

Mobile Feelings –wireless communication of heartbeat and breath for mobile art

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Abstract

"Mobile Feelings" is a mobile art project where users can send and receive body data over a wireless communication network. Specially designed "Mobile Feelings" devices allow remote users to feel each others' heartbeat signals and breath over distance. The system explores novel forms of intuitive and non-verbal communications that go beyond the conventional transmission of voice, sounds and images used in standard mobile communication. "Mobile Feelings" enables intuitive bodily communication between remote users by exploring the emotional quality of touch and breath as some of the less explored communication senses.

1 - Background

Research in the field of "affective computing" concerns itself with analyzing human emotions by measuring physiological signals and extracting corresponding affective patterns. This is done for example through analyzing facial expression, gestures, voice modulations or a change in autonomic nervous system activity such as accelerated heart rate or increasing skin conductivity [1]. "Wearable Computing" [2] is one of the possible applications of effective computing and "Affective Jewelry" [3] can for example include low-cost biosensors into earrings, rings and even shoes to measure the wearer's emotional state. In 2001 France Telecom Studio Créatif developed the "Multimedia Scarf" [4] which contains a tactile screen, a telephone and a camera through which users can connect to the Internet to send video mail, videophone communication, listen to music or watch a film. All electronic part were hidden in the lining of the tissue. Other versions of smart cloths, called also CreateWear™ were recently introduced at the 3-GSM World Congress in Cannes [5].

Media artists have long explored the sense of touch for tele-virtual communication. In 1992 Norwegian media artist Stahl Stenslie and Kirk Woolford devised a "cyberSM" body suit that connected users in Paris and Cologne [6]. Users on these locations wore special "cyberSM" suits and by touching images of virtual bodies on a screen they could send the touch coordinates and its intensity to the remote user. As a result both users could perceive strong physical feedback including vibrations and shock onto their bodies, which created a strong sense of presence and connection between the remote users. In 1995 Japanese media artist Naoko Tosa et al. demonstrated a system called "Networked Neuro-Baby" where users between Tokyo and Los Angeles could remotely shake hands by squeezing a specially designed "Handshaking Device" that measured the handshake's pressure and relayed the position and pressure data to the remote user through a force-feedback interface [7]. In 1995 Australian media artists Stelarc devised a system called "Ping Body/Proto-Parasite," where on-line users could remotely control Stelarc's body which was connected to the Internet with various sensors, motors and actuators attached to his muscles and extremities [8].

2 - Conceptual Consideration

With the rapid advances in mobile communication technologies, ubiquitous computing, ad-hoc networks and wearable devices these fields have become full-fledged research areas. Most research applications in mobile communications and ubiquitous computing however concern themselves primarily with the transmission of image, voice and sound information.

Considering that human communication is not only based on conscious communication of information but often also includes unspoken, intuitive and sensual information exchanges, we set-out to construct wireless communication devices that let users communicate in a very intuitive, emotional and private fashion. The sense of touch still remains one of our most private sensation for

which we still lack a concise language to describe [9].

Another motivation for this project comes from the consideration that mobile phones have transformed our social and individual lives in such a radical fashion (as described by Sadie Plant [10]) that we all have become to accept a decreasing sense of privacy in exchange for connectivity and mobility.

To explore this relationship between privacy and ubiquity and connectivity, we created the “Mobile Feelings” project, which was first showed and published at the Ars Electronica 2003 in Linz, Austria [11].

3 - Mobile Feelings – Description

Research on “Mobile Feelings” started in 2001 as a collaborative project between the authors, the IAMAS Institute of Advanced Media Arts and Sciences and the France Telecom Studio Creatif. In 2001 a joined patent was applied.

3.1 – Mobile Feelings Devices

We constructed 6 egg-shaped “Mobile Feelings” devices (shown in Fig. 1) which each contain various sensors, actuators, micro-controllers, batteries and a wireless communication module.



Fig. 1 Two “Mobile Feelings” interface devices which enable users to wirelessly transmit and receive each others’ heartbeat and breath.

3.1.1 - Micro sensors, Actuators and Microcontrollers

Each of the “Mobile Feelings” devices hosts various miniature sensors, such as a pulse sensor, a touch sensor and a breath sensor as well as a micro-motor, a micro-ventilator, 2 white LEDs and a rechargeable battery. In addition, a 16 Mhz microcontroller, 3 pre-amplifiers and 1 amplifier are contained in each device as well.

3.1.2 - Wireless Communication Module

Each “Mobile Feelings” device also contains a Bluetooth module, which can either establish direct connections between the 6 devices in a range of 10 meters or communicate to a nearby Bluetooth-enabled device (such as a PC or PDA) which connects to the Internet or to a mobile phone network using a Bluetooth-capable phone.

This allows all 6 devices to wirelessly communicate to each other and send the information over the Internet or telephone network to remotely located users. An image of the complete “Mobile Feelings” device including sensor, actuators and communication module is shown in Figure 2.

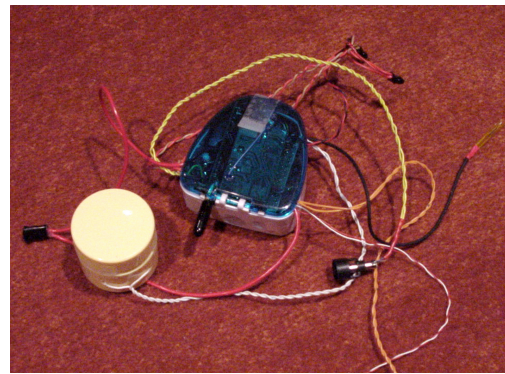


Fig. 2 “Mobile Feelings” interface device containing a pulse and a touch sensor, breath sensor, a micro-ventilator, a micro-motor (inside a yellow box), 2 LEDs, microcontrollers and a Bluetooth module (both inside the blue box). Size around 5 cm.

3.2 - Mobile Feelings Communication

As the user picks up one of the “Mobile Feelings” devices and places his/her finger on the pulse sensor on top of the egg-shaped interface, a LED light starts blinking: it shows the strength and frequency of the user’s own heartbeat. When the second remote user also holds a “Mobile Feelings” device, his/her pulse data are captured and visualized by the LED on his/her device as well.

3.2.1 – Communicating via heart beat

Each device holds a second LED, which also shows the heartbeat frequency and strength of the remote user. This provides both users with visually feedback about their own pulse and that of the remote user.

In addition to seeing their heartbeats via the blinking LEDs, both users feel a strong rhythmic pulsing in their palm, which

corresponds to the actual heartbeat of the remote user. This haptic sensation is created through an actuator consisting of a micro motor that moves a small piece of metal, creating the sensation of pulsing. No sound is generated from this motor, as the pulse rate frequency is fairly low.

The exact frequency and strength of the remote user's heartbeat is received via the wireless Bluetooth module at the devices' CPU, which relays this information to the actuator's movement. This results in an immediate haptic feedback of the remote user's heart beat and its frequency in the form of a rhythmic pulsing which varies from user to user depending on his/her heart beat and even emotional and physical state.

The communication speed between sending the pulse from one user and receiving the pulse as haptic feedback for the remote user is almost instantaneous, as the communication speed between the devices is around 38 KHz.

Both users can thus feel a strong sensation of bodily connection, which feels like "holding each other's heart in their hands" and feeling the other users heartbeat and its strength through these devices.

Figure 3 shows a snapshot of two remote users at the European Media Art Festival in Osnabrueck [12] where this system has been presented in 2004.



Fig. 3 Two remote users as they communicate with each other through their heartbeats.

3.2.2 – Communicating via breathing

In addition to sending and receiving heartbeat data, each "Mobile Feelings" device also hosts a breath sensor as well as a micro-ventilator. When a user breathes onto his/her device, the heat of his/her breath is captured and analysed and sent to the remote user's "Mobile Feelings" device. There, the breath data are transformed into a small wind that comes out

of the device through a small micro-ventilator. It instantaneously blows a small wind into the face of the remote user, creating an additional effect of bodily connection.

3.3 – User Evaluations and Observations

Users who communicated with each other through the "Mobile Feelings" devices described their experience as very unusual and slightly unsettling, as in real life one usually does not touch others much, let alone breath at them. Many users found the experience also to be very comforting and sensual, reminding them to touching a lover, a child, their mother or other persons with whom we usually share private feelings through touch.

Young users of opposite sex also reported that they found the devices to be good "flirting tools" as it lets them feel and touch each other without having to talk to each other.

Another observation we made during the exhibitions of the system [11, 12] was that when users concentrate on the sense of touch, they often reduce other sensory input channels such as vision and sound. It almost appears as if the sense of vision and sound is so predominant in our daily live interaction and communication, that we have to specifically focus on the sense of touch when we fully want to feel something as strong as another person's heartbeat. Gault describes touch as a very strong "break-in" sense: coetaneous sensations, especially if aroused in unusual patterns, are highly attention demanding [13].

Poupyrev et al. who explore the implications of using tactile feedback for mobile interfaces describes the sense of touch as having "a strong emotional impact. Running a finger into a splinter, touching a cat's fur, or immersing into some unknown sticky substance all bring intense, though very different, emotional responses. Touch is fast, needs little conscious control, allows for information encoding, and produces strong emotional responses." [14]

4 – Future Work and Applications

"Mobile Feelings" is an art project that explores novel forms of communication, which include sharing touch and breath over a mobile communication network. The resulting experience has proven to be very unique as it lets complete strangers share private body sensations over a mobile network. While the system clearly breaks the conventional boundaries between private and public space,

the potential of the system lies also in its strong emotional impact when used in special setting such as flirting or creating a bodily connection between remote users in a public setting.

A future application of this system could include personalized “Mobile Feelings” devices that can carry the heartbeat of loved ones whom one can “feel” when being alone or in stress. Similar research for stressed children has recently been presented [15], showing that the sense of touch will become a more valuable sense for future mobile communication. Further applications of our technology and idea could also include mobile network games as well as the expanding field of mobile and wireless art [16, 17].

Finally, our current research investigates how to capture and transmit further haptic sensations, such as materials and textures and also how to capture and relay olfactory information via mobile communication networks to create an even stronger connection and sense of presence between remote users.

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