In order to realize a computer-supported networked language of interaction based on affect, intimacy, gesture and caress system, we consider four areas: input (incoming affect data), output (remote gestural feedback), network connectivity and signal processing (GIT - gestural interface toolkit). The basic structure of our architecture is shown in figure 1.

With incoming affect data, we are primarily concerned with capturing information artifacts that are often far less structured than is usually the case with computer-based

systems. Traditional input devices, such as keyboards and mice, do not reflect a range of modes of human interaction involved in a collaborative sensing environment where a 'caress' can be recognized as containing properties that reside in the physical, emotional, as well as intentional domains. From the technical standpoint we are currently looking at three categories of input sensors: pressure, biometric response and location/position sensors. Two devices of particular interest are a pressure surface known as 'smart fabric' (developed by Tactex Inc.) and bio-sensors. An initial stage in our blueprint project is to extend the form factor of the pressure sensitive pad in order to incorporate a wearable armband and portable hand-held brush-like devices. We will also integrate other sensors such as data gloves and trackers.

The data from the sensors are blended, transformed and interpreted by the GIT and delivered to the output space. We are using a wearable 'hug' device (in development), auditory and visual displays, including a CAVE, for affective rendering. Together, the whole system provides the affect space.

1.3Affective Space: Applications of Caress

One direction for using the affect space considers the elements of navigation from the literal, expressive and symbolic perspective. Touch and caress play an active role in our desire to navigate affective space. Sensing interaction with the pressure-sensitive pad, made wearable and hand-held, enables logical navigation through a virtual dynamic environment or space. The navigation may be: *literal*, as in current desktop and web applications, *expressive* as in on-line gaming, installation spaces, computer animation and choreography, or *symbolic*, as in applications requiring semiotic interpretation of caress. Symbolic navigation is a context dependent, context aware, and configurable navigation space.

As an example of expressive navigation we are using the pressure sensitive devices for navigational within in an immersive collaborative VR environment such as the CAVE. The visual representational field **is a fluid particle space composed of discrete particles set in motion, interacting with one another other through their own motion, and through the motion induced by the gestural interaction of the participants. This fluid particle field can be thought of as a 'verb' space, where the gesture of the participants is enacted through their input.** Gestures such as cupping, funneling, pushing, dispersing, molding, and collecting effect and 'enact' the visual particle field. A gestural taxonomy can be contructed based on a variety of gesture classifications modeled in movement theory and practice. **Possible responses are reverberating, bouncing, jostling and merging.**

1.4 Summary

By approaching the tactics of caress from a top-down and bottom-up perspective we are creating an ensemble of tools and work that explore the pragmatics and expressive possibilities of caress. At the bottom level we are creating a suite of software and hardware tools to encode, transmit and synthesize the elements of touch. At the middle level we are developing a language of caress that enables the interpretation of touch and affective sensing such as the bio-sensor data. The representation of touch in a language of caress accounts for intent. The development of the intentional grammar provides a foundation for the top-level of applications. We are actively developing three different works to explore the elements of caress and affective responses. Each of these works looks at the relationship between people. People caress each other to express meaning and emotion which is fundamental for communication. The tactics of caress project augments and enables communication of caress locally and remotely.

1.6 References

[1] **Picard, Rosalind** *Affective Computing*, **MIT Press, 1997**

[2] **Picard, Rosalind** *Affective Computing*, **MIT Press, 1997**

[3] Varela, F., *The Embodied Mind,* MIT Press 1991, *Ethical Know How* Stanford University Press 1999

[4] Damasio, A., *Descartes' Error*, 1994, *The Feeling of What Happens*1999

[5] Sweigard, L. *Human Movement Potential,* 1974

[6] Behnke, E., Matching, in *Bone, Breath and Gesture: Practices of Embodiment 1995*

[7] Bartinieff, I., *Body Movement, Coping with the Environment*, 1990

ɔhen, B., *Sensing, Feeling and Action: The Experiential Anatomy*, 1993