Online Appendix to: All You Need is Love: Current Strategies of Mediating Intimate Relationships through Technology

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6th Sense

Awareness

6th sense is a light sculpture. Through telecommunication it responds to the remote fluid of electricity or water of another household. The original idea was to build on the family tree metaphor where each leaf is a representation of a remote family member or a friend.

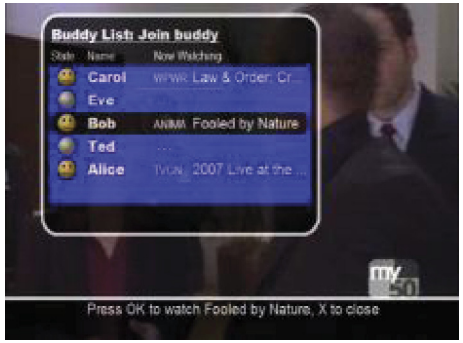
Tollmar, K. and Persson, J. 2002. Understanding remote presence. In *Proceedings of the 2nd Nordic Conference on Human-Computer Interaction (NordiCHI'02)*. ACM Press, 41–50.

Ambient Social TV 2

Awareness

Social TV 2 allows users to see which television shows other people are watching and send lightweight messages from within the TV viewing experience. This information can be viewed from an on<screen buddy list. The deployed system has two presence states: "watching TV" and "away". Users can change to the same program that their buddy is watching from the buddy list. Additionally, whenever the channel is changed, a list of buddies who are also watching that program is displayed as part of the transient channel information banner. Additionally, there is a primary ambient display, Ambient Orb, that is a color changing lamp from Ambient Devices 2 and configured it to display the current number of buddies watching television. Different colors are used to indicate whether one (blue), more than one (purple), or no other buddies (yellow) are currently watching TV. The orb is connected via serial cable to the prototype, and therefore has to be placed close to the TV. The Chumby3 is a WiFi enabled internet appliance with a 3.5' LCD color display which provides faster updates and more reliable wireless reception than the orb's pager based network alternative.

Harboe, G., Metcalf, C. J., Bentley, F., Tullio, J., Massey, N., and Romano, G. 2008. Ambient social tv. In *Proceeding of the 26th Annual CHI Conference on Human Factors in Computing Systems (CHI'08)*. ACM Press, 1–10.

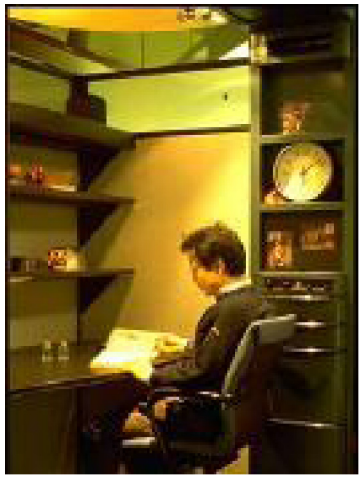


AmbientROOM

Awareness, Expressivity

AmbientROOM consists of a display that illustrates the activity of a remote partner by using a small, motorized physical icon. The phicon can be grasped by the user and pointed at the ceiling of the room. This action transfers the vibration to the motion of a solenoid in a shallow water tank. A lamp reflecting off of the water then produces rippling shadows on the ceiling. Another display that has electric field sensors are used to measure the amount of human movement in an atrium. This activity is represented by a pattern of illuminated patches projected onto an inner wall of the ambientROOM. A variant of AmbientROOM is the application Ghostly Presence. Varying levels of activity is expressed in the room by combinations of ambient light, sound, airflow, and water movement.

Ishii, H., Wisneski, C., Brave, S., et al. 1998. ambientROOM. In *Conference Summary on Human Factors in Computing Systems (CHI'98)*. ACM Press, 173–174.

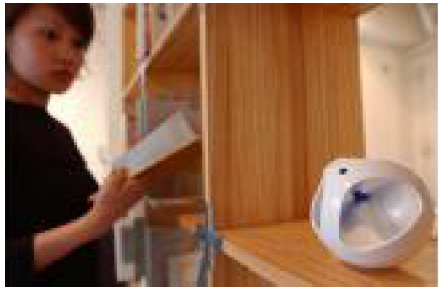


Anemo

Awareness

Anemo detects sounds within a room and transmits it to its counterpart's propeller to spin. As the sounds grow louder, anemo spins faster.

Ogawa, H., Ando, N., and Onodera, S. 2005. SmallConnection. In *Proceedings of the 13th Annual ACM International Conference on Multimedia (MULTIMEDIA'05)*. ACM Press, 1073–1074.



AROMA

Awareness

AROMA representations are constructed of mappings from combinations of (possibly processed) activity data to visual effects that all together make up an active image on a wall-display. The activity data stem from, among others, sound signals that are picked up by microphones, condensed into a crude measure of change and transmitted to the remote site; Two main concepts of activity has been explored so far, differing in perceived notion of the source of activity:

l Room activity, for instance, reporting levels of visual and/or auditory activity

l People presence, for instance, reporting activity as attributed to a certain number of people.

The latter requires additional sensor data and processing to allow us to distinguish between people and other "movable" objects (pets, curtains moving in the wind).

Pedersen, E. R. 1998. People presence or room activity supporting peripheral awareness over distance. In *Conference Summary on Human Factors in Computing Systems (CHI'98)*. ACM Press, 283–284.

AugmentedMirror

Awareness, Expressivity

The mirror is augmented with colored lights and physical icons to indicate the remote partner's presence. A number of red, green, and blue LEDs are attached to the mirror's frame and then covered with translucent paper. When the LEDs are lit, the paper helps to smooth and spread the color along the frame, rather than having light at a few discrete points. The frame glows green when the user's loved one comes online, red when offline and blue when idle. When a text message is sent by the loved one to the user, the LEDs are lit in succession creating a cycling color effect (lasting a few seconds). A simple electronic circuit receives the loved one's presence information from a networked computer connected to it and decides which LEDs to turn on and off.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Bed

Awareness, Expressivity

The head pillow consists of a body tracker, a microphone, and a pair of headphones. The body pillow contains an electric heating blanket and a subwoofer speaker in order to produce physical vibration. Along the bottom of the curtain there are fans. Onto each curtain there is a projection of colorful patterns generated by pumping of brightly colored liquid dyes into two thinly separated Plexiglas sheets. Also, the output device is backlit by a small spotlight. If one person starts moving around in the bed, the movement captured by the head pillow is communicated through an increase of the rate and intensity of the vibrations in the other's body pillow. When one partner says something, a computer analyzes the quality of the audio in terms of amplitude (softness/loudness) and transmits it to the remote location. Additionally, it is visualized through colors projected onto the curtains. The audio analyzer differentiates spoken conversation from airy noises (e.g., breathing) and only transmits airy noises to the fans which reconstruct this event remotely through blowing the other's curtains.

Dodge, C. 1997. The bed. In *Extended Abstracts on Human Factors in Computing Systems Looking to the Future (CHI'97)*. ACM Press, 371–372.

BuddyClock

Awareness

BuddyClock is designed as a basic, bedside alarm clock, with a time display, alarm setting, and "snooze button" features. The prototype is implemented using Python on a touch-screen Nokia N800 Internet Tablet. Each BuddyClock is connected to the others in its social network via wireless connection to a remote BuddyClock server, which shares real-time alarm status with others. The BuddyClock screen shows alarm status information for up to three other connected clocks. When the user changes the local alarm status (e.g., alarm on, snooze, alarm off), an icon on the display of the other BuddyClocks in the network is changed simultaneously to the corresponding status icon. Changes in a remote user status are also signaled by a quiet audio tone. When the user touches the icons, the clock displays detailed text information next to the name. When an icon representing the "asleep" status is displayed, the display shows the time that a user's wake-up alarm is set. When the "awake" status is shown, the clock displays the time that a user turned off the alarm. A single blue icon at the top left corner indicates a user's own sleeping status graphically so users can see how their own status is shown to others.

Kim, S., Kientz, J. A., Patel, S. N., and Abowd, G. D. 2008. Are you sleeping? In *Proceedings of the ACM Conference on Computer Supported Cooperative (CSCW'08)*. ACM Press, 619–628.

Chime

Awareness

A wind chime chimes at different frequencies to indicate the remote partner's presence status.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Coffee Aroma Generator

Awareness

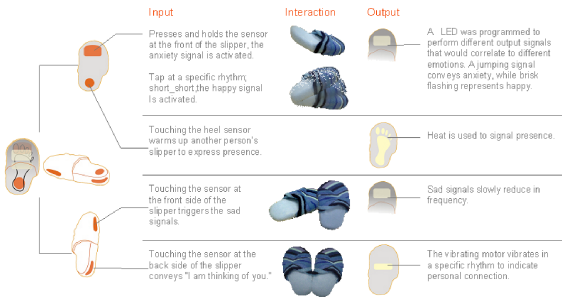
Meeting Pot system transmits coffee aroma to remote locations, wherever the coffee aroma generators are located, when someone uses the coffee maker.

Siio, I., Rowan, J., Mima, N., and Mynatt, E. 2003. Digital decor: Augmented everyday things. In *Graphics Interface 2003*. 159–166.

ComSlipper

Awareness, Expressivity

The concept consists of two pairs of slippers. The Comslipper provides warmth, light, and vibration as the output mechanism. When the sensor at the heal is touched, the paired slipper warms up. As soon as someone wears his/her pair, the remote pair warms up. When the wearer presses and holds the sensor at the front of the slipper, the anxiety signals appear on the side of the other person's slipper. When the person taps the slipper, it activates the happy signal. The expression of sad is the slowly drop down signals while the brisk flashings represent happy. Rubbing the slipper and touching the back, senor at the side of the slipper conveys, 'I am thinking of you'. The ComSlipper also vibrates in a specific rhythm to indicate personal connection.



Chen, C.-Y., Forlizzi, J., and Jennings, P. 2006. ComSlipper. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 369–374.

Curtain Intentional Presence Device

Awareness, Expressivity

The Curtain device is a small window places within a wooden picture frame on the wall. Users open up the curtain by pulling apart wooden shutters over the display, thus indicating their presence. Users are represented by faces superimposed on images of objects. The images float around the display in a slow and random motion. Users can pull the string hanging from the device to select from a range of objects to represent them locally and on remote devices.

Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.

Digital Family Portraits

Awareness, Memories

The picture frames reflect the person represented in the photograph that they surround. The frame illustrates the current activity of this person and his/her activity of the past.

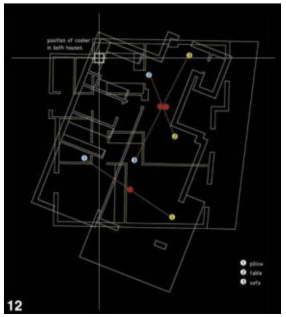
Mynatt, E. D., Rowan, J., Craighill, S., and Jacobs, A. 2001. Digital family portraits. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 333–340.

DigitalSelves

Awareness

The digital selves receive signals from sensors that are placed in household devices and furniture or even walls. Those sensors transmit signals when the device or furniture is in use. The object in the other person's house receives the signals and emits light accordingly to notify the inhabitant. The digital selves are located at the mid-distance between the connected household items. The object is meant to be a free standing object that stands on a vertical metal pole supported by a heavy base. The height of the object represents the height of the household items.

Grivas, K. 2006. Digital Selves: Devices for intimate communications between homes. In *Pers. Ubiquitous Comput. 10*, 2–3, 66–76.



Emotional Environments

Awareness

The concept of a coupled ambient environment network can sense people's physical movement in space and interpret their movement as emotions based on Faberg's emotion-movement framework. The perceived emotion is then used as communication input from the sender's environment to that of his/her loved one by affecting the receiver's physical environment through change of lighting, colors, music, and projected images.

Li, M. and Jianting, H. 2009. Ambient environments for emotional physical communication. In *Proceedings of the 10th International Conference NZ Chapter of the ACM's Special Interest Group on Human-Computer Interaction (CHINZ'09)*. ACM Press, 81–84.

Family Digital Assistant

Awareness

The Family Digital Assistant (FDA) acknowledges that shared mundane experiences are part of the intimate experience. Where a PDA is for personal purposes, a FDA coordinates family activities.

Kjeldskov, J., Gibbs, M., Vetere, F., et al. 2004. Using cultural probes to explore mediated intimacy. In *Australas. J. Inf. Syst. 11*, 2, 102–115.

Frame

Awareness

The Frame informs the partner whether the remote partner is at home or not. The receptor was to be put on a key ring or in a wallet and it would indicate whether a person is at home or not. The receptor transmits signals to the frame where a picture of the remote partner arises. As soon as the person leaves home, it will be dimmed.

Tollmar, K., Junestrand, S., and Torgny, O. 2000. Virtually living together. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'00)*. ACM Press, 83–91.

Habitat

Awareness

Objects are tagged with RFID tags. When one of the objects is placed on the coffee table, they are sensed by the tag reader, which uniquely identifies each object. The tag reader is polled regularly by the computer to check if any items have been added or removed. Such events cause messages to be sent to the coffee table in the remote partner's living space. The remote coffee table displays a corresponding representation of the opposite person's activity and their overall daily cycle on the surface of the table, using an appropriately mounted video projector. When items are removed, the displaying coffee table gradually fades away that representation.

Patel, D. and Agamanolis, S. 2003. Habitat: Awareness of life rhythms over a distance using networked furniture. In *Adjunct Proceedings of UbiComp 5th International Conference on Ubiquitous Computing*. 5–6.

Hover

Awareness

Hover acts as a low-cost, low-bandwidth that is used while talking on the phone. It provides visual awareness of remote persons in the form of an abstract physical representation with several affordances: a real-time indication of the level of physical activity of the remote person. It is connected to a computer and telephone or an Internet phone. The user places multicolored balls representing persons with whom she frequently communicates (e.g. family and friends) on a stand on the Hover platform. The user takes a ball representing the other person and puts it on the top of the ramp. The ball is sensed, then rolls down and stays at the foot of the ramp. The number is then dialed automatically. On the other person's end, the ball that represents the person who is calling starts floating when the call comes in. If this person wants to pick up the call, he/she grabs the ball and puts it on the ramp. The ball rolls across a sensor on the ramp, sending a signal to indicate that he/she answered the call. At the foot of the ramp, an air stream levitates the ball. As someone speaks, the other one sees the ball floating up and down in correspondence with the remote partner's movements.

Maynes-Aminzade, D., Tan, B.-K., Goulding, K., and Vaucelle, C. 2002. Hover. In *ACM SIGGRAPH Conference Abstracts and Applications (SIGGRAPH'02)*. ACM Press, 194.

InformationAppliance

Awareness

An augmented display of information such as thermometers or clocks that use color to reflect presence.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Intentional Presence Lampshade

Awareness

When both users indicate their presence, the lampshade becomes a collaborative decoration. Users choose the appearance of their own lampshade by selecting a solid color for the upper region and a foreground image for the lower region of the shade. This foreground image is the user's representation in the upper region on the remote user's lamp.

Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.

Keep in Touch

Awareness

Two interactive fabric touch screen project a shadowy and blurry image of the other site. When the partner walks towards to the fabric, the other partner sees a blurry silhouette of his/her partner. Once he/she touches his/her partner's blurred body, the image comes into focus revealing the partner's features. While not in active use, the interactive fabric surface shows a faint shadowy video of the other location.

Motamedi, N. 2007. The aesthetics of touch in interaction design. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 455–460.

Living Diary

Awareness

The device allows partners to share their schedule of the day's activities (e.g. working, studying and ferrying children). The device not only offers coordinated support for family routine, but allows activities to be annotated with distinctive symbols, sounds and images.

Howard, S., Vetere, F., Gibbs, M., et al. 2004. Mediating intimacy: Digital kisses and cut and paste hugs. In *Proceedings of the 18th British HCI Group Annual Conference on HCI (BCS-HCI'04)*. 45–48.

LumiTouch

Awareness, Expressivity

Lumitouch system consists of a pair of interactive picture frames which measure the distance of a person to the picture and transmit the distance as the brightness of an LED on the remote frame. People can also squeeze the sides of the picture frame. The squeeze pressures are transmitted as brightness of a particular color. The top three sides of the picture frame are mapped to different colored lights. The display varies depending on the squeeze attributes (where, how hard, and how long the user squeezed).

Chang, A., Resner, B., Koerner, B., Wang, X., and Ishii, H. 2001. LumiTouch. In *Extended Abstracts on Human Factors in Computing Systems (CHI'01)*. ACM Press, 313–314.

Motion Presence application

Awareness

Motion Presence application is an augmented phone book style application that allows close friends and family to view each other's current motion status ("moving" or "not moving") on their mobile phones.

Bentley, F. R. and Metcalf, C. J. 2007. Sharing motion information with close family and friends. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'07)*. ACM Press, 1361–1370.

musicbox

Awareness

musicbox is a tangible interface supporting remote awareness through the medium of music and light. The musicbox is linked over the internet to the music and light levels surrounding a remote piano. The system communicates live music and a sense of physical movement through a lighted wooden 'music box,' while also providing browsable access to music previously played by the device.

Ullmer, B. and Ishii, H. 1999. musicbox. A tangible Interface for Remote Presence and Browsable History. http://tangible.media.mit.edu/project/musicbox/.

PhotoDisplay

Awareness

A display contains a copy of a personal photograph where the background imagery is replaced with a translucent background that changes colors to reflect changes in presence status.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

PictureFrame

Awareness

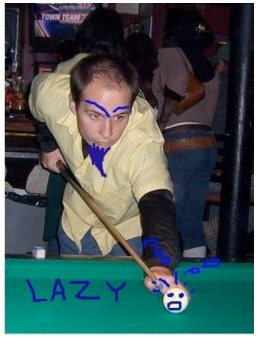
The device acts as picture frame that displays a physical icon to current presence of the remote partner.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Portal Frame

Awareness

The concept consists of a handheld and a frame. The mobile handheld tracks the remote user via GPS and offers a pre-programmed picture that is sent to the stationary handheld. The determination of image is done using machine learning techniques. If the image displayed is incorrect, the user can specify the correct image to be displayed. In addition to the picture, the remote device sends contextual information. This handheld operates as a model for the frame. The frame is connected to a server over the Internet that determines the appropriate image to display. The remote user can see the current image on the stationary device. The frame has a touch screen to enable the viewers to interact by sketching on the image. This user can write a short comment or annotate the picture and send it to the remote user. The sketch is displayed over the image upon which it was drawn but the remote user is not informed of the new sketch.



Bergstrom, T. and Karahalios, K. 2006. Communicating more than nothing. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 532–537.

Presence Light

Awareness

A pair of linked decorative objects that come in a variety of styles. The objects show activity from a remote location. If one light senses nearby sounds or movement it tells the other light in the other house to turn on. More activity makes the light brighter. A user's presence is communicated to others only if he/she explicitly activates the IPL device.

Concept that is later based on this idea: Intentional Presence Lampshade

Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.

PresenceStool

Awareness

Plastic stool that changes colors to reflect someone's online presence.

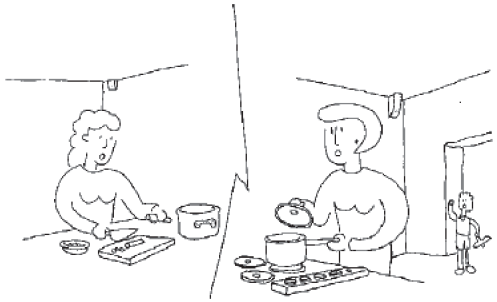
Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

ROOMLINK

Awareness, Joint Action

An "always on" connection that links two rooms in separate households using only high quality audio. User can hear everything that happens at the other location. Room Link doesn't tie up the phone line and has better quality audio than a speakerphone.

Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.



ScentsOfPresence

Awareness

Small toy can release different scents when a remote person's presence status changes.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Social Radio

Awareness

Social Radio enables an intimate group of persons to stay in touch with each other. Each user has several artifacts at home that represent a personal circle of friends. Each artifact represents one remote individual and displays awareness information about that person. The presence of a remote person is indicated using ambient light. In addition, an artifact communicates the mood of a remote user by replaying the music the person is currently listening to. When several artifacts are placed next to each other, the artifacts take turns in playing music. This guarantees that only one artifact of the group plays music at the same time.

Etter, R. and Röcker, C. 2007. A tangible user interface for multi-user awareness systems. In *Proceedings of the 1st International Conference on Tangible and Embedded Interaction (TEI'07)*. ACM Press, 11–12.

SoftAir Communication

Awareness

Sensors in the inflatable chairs detect weight and movements, which are then transmitted to a remotely located chair through light and sound.

Tollmar, K., Junestrand, S., and Torgny, O. 2000. Virtually living together. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'00)*. ACM Press, 83–91.

StatusGrid

Awareness

StatusGrid is a photo wall in a grid pattern with colored lights for each photo of a person indicating presence.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Stuffed Animal

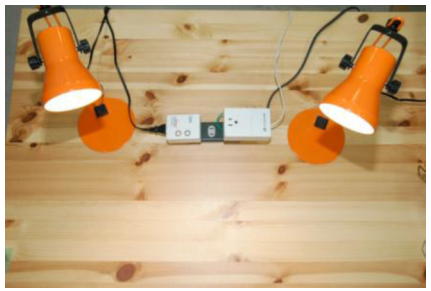
Awareness, Physicalness

A stuffed animal or pillow changes color or temperature and vibrates to reflect presence of a remote partner.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

SyncLamp

Awareness, Expressivity



The SyncLamp systems consist of a pair of PCs in each house and a Web server for the sharing of information. The SyncLamp system consists of a pair of lamps with X10 lamp modules, X10 controllers, PCs with X10 computer interfaces, and a Web server. When a person turns on the lamp with the X10 controller, a program on the computer intercepts the X10 signal via the X10 computer interface. Then, the program sends the event to a CGI program on the web server so that the information can be shared. Meanwhile, a PC program in the other person's house detects the event by polling the web server, and turns on the other lamp via the X10 computer interface. Thus, controlling the brightness of one lamp, the partner's lamp also changes to the same brightness.

Tsujita, H., Siio, I., and Tsukada, K. 2007. SyncDecor. In *Extended Abstracts on Human Factors in Computing Systems (CHI'07)*. ACM Press, 2699–2704.

SyncSky

Awareness

SyncSky includes a pair of Web cameras and projectors. The camera is attached to the wall beside the window of a room to capture the sky and the scenery around the window. The projector of the remote partner displays the captured image on the ceiling of the other person's room.

Tsujita, H., Siio, I., and Tsukada, K. 2007. SyncDecor. In *Extended Abstracts on Human Factors in Computing Systems (CHI'07)*. ACM Press, 2699–2704.

SyncTrash

Awareness, Expressivity

The SyncTrash system consists of a pair of trash boxes with servo motors, pushon foot switches, PCs, and a Web server. The servo motor is equipped at the side of a trash box for opening/closing the lid, and is connected to a computer with a PhidgetServo device. The foot switch is also connected to the computer with a Phidget Interface Kit. When a person presses the foot switch, a program on the PC opens the lid of the trash box by activating the servo motor. Next, the program sends the state of the trash box (open/close) to a CGI program on the web server. Then, the PC program in the other house detects the state by polling the web server, and opens the trash box in the same way. Thus, once a person opens the lid of his/her trash box, the lid of the other distant trash box opens as well.

Tsujita, H., Siio, I., and Tsukada, K. 2007. SyncDecor. In *Extended Abstracts on Human Factors in Computing Systems (CHI'07)*. ACM Press, 2699–2704.

Tangible/Virtual MissU

Awareness, Expressivity

Tangible MissU (Mini interactive shared sound Unit) consists of a tangible ambient sound device and a shared music playlist. Users can listen to the current song, add songs to the playlist, reorder songs in the playlist, and browse the playlist history. Additionally, they can listen to the background sounds of the remote partner's environment. Each partner has one MissU device in their home, to share sounds in a certain area such as the bedroom. Each partner is represented by a color. On one partner's device moving the green slider controls the volume of his outgoing sounds and moving the blue slider controls the other partner's incoming sounds. One partner's own ambient sounds are captured via a microphone and shown as the luminosity of a green LED. Both partners can move the green slider to the edge of the device to restrict his outgoing sounds, thus dimming the LED. Moving it towards the center maximizes the outgoing signal. If one partner needs quiet, he can lower sounds from the remote partner's environment by moving the blue slider to the edge of MissU. However, the blue LED still shows the absolute volume of the sounds in the other partner's environment. Virtual MissU is a flash application that streams ambient sounds and music from a joint music playlist. Partners navigate to the MissU URLs using a regular browser. Each partner's sounds are represented by a colored sphere, which can be manipulated directly in the same way as the tangible sliders. Virtual MissU was designed for the home. Another variant Simulated MissU is designed for mobile situations.

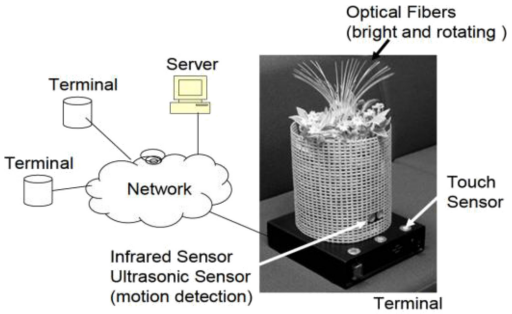
Lottridge, D., Masson, N., and Mackay, W. 2009. Sharing empty moments. In *Proceedings of the 27th International Conference on Human Factors in Computing Systems (CHI'09)*. ACM Press, 2329–2338.

Tsunagari/Family Planter

Awareness, Expressivity

The terminal is connected to other terminals via a server. The terminal's infrared and ultrasonic sensors detect a person's presence and motion. The detected cue information (the presence and motion) is transmitted to a predesignated terminal via the server. The terminal at the receiver side presents the received information. Optical fibers at the top of the terminal will gleam to indicate the remote human presence and will rotate to indicate the remote human motion. The terminal also has three touch sensors. Touching a terminal causes the receiver's terminal to emit three kinds of sound.

Itoh, Y., Miyajima, A., and Watanabe, T. 2002. 'TSUNAGARI' communication. In *Extended Abstracts on Human Factors in Computing Systems (CHI'02)*. ACM Press, 810–811.



FamilyPlanter system

TxtBoard

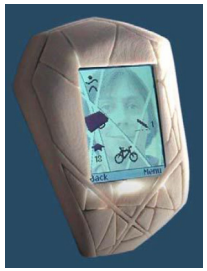
Awareness

TxtBoard consists of an 8-inch touch screen display connected to a dedicated mobile phone via Bluetooth. The mobile phone was hidden within the casing of the device. Messages sent to the phone are displayed on the larger display.

O'Hara, K., Harper, R., Unger, A., Wilkes, J., Sharpe, B., and Jansen, M. 2005. TxtBoard. In *Extended Abstracts on Human Factors in Computing Systems (CHI'05)*. ACM Press, 1705–1708.

Watchme

Awareness

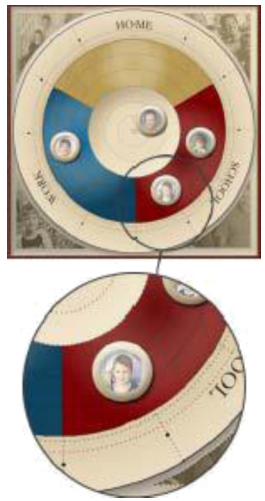


WatchMe is a personal communicator with context awareness in a wristwatch form; it is meant to keep intimate friends and family always connected via awareness cues and text, voice instant message, or synchronous voice connectivity. Sensors worn with the watch track location (via GPS), acceleration, and speech activity; this is classified and conveyed to the other party, where it appears in iconic form on the watch face. When a remote person with whom this information is shared examines it, their face appears on the watch of the person being checked on. The working prototype was used as the focus of interviews to gauge the desirability of such a device.

Marmasse, N., Schmandt, C., and Spectre, D. 2004. WatchMe: Communication and awareness between members of a closely-knit group. In *Proceedings of the International Conference on Ubiquitous Computing (UbiComp'04)*. Springer, 214–231.

Whereabouts Clock

Awareness



The Whereabouts Clock works by using cell phone data. When a family member's cell phone is on, it automatically transmits SMS messages to the device when that person moves from one registered zone (such as 'home') into another registered zone (such as 'school'). Registering these zones only needs to be done once for each zone when the software is first installed. Thereafter, users need do nothing except switch on their phones. If they do not wish to be shown on the clock, they simply switch the application off. Additionally, users are given the option of texting in more specific information about their activities in each zone. So, for example, if a person is 'out' but shopping, they can text 'shopping' and the text will appear under the person's icon on the Clock.

Sellen, A., Eardley, R., Izadi, S., and Harper, R. 2006. The whereabouts clock. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 1307–1312.

Air

Awareness, Expressivity

The device consists of two sets of blue and red lamps connected over a network. One person controls the blue lamp and the other, the red lamp. When a colored lamp is turned on at one end, the same color lamp on the other end is also turned on.

Ogawa, H., Ando, N., and Onodera, S. 2005. SmallConnection. In *Proceedings of the 13th Annual ACM International Conference on Multimedia (MULTIMEDIA'05)*. ACM Press, 1073–1074.

Contextual Photo-Display

Awareness

Digital photos are displayed according to specific contextual factors or emotional status.

Jung, H. and Connelly, K. 2007. Exploring design concepts for sharing experiences through digital photography. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 313–327.

RotatingLights

Awareness, Expressivity

A floor lamp with multiple bulbs flashes in different patterns to reflect a remote partner's status.

Dey, A. K. and de Guzman, E. 2006. From awareness to connectedness. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'06)*. ACM Press, 899–908.

Rüüg

Awareness, Joint Action

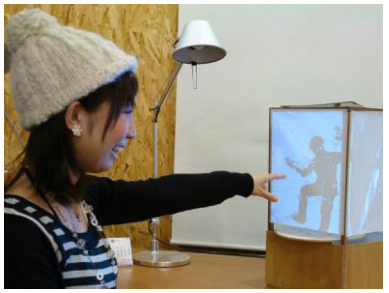
Rüüg pile is heat-sensitive and changes color when it warms. When one friend walks, sits, or writes on their Rüüg, data from pressure sensors in the Rüüg is sent through a wireless internet connection to its Rüügmate. The grid of pixels underneath the Rüügmate's Rüüg heat up the colorsensitive dye, radiating warmth and creating colorful representations of footprints, body prints, or writing in the Rüüg's plush pile.

Thompson, A., Friedland, A., and Cargiuolo, J. 2005. Rüüg. In *Extended Abstracts on Human Factors in Computing Systems (CHI'05)*. ACM Press, 1829–1832.

Teleshadow

Awareness, Expressivity

The device has the traditional form of a Japanese lamp. The front side is a screen and able to reflect the shadow with the projector and the mirror which are inside of the lamp. The front screen has a touch-panel behind the Japanese paper. Also, it consists of a turntable and a camera in order to take the shadow. To see friend's shadow, the user connects his/her id card with the turntable and rotates it to select his/her friends. By touching the shadow, user can talk with friends.



Yasuda, S., Hashimoto, S., Koizumi, M., and Okude, N. 2007. Teleshadow: Feeling presence in private spaces. In *ACM SIGGRAPH 2007 Sketches Article*. 15.

eMoto

Awareness, Gift Giving

eMoto lets users send text messages between mobile phones, but in addition to text, the messages also have colorful and animated shapes in the background. The user writes the text-message and then chooses which expression to have in the background from a big palette of expressions mapped on a circle. The expressions are designed to convey emotional content along two axes: arousal and valence. For example, aggressive expressions have high arousal and negative valence and are portrayed as sharp, edgy shapes, in strong red colors, with quick sharp animated movements. To move around in the circle the user has to perform set of gestures using the stylus pen (that comes with some mobile phones) that the authors extended with sensors that could pick up on pressure and shaking movements. The pressure and shaking movements can act as a basis for most emotional gestures people do, a basis that allows users to build their own gestures on top of these general characteristics.

Höök, K., Ståhl, A., Sundström, P., and Laaksolaahti, J. 2008. Interactional empowerment. In *Proceedings of the 26th Annual SIGCHI Conference on Human Factors in Computing Systems (CHI'08)*. ACM Press, 647–656.

Long-term Planner Coordination watch

Awareness, Memories

The long-term planner is a large display that visualizes entangled family schedules and provides shared tangible interaction when scheduling new appointments; the coordination watch is a mobile device that allows distributed haptic interaction when changing appointments. At home, the family uses the long-term planner for fitting new appointments in the shared family routines. In mobile situations, the personal coordination watches are used for ad-hoc fine-tuning of previously made appointments.

Hoefnagels, S., Geelhoed, E., Stappers, P. J., Hoeben, A., and van der Lugt, R. 2004. Friction in scheduling and coordinating lives of families. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'04)*. ACM Press, 321–324.

Our Day

Awareness, Memories

A touch screen device is used as a shared representation of a couple's day. It allows users to share schedules and highlights overlapping time. Partners can communicate by associating photos and audio messages with calendar events.

King, S. and Forlizzi, J. 2007. Slow messaging. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 451–454.

Photoframe

Awareness, Gift Giving

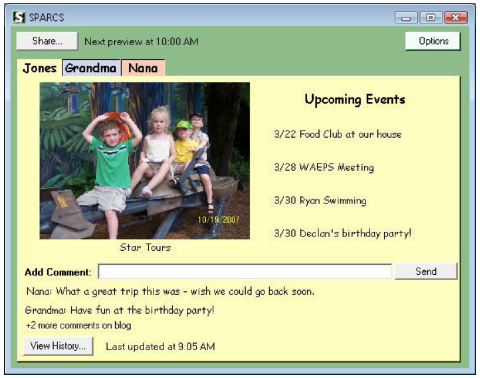
The photo frame takes spontaneously pictures and sends it to the remote picture frame. The photo frame displays the most recent one and from two hours ago. Also, it can display one favorite picture selected by the user. Keeping looking on it, the photo frame recognized the explicit action and displayed an icon to indicate this. Meanwhile, the remote frame begins to flash and sound an alert. If the user is busy and just glances on it, the frame spots the glance, silences the alert, and displays an icon on the partner's frame to indicate that the call had been declined.

Hemmeryckx-Deleersnijder, B. and Thorne, J. M. 2008. Awareness and conversational context-sharing to enrich TV-based communication. *Comput. Entertainment 6*, 1, 1–13.

SPARCS

Awareness, Memories

SPARCS encourages frequent sharing of photos and calendar information between extended families.



Brush, A. J. B., Inkpen, K. M., and Tee, K. 2008. SPARCS. In *Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCW'08)*. ACM Press, 629–638.

VibroBod

Awareness

VibroBod's rubber body contains force-sensitive resistors and microphones. It captures hand position, pressure, and vocalizations. VibroBods rest on the laps of individuals having personal conversations via phone, chat or instant messaging. VibroBod has various finger holds to afford different gestural positions which correspond with different emotional states; more anxious finger grips, for example, are deep holes set so that both hands and individual fingers are contracted close together, whereas relaxed finger grips accommodate arms and hands much further apart in more restful positions. The force of a user's grip produces different pressures on three sensitive resistors, which, combined with vocal inputs, affect different frequencies and vibration patterns inducing distinct psychological states. The VibroBod grows warmer with use.

Dobson, K., Boyd, D., Ju, W., Donath, J., and Ishii, H. 2001. Creating visceral personal and social interactions in mediated spaces. In *Extended Abstracts on Human Factors in Computing Systems (CHI'01)*. ACM Press, 151–152.

CASY

Expressivity

Contextual Asynchronous System (CASY) is a system that uses audio and video messaging, asynchronous communication and context-based delivery. CASY enables family members to send "good morning" and "good night" asynchronous video snippets into a shared family database. The recipient then views the snippets when going to sleep or waking up.

Zuckerman, O. and Maes, P. 2005. CASY: Awareness System for Children in Distributed Families. In *Proceedings of the Conference on Interaction Design and Children (IDC'05)*. ACM Press.

GustBowl

Expressivity

The Gustbowl contains a motion sensor, a digital camera, an electric motor, and a semi-transparent display. Linked in pairs by a telephone or Internet connection, each Gustbowl repeats the movement of the other bowl. As soon as some items are thrown in, the gustbowl of the remote partner begins to wobble. When the wobbling stops, a picture appears dynamically, showing the content of the paired bowl. This picture fades out gradually, indicating the time since the bowl was last touched. After a while it disappears without a trace.

van der Hoog, W., Keller, I., and Stappers, P. J. 2004. Gustbowl. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 775–776.

Hermes@Home

Expressivity

The Hermes@Home system is a hardware and software solution that effectively supports two classes of user: the person(s) at home and the person(s) away from home. Hermes@Home system supports awareness through messaging between members of a home. Person away from the home can send messages via a web portal to an always on information appliance–style display situated in the home, while people at home can scribble messages on the touch sensitive display of this unit for reception by the person(s) away from the home. The home unit is also equipped with a webcam, which users can place around the home and is set to take regular pictures. The away user interface is accessible online via a Web Portal. The graphical user interface (GUI) functionality is split in two parts. The left half of the display is used to display, cycle through and acknowledge received messages. The right half provides a large area on which users can scribble notes and send with the tap of a button. The current home unit is a Fujitsu Siemens Lifebook TabletPC with a touch sensitive display which (unusually for such displays) enables the user to use either a stylus or their finger.

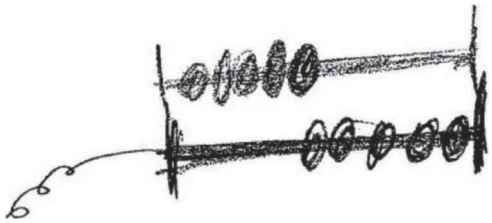
Saslis-Lagoudakis, G., Cheverst, K., Dix, A., Fitton, D., and Rouncefield, M. 2006. Hermes@Home. In *Proceedings of the 20th Conference of the Computer-Human Interaction Special Interest Group (CHISIG) of Australia on Computer-Human Interaction: Design: Activities, Artefacts and Environments (OZCHI'06)*. ACM Press, 23–30.

How do I love thee

Expressivity

How do I love thee is a pair of abacus that are synchronized over the internet. Changes in one abacus are transmitted to the remote abacus and displayed.

Kaye, J. 'Jofish' and Goulding, L. 2004. Intimate objects. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'04)*. ACM Press, 341–344.



MessageProbe

Expressivity

The messageProbe is a simple application that enables members of a distributed family to communicate using digital Post-It notes in a zoomable space. It can function synchronously, with two or more family members writing and drawing from different locations at the same time, or synchronously, with family members checking it periodically for new messages from other households. There is no mouse or keyboard – just a writable LCD tablet and pen.

Hutchinson, H., Hansen, H., Roussel, N., et al. 2003. In *Technology Probes*. ACM Press, New York, NY.

SyncAroma

Expressivity

SyncAroma is a system for synchronizing smells between users and to transmit the partner's feeling and state.

Tsujita, H., Tsukada, K., and Siio, I. 2008. SyncDecor. In *Proceedings of the Working Conference on Advanced Visual Interfaces (AVI'08)*. ACM Press, 449–453.

Tree-lamp

Expressivity

The tree-lamp is a wall mounted modular tree of lights, which enables the user to map the relations between people. When the user touches a certain part of the tree, the corresponding person will be notified that the user has been thinking about them.

Tollmar, K. and Persson, J. 2002. Understanding remote presence. In *Proceedings of the 2nd Nordic Conference on Human-Computer Interaction (NordiCHI'02)*. ACM Press, 41–50.

VideoProbe

Expressivity

The videoProbe provides a simple method of sharing impromptu images among family members living in different households. Using a video camera that takes a snapshot when the image it captures becomes steady for approximately three seconds. The images are stored and made available to anyone else in the network. Family members can browse the images with a remote control. Images fade over time and eventually disappear, to encourage families to create new ones.

Hutchinson, H., Hansen, H., Roussel, N., et al. 2003. In *Technology Probes*. ACM Press, New York, NY.

Ambient Photo-Frame

Expressivity

The color of digital photo frame change according to the counts of viewing or downloading in relation with photo-sharing Web sites.

Jung, H. and Connelly, K. 2007. Exploring design concepts for sharing experiences through digital photography. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 313–327.

Applause Light

Expressivity, Awareness

The light color changes according to the number of pressing button in a particular time length, taking a metaphor of temperature. When the number of pressing increases, the light color changes to bright red. Whereas if the number of pressing button decreases, the light color is gradually changing to dark blue according to the time, which means 'cool down.'

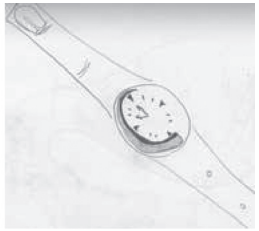
Suzuki, K. and Hashimoto, S. 2004. Feellight. In *Proceedings of the ACM SIGMM Workshop on Effective Telepresence (ETP'04)*. ACM Press, 40–44.

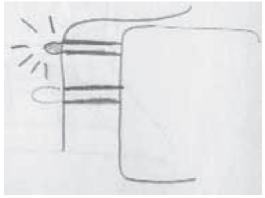
CanCan

Expressivity

CanCan is a button that is added to ordinary objects (e.g., wrist watch). It corresponds to the meaning "can't be there for you right now." The depression of the button leads to notification light at the partner's end either on a computer terminal, a phone or a watch.

Bhandari, S. and Bardzell, S. 2008. Bridging gaps. In *Proceedings of the 26th Annual CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI'08)*. ACM Press, 2763–2768.

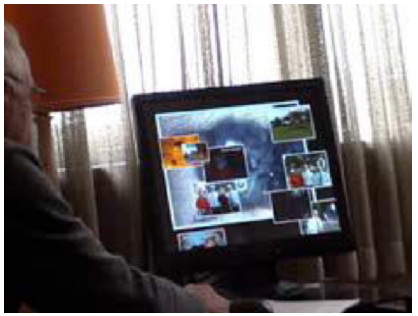




Collage

Expressivity

Users send a MMS to an e-mail address. Image attachments and body text are then extracted and sent to the Collage system in order to be displayed on a picture frame in different households. All Collage systems receive the same content in the same order. If someone manipulated content in one household, this would be reflected in all of the displays in real-time. The appearance of images and text on the touch screen is initially disassociated from each other and each placed in a pseudo-random sequence. The images and text flow down the screen, repeating a display cycle after some time. This period of repetition is dependent on the amount of content in the system. The display algorithm varies the size and speed at which content displayed according to its age. Older content appears smaller and flows down the screen at a higher rate, hence appearing as if it is shrinking away to the background over time. Content can be manipulated by users on the touch screen in the following ways: Single Image Focus, Enlarging Multiple Images, Manipulation of Flow, and Deletion.

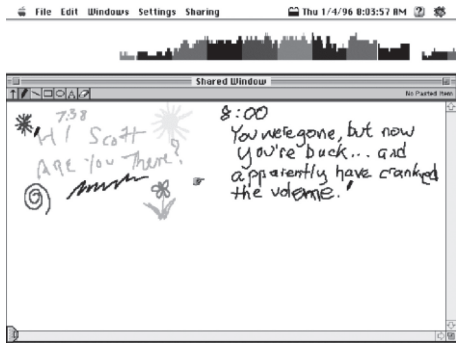


Ashkanasy, S., Benda, P., and Vetere, F. 2007. Happy coincidences in designing for social connectedness and play through opportunistic image capture. In *Proceedings of the Conference on Designing for User eXperiences (DUX'07)*. ACM Press, 2–17.

CommuteBoard

Expressivity

CommuteBoard replaces phone calls with quick handwritten messages on a shared whiteboard. The whiteboard was supplemented by an activity sensor that visually showed the general noise level at the remote location. This audiobased activity sensor indicated whether the remote household was awake.

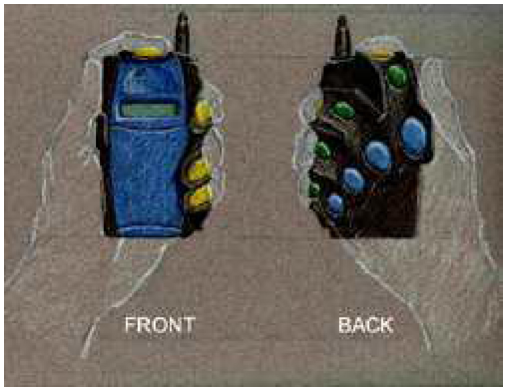


Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.

ComTouch

Expressivity

ComTouch is a digitally augmented mobile phone concept, where a vibrotactile mapping is added. The mobile phone has extra buttons on the side and back which support the mapping. Pressure sensors are used under each finger, to allow people a way to squeeze the phone. The touch pressure under each finger is mapped to vibration intensity. ComTouch is a vibrotactile device sleeve that fits over the back of a mobile phone. The basic concept is a handheld device that translates finger pressure into vibration. The devices are bi-directional and both users can send and receive signals simultaneously. The input is located on the fingertips and the output, vibrations, is located on the middle and base of the finger.



Chang, A., O'Modhrain, S., Jacob, R., Gunther, E., and Ishii, H. 2002. ComTouch. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'02)*. ACM Press, 312–320.

Constant Touch

Expressivity, Awareness

Constant Touch is similar to a walkie-talkie or push-to-talk device that provides an open channel for constant updating throughout the day. It contains a single point transducer (such as a light) that is activated when one wants to say, "I'm thinking of you." The form is configurable to suggest a physical presence as if "She is with me all the time."

Kjeldskov, J., Gibbs, M., Vetere, F., et al. 2004. Using cultural probes to explore mediated intimacy. In *Australas. J. Inf. Syst. 11*, 2, 102–115.

Cube

Expressivity

The Cube consists of a virtual three-dimensional cube where couples can leave symbolic messages. Each of the six sides of the cube contains nine squares and users can compose messages to each other by selecting and placing graphical symbols on the squares from a shared set of symbols. Users can also design new symbols to develop their own code language.

Garnæs, K., Grünberger, O., Kjeldskov, J., and Skov, M. B. 2007. Designing technologies for presence-in-absence: Illustrating the Cube and the Picture Frame. In *Pers. Ubiquitous Comput. 11*, 5, 403–408.

Digital Kiss

Expressivity, Gift Giving

A device, smaller than a phone, communicates in symbols that have been handwritten and programmed. To send the message the user places his/her lips onto the screen in a kiss. The machine scans her lips with dimension and depth.

Howard, S., Vetere, F., Gibbs, M., et al. 2004. Mediating Intimacy: Digital Kisses and Cut and Paste Hugs. In *Proceedings of the 18th British HCI Group Annual Conference on HCI (BCS-HCI'04)*. 45–48.

eKISS

Expressivity, Memories

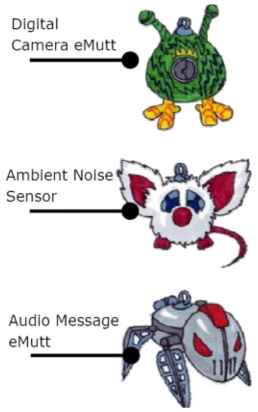
eKISS is a mobile picture blog that consists of a website that illustrates pictures and texts. eKISS is fed with pictures from users who use their regular camera phones to take pictures. Additionally, text comments can be added to the pictures. The pictures are then sent from the phone as an MMS that are automatically shown on a blog (moblog.tv2.dk). The page displays the four latest pictures sent to the system along with date and time they are sent. The most recent picture is displayed in large, while the rest is smaller. By clicking on one of the small pictures, a popup window will display the picture in its original size. There is also a link to a second page which displays all previously sent pictures in chronologic order.

Dalsgaard, T., Skov, M. B., and Thomassen, B. R. 2007. eKISS: Sharing experiences in families through a picture blog. In *Proceedings of the 21st British HCI Group Annual Conference on People and Computers*. 67–75.

eMutts

Expressivity

eMutts consists of a series of toys and sensors that children can carry these as key-chains. Some are passive sensors that record data: pedometer, ambientnoise sensor, GPS, etc. Other eMutts require explicit interactions from the child: stress ball which records pressure throughout the day, voice recorder, digital camera. The child selects one or two toys to carry. When the child docks the toys at the end of the day, it will upload the data on a computer and send it to the parent.

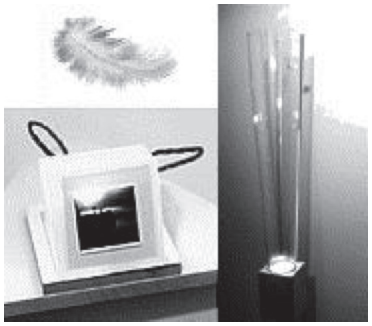


Yarosh, S. 2008. Supporting parent-child interaction in divorced families. In *Proceedings of the 7th International Conference on Interaction Design and Children (IDC'08)*. ACM Press, 33–36.

Feather

Expressivity

The traveler carries a picture frame that allows him/her to send a signal to the other object. In one version, this involves turning over the object, which otherwise sits picture-side down whereas in another version, the object encourages lifting to view the image. By holding the object a circuit between the two halves of the unit is closed and a signal to the other object is sent. The other object contains a small and quiet electric fan in its base, and a single feather that rests on an unobtrusive grill above it. When triggered by the absent partner holding the picture frame, the fan starts, wafting the feather into the air. The drifting feather is constrained by a clear, cone-shaped plastic enclosure extending from the base.



Strong, R. and Gaver, W. 1996. Feather, scent & shaker: Supporting simple intimacy in videos. In *Extended Proceedings of CSCW*. ACM Press, 29–30.

FeelLight

Expressivity, Awareness

The concept consists of two I/O devices which are always on-connected. The device contains a full-color LED, a buzzer, a switch and a LSI chip. The device connected to the network terminal device obtains a user's button-pressing action by the button switch, and changes the color of the embedded light. The signal of switch whether the button is pressed or not is transmitted to the other side of the line, and causes the color change of the light of the other side of the line. The color of light is coincided with each other. Users can get intent from the other user in real time by changes of color of luminous light. In addition, as the color of light preserved until the next change, the light plays a role of a memory. The light simply changes on a periodic basis of four colors; red, yellow, green and blue. By pressing the button with each other, a variety of communication has been achieved by the changes of color of light.

Suzuki, K. and Hashimoto, S. 2004. Feellight. In *Proceedings of the ACM SIGMM Workshop on Effective Telepresence (ETP'04)*. ACM Press, 40–44.

FeelLight Mobile

Expressivity, Awareness

Extension to Feellight: The concept consists of two I/O devices which are always on-connected. The device connected to the network terminal device obtains a user's button-pressing action by the button switch, and changes the color of the embedded light. The signal of switch whether the button is pressed or not is transmitted to the other side of the line, and causes the color change of the light of the other side of the line. The color of light is coincided with each other. The light simply changes on a periodic basis of four colors (red, yellow, green, and blue). The concept is a device attached to the cellular phone and a stand-alone FeelLight device with a wireless connection. It is also intended to embed it to home electric appliances and desktop computers. The device can also be attached to the mouse or keyboard without missing the property.

Suzuki, K. and Hashimoto, S. 2004. Feellight. In *Proceedings of the ACM SIGMM Workshop on Effective Telepresence (ETP'04)*. ACM Press, 40–44.

FeelLight Virtual

Expressivity, Awareness

We also have implemented FeelLight Virtual that is a software application on computer and cellular phone. The application supports the same functionality as the real device for communication.

Suzuki, K. and Hashimoto, S. 2004. Feellight. In *Proceedings of the ACM SIGMM Workshop on Effective Telepresence (ETP'04)*. ACM Press, 40–44.

Gumball Machine

Expressivity

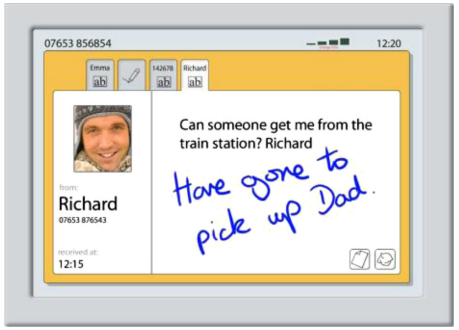
An augmented gumball machine with a Servo Phidget controls the dispensing of the candy. The gumball machine is networked and provides the ability to automatically control it from a personal Web page. Every visit to the Web page is regarded as an I-thought. I-thoughts are then translated into a physical token of affection. When a customizable number of people visit the Web site, five for the experiments, the machine dispenses a gumball to inform the owner of the Web page of these I-thoughts. Each Web visit is logged storing the IP address and the city where the Web surfer is located. The IP address and the physical location of the most recent visits to the Web page are shown to allow the remote Web visitor to know that her visit has been logged. Because every fifth visit dispenses a gumball, the viewer can also determine if her act dispensed candy.

Truong, K. N., Richter, H., Hayes, G. R., and Abowd, G. D. 2004. Devices for sharing thoughts and affection at a distance. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 1203–1206.

HomeNote

Expressivity

The prototype device is based on TxtBoard, a situated messaging device that uses the SMS protocol to let members of households broadcast messages home. A tablet device that supports stylus markings, or scribble, in addition to SMS are implemented. The HomeNote prototype is essentially a Toshiba Portégé Tablet PC encased in a wall-mountable frame containing GPRS and SIM cards. This provides each HomeNote with a unique phone number which is used to receive and display text messages sent via mobile phones (in this version users could not send messages out through the device). Local scribbling is also supported using the tablet's stylus input.



Sellen, A., Harper, R., Eardley, R., et al. 2006. HomeNote. In *Proceedings of the 20th Anniversary Conference on Computer Supported Cooperative Work (CSCW'06)*. ACM Press, 383–392.

Honey I am home

Expressivity, Awareness

The device is a single-bit smell output device which a distant lover activates to indicate they are thinking of their partner.

Kaye, J. 'Jofish' and Goulding, L. 2004. Intimate objects. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'04)*. ACM Press, 341–344.

InScene

Expressivity, Gift Giving

The sender can send a message to the remote partner's incense via a mobile phone. When the receiver lights the incense, aroma and lighted smoke are dispensed in the room and stars are projected on the ceiling. Additionally, by holding or waving a hand over the smoke, the sender's message can be viewed. InScene consists of two devices called ICKO and KORO. ICKO serve as a message-sending media whereas KORO serves as a player of message. ICKO is a cone shaped incense with RFID tag attached and serve as a message sending media. Aluminum piece is inserted between incense and RFID. The sender uses the e-mail function of mobile phones to imply a message in the incense. KORO is a table shaped information terminal which serves as a player of message. KORO has Mac mini, a video projector, an RFID reader, and a motion sensor installed. When ICKO is placed on KORO, the system software receives the message and creates a moving image in real time. The image created is then projected by the projector, lighting smoke and coloring the ceiling with moving stars. And when a hand is held over the smoke, the message will be projected.

Katsumoto, Y., Kanai, E., Kirillova, N., et al. 2006. InScene. In *Proceedings of the ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (ACE'06)*. ACM Press, 34–35.

Lumicard

Expressivity, Awareness

Lumicard is a stand for electronic postcards. Users can draw or write something on a postcard with an electronic tag and send it to people. People can also keep a sensor at home that sends awareness information to the tagged postcard.

Tollmar, K. and Persson, J. 2002. Understanding remote presence. In *Proceedings of the 2nd Nordic Conference on Human-Computer Interaction (NordiCHI'02)*. ACM Press, 41–50.

One

Expressivity, Awareness

The device is a sphere split in half where rods stick out from the center. These buttons can be pushed in and out. When the center rod is pushed in at one end, the rod on the other end moves up. If the rod is pulled out, the other moves down.

Ogawa, H., Ando, N., and Onodera, S. 2005. SmallConnection. In *Proceedings of the 13th Annual ACM International Conference on Multimedia (MULTIMEDIA'05)*. ACM Press, 1073–1074.

Peek-A-Drawer

Expressivity, Awareness

It provides virtual shared drawers that connect family members who are located at a distance. When a user puts something in the upper drawer and closes it, a photograph is taken automatically and the image appears in the lower drawer at a distant place.

Siio, I., Rowan, J., Mima, N., and Mynatt, E. 2003. Digital decor: Augmented everyday things. In *Proceedings of Graphics Interface 2003*. 159–166.

PersonCards

Expressivity, Gift Giving

PersonCards allows for lightweight information such as picture messages to be sent to a frame and displayed within another's home. Content can be sent to a PersonCard from any channel (e.g., SMS, MMS, Twitter). Recipients can then scribble on the screen, so as to send back handwritten messages. The device could even incorporate a small camera, so that pictures could be taken and delivered instantly to the sender without the need to incorporate other technologies.

Lindley, S. E., Harper, R., and Sellen, A. 2009. Desiring to be in touch in a changing communications landscape. In *Proceedings of the 27th International Conference on Human Factors in Computing Systems (CHI'09)*. ACM Press, 1693–1702.

Physical Intimate Object

Expressivity

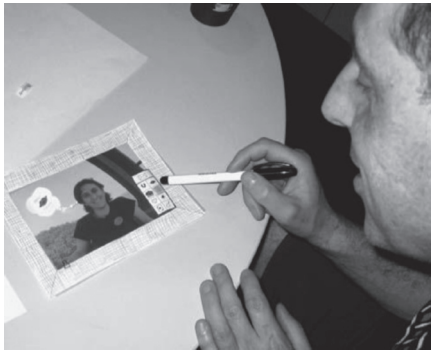
The Physical Intimate Object is a metal box with a button and a red LED that is plugged into an internet connection. Each member of a couple has a PIO: pressing the button on one box makes the remote LED glow brightly. It then fades over time. A smaller red LED located on the side of the box shows the current brightness of the remote partner's light.

Boehner, K., David, S., Sengers, P., and Kaye, J. 2005. Critical Technical Practice as a Methodology for Values in Design. In *Proceedings of the Workshop on Quality Values and Choices (CHI'05)*. ACM Press, 5–10.

Picture Frame

Expressivity

The Picture Frame is a networked digital touch screen with the appearance of a picture frame. The frame contains an image of the user's partner. The user can send singular graphical symbols to his or her partner's frame where they appear in a thought bubble beside the image of the user's head.



Garnæs, K., Grünberger, O., Kjeldskov, J., and Skov, M. B. 2007. Designing technologies for presence-in-absence: Illustrating the cube and the picture frame. *Pers. Ubiquitous Comput. 11*, 5, 403–408.

Scent

Expressivity

Scent is a variation on Feather. The traveler transmits a signal through holding the frame. This starts a heating element at the bottom of an aluminum bowl at home, vaporizing essential oil deposited within. The result is that a scent fills the home space.

Strong, R. and Gaver, W. 1996. Feather, Scent & Shaker: Supporting Simple Intimacy in Videos. In *Extended Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCW'96)*. ACM Press, 29–30.

Teddy Bear

Expressivity, Gift Giving

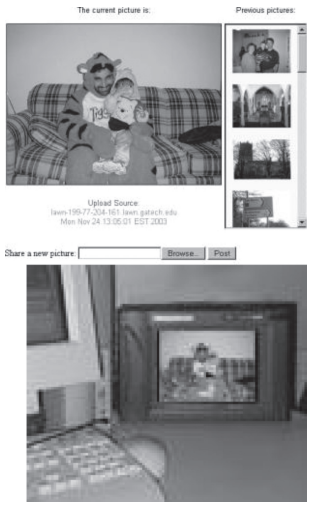
The teddy bear captures pictures and can be connected and displayed on a remote tv. In order to do so, the bear must be placed on a table, which acts as a trigger to start a rich context- sharing conversation over the TV. By placing the bear on the table the user can call someone. The pictures captured over the day can also be seen by the person who was called.

Hemmeryckx-Deleersnijder, B. and Thorne, J. M. 2008. Awareness and conversational context-sharing to enrich TV-based communication. *Comput. Entertainment 6*, 1, 1–13.

The Digital Picture Frame

Expressivity

The Digital Picture Frame allows anyone on the Web to upload and choose a photo to display on a particular person's picture frame. The frame is composed of several components: the Web client, the Web server, and a frame client. The Web client shows the current picture and information about when and from where the photo was uploaded, a set of thumbnails of all the photos that have been uploaded, and a simple Web form for uploading a new photo. Visitors to the page can either upload a new image, which becomes the current image on the picture frame, or scroll through the set of photos and select an existing one for display. To provide further feedback to the Web page visitors, the Web page includes an image of the frame sitting on its owner's desk or shelf. The authors manipulate this image to show each new photo in the frame, making it more obvious that this picture is actually being viewed at the user's desk. The authors log users' IP addresses for all visits.

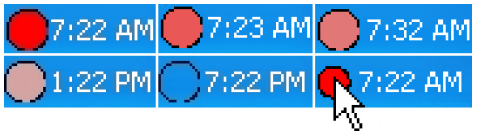


Truong, K. N., Richter, H., Hayes, G. R., and Abowd, G. D. 2004. Devices for sharing thoughts and affection at a distance. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 1203–1206.

Virtual Intimate Object

Expressivity

VIO appears as a small circle in the taskbar of the user's Windows screen. When one member clicks on the circle, their partner's circle changes to bright red. The circle dims quickly at first, and then fades slowly over time. It returns to transparent twelve hours after the circle was clicked. Pressing the button again restarts the cycle at maximum light intensity. Moving the mouse over the circle without clicking shows the current status of the remote partner's circle.



Kaye, J. 'Jofish,' Levitt, M. K., Nevins, J., Golden, J., and Schmidt, V. 2005. Communicating intimacy one bit at a time. In *Extended Abstracts on Human Factors in Computing Systems (CHI'05)*. ACM Press, 1529.

weConnect

Expressivity

The service includes two one-directional channels, one for each person, to enable independent media stream in each direction. Using the weConnect tools and media content available on the device or on the Web, the user can create content mixes and push them through the channel to the recipient. The weConnect Web server will store the content and provide a gateway to the recipient. The recipient's device automatically "pulls" the content from the server and displays it through the weConnect viewer on the mobile phone, the desktop, or any Web enabled device that runs the weConnect client.

Milic-Frayling, N., Hicks, M., Jones, R., and Costello, J. 2008. Exploring personal broadcast channels for rich media sharing in close relationships. In *Proceedings of the 7th International Conference on Mobile and Ubiquitous Multimedia (MUM'08)*. ACM Press, 23–30.

ToTell (Astra)

Expressivity, Gift Giving

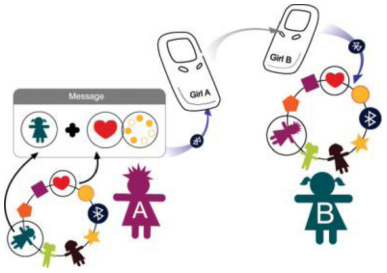
During the day, an individual can capture daily experiences using a mobile device that supports picture taking, freehand drawing and handwriting. The ToTell list composed in this way is shared with related family members at home, where the list can be accessed using the tablet device. When the device is not used it shows an overview of such messages in a spiral visualisation. The touchscreen interface can be used to browse similar messages and check the availability of others. The information displayed in the spiral overview consists of pictures or drawings and text notes made on the mobile device. The spiral is divided in 3 areas: The main area of the spiral holds 6 pictures, whose size and position portrays recency. The centre of the spiral gives access to earlier items, the outer end to more recent ones.

Markopoulos, P., Romero, N., van Baren, J., IJsselsteijn, W., de Ruyter, B., and Farshchian, B. 2004. Keeping in touch with the family. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 1351–1354.

BuddyBeads

Expressivity, Memories

BuddyBeads are techno-jewelry, emotional and coded communication accessories in the form of jewelry pieces that allow group members to communicate in an emotional way, with codes and signals they decided upon. Each group member has a matching jewelry piece (for example, a bracelet) made of beads. Each bead carries a message inside. Example for a message can be "I'm talking to a cool guy." These messages are decided by the group in advance and the group constructs internal codes among its members. Once pressed, the beads transmit their message to the other group members. The messages are constructed from a combination of the bead's shape (which is identical in all the bracelets within the group) and varying sequences of vibrations that are formed according to the sender's way of pressing the bead and enhance the message with another layer of meaning. The combination of the visual and haptic information conveys the sender's state of mind. The friend receives the message in her own bracelet in the form of a correlating bead, which glows and vibrates. Even though different groups may use the same bead shapes, they will mean different things in each group, according to the specific group's culture and vernacular.



Kikin-Gil, R. 2005. BuddyBeads. In *Proceedings of the 7th International Conference on Human Computer Interaction with Mobile Devices & Services (MobileHCI'05)*. ACM Press, 375–376.

HIM

Expressivity, Physicalness

The Haptic Instant Messenger (HIM) provides all features of an ordinary messenger, such as listing who is online and sending text messages. From a technical point of view a hapticon consists of vibration patterns (specified by frequency, amplitude, duration). The user can select the input and output devices that are used to generate haptic effects. A set of predefined hapticons and interfaces is provided, and it is easy to design new signals. Haptic effects can be triggered by using special input devices, or by using their corresponding textual representation in the text message (just like emoticons).

Icon	Emoticon	Meaning	Hapticon
	:)	regular smile	
	:D	big smile	
	:(	sad face	
	;-)	wink	
	(k)	kiss	
	:$	embarassed	

Rovers, A. F. and van Essen, H. A. 2004. HIM. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 1313–1316.

Shaker

Expressivity, Physicalness

The system consists of two pairs of devices. Each contains a solenoid, containing a metal rod surrounded by a wire coil. When the sender is shaken, the movement of the rod induces a current in the coil. When this is sent to the receiver, the current causes its solenoid to shake the receiver proportionally. Shakers could be of a form and size that makes them easy to carry or wear i.as jewellery, using pager or cellphone technology to link them.

Strong, R. and Gaver, W. 1996. Feather, Scent & Shaker: Supporting simple intimacy in videos. In *Extended Proceedings of CSCW*. ACM Press, 29–30.

In Touch

Physicalness, Expressivity

Small tokens are carried to keep "in touch" with a friend or relative. If the token is touched, the friend will receive the touch through their token – it might glow, become warm or vibrate.

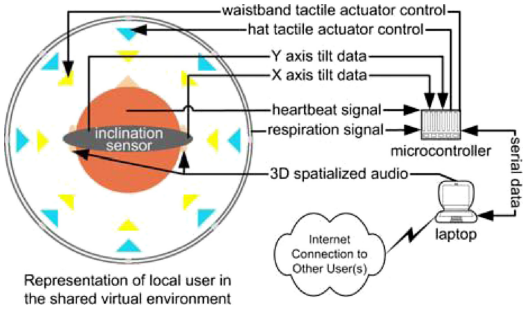
Hindus, D., Mainwaring, S. D., Leduc, N., Hagström, A. E., and Bayley, O. 2001. Casablanca. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'01)*. ACM Press, 325–332.

Closed-Eyes Nonverbal Telehaptic Communication

Physicalness

Communication between users is achieved by sensing subtle volitional muscle movements, breathing, and heartbeats, then presenting this information to the other user, via subtle haptic and sound cues. More subtle real-time biometric measures (similarly affected by changing thoughts and emotions) could be output as mild thermo-, vibro-, and/or electro-tactile stimulation on a distant partner's bodily surface.

Meyer, W. 2004. The body's surface as a multimedia interface. In *ACM SIGGRAPH 2004 Sketches*. ACM Press, 122.



Sensing Beds

Physicalness, Awareness

The beds mediate between two romantic partners. Sensors located in one mattress pad track the position of its occupant. The position data is transmitted every five minutes to the other bed where heating pads are activated at the same coordinates.

Goodman, E. and Misilim, M. 2003. The sensing beds. In *Proceedings of the UbiComp Workshop (2003)*.

KissCommunicator

Physicalness

The Kiss Communicator uses wireless technology to transmit the digital equivalent of a personal gesture, such as a wave, wink or a kiss. First the device must be squeezed gently and it then responds with a slight glow. The user has to blow into it and create a message in the form of an animated light sequence as the device responds to the breath. The message is sent to the corresponding Communicator. The remote unit indicates that there is a message but waits until its owner squeezes it to play back the light sequence.

Buchenau, M. and Suri, J. F. 2000. Experience prototyping. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'00)*. ACM Press, 424–433.

connexus

Physicalness, Awareness

Force sensing resistors provide pressure detection over a low resolution surface array on the top of the Connexus. This allows for simple touching to be sensed. By time stamping the sensed data, rich signals such as a user swirling their finger along the surface of the Connexus can be detected. Ambient light is easily sensed with a photocell. As a user moves inside, outside, or places their hand over the Connexus, a signal is generated. A small heartbeat sensor allows detection of an individual's pulse. This provides access to a personal 'life signal' of another person. When electrical current is applied to a Peltier Junction, a temperature difference is created with one side of the thermocouple being hotter than room temperature, and the other being cooler. This allows the Connexus to heat and cool the skin it is contacting. Using an array of superbright Simple vibrations are easily and privately felt through skin contact. Various vibration patterns and duty cycles provide a number of output possibilities for the Connexus.

Paulos, E. 2003. Connexus. In *Proceedings of the Conference on Designing for User Experiences (DUX'03)*. ACM Press, 1–4.

Hand Holding

Physicalness, Expressivity

The object on the left is translucent, and made of soft silicone. To use it, one member of a couple puts their hand into their (customized) handprint. Their significant other's handprint lights up and starts to pulse in rhythm with the first user's heartbeat. When both have their hands in the handprints, a small heater warms the device, in an attempt to simulate the body heat of the other. Both partners place their hand into the device at the same time by wrapping around the central post. The outer sleeve on one device contracts in correspondence to the pressure on the inner post of the other device.

Kaye, J. 'Jofish' and Goulding, L. 2004. Intimate objects. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'04)*. ACM Press, 341–344.

Holding Hands over Distance

Physicalness, Expressivity

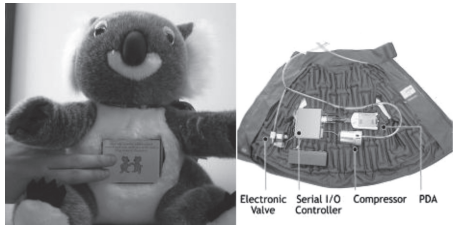
The probes are yellow, deformable, hand-size balls which contain an embedded microchip which logs the time and the number of incidences of squeezing. These probes did not communicate with each other at this stage in the project.

O'Brien, S. and Mueller, F. 2006. 'Floyd.' Holding hands over a distance. In *Proceedings of the 18th Australia Conference on Computer-Human Interaction*. ACM Press, New York, NY.

Hug Over Distance

Physicalness

The device consists of a koala and an inflatable vest. If the user takes the koala and rubs its belly, a hug request is sent to a vest which is worn by the other partner. The vest contains a wireless receiver, which receives the hug request. Inside the vest there are small air compartments which inflate all around her body torso.

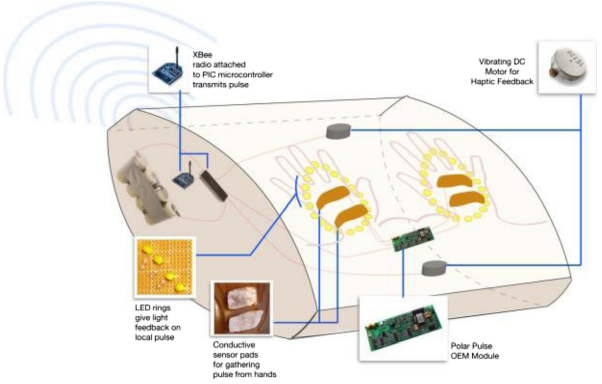


Mueller, F. 'Floyd', Vetere, F., Gibbs, M. R., Kjeldskov, J., Pedell, S., and Howard, S. 2005. Hug over a distance. In *Extended Abstracts on Human Factors in Computing Systems (CHI'05)*. ACM Press, 1673–1676.

ImPulse

Physicalness, Awareness

The devices sense pulse through palm contact and wirelessly transmit heartbeats to the paired unit through light flashes and vibration.



Lotan, G. and Croft, C. 2007. imPulse. In *Extended Abstracts on Human Factors in Computing Systems (CHI'07)*. ACM Press, 1983–1988.

Internet Pajama

Physicalness, Expressivity

The concept consists of a doll (e.g., teddy bear) and a pajama suit. Once a user hugs the doll, the doll detects varying amount of pressure from the hug. It subsequently transmits the data to the pajama suit which reproduces the hugging feeling through a change of pressure and temperature. Inflatable air compartments on the inside of the pajama and heating elements are implemented in order to change these parameters. When one user is far away from the other, the color of the pajama is dull. As the partner returns closer to home, the color of the pajama will change to become brighter and warmer. A scent similar to the fragrance used by the other user is also intended to be utilized. Additionally, a LCD display panel embedded on the sleeves of the pajama allows the user to look at live images of the remote user. Also, emotions can be communicated using animated emoticons.

Teh, J., Lee, S. P., and Cheok, A. D. 2006. Internet pajama. In *Proceedings of the ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (ACE'06)*. ACM Press, 102.

Lovelet

Physicalness, Expressivity

Lovelet is a wearable communication tool that contains thermosensor. This sensor senses air temperature surrounding a user and the temperature data is transmitted to the partner. Lovelet illuminates in different color depending on the temperature. When one partner finds that the remote parnter is in the cold, he/she can warm user by touching the touch-sensor in his/her Lovelet to electrify the peltier device in the remote partner's Lovelet.

Fujita, H. and Nishimoto, K. 2004. Lovelet. In *Extended Abstracts of the Conference on Human Factors and Computing Systems (CHI'04)*. ACM Press, 1553.

Secret Touch

Physicalness

The Secret Touch device allows partners to exchange tactile impulses over the Internet by padding or squeezing the device in their hand or pocket. At the receiving end, these pads and squeezes would be emulated as vibrations, heat or pressure.

Vetere, F., Gibbs, M. R., Kjeldskov, J., et al. 2005. Mediating intimacy. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'05)*. ACM Press, 471–480.

Stroking Device

Physicalness, Expressivity

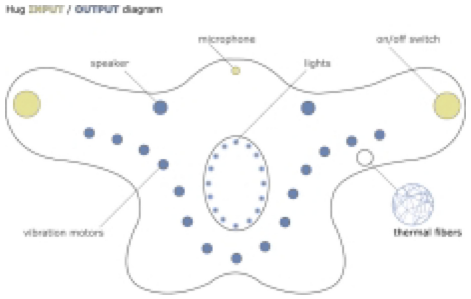
The device receives input by stroking with the thumb over a certain area (prototype A) or the user must turn a little knob in a circular path (prototype B), respectively. The output is transmitted to the remote unit that produces circular movements created by a small arm powered by a miniature servo motor. The device can be used to touch either each other's hands or the partner on other parts of the body.

Eichhorn, E., Wettach, R., and Hornecker, E. 2008. A stroking device for spatially separated couples. In *Proceedings of the 10th International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI'08)*. ACM Press, 303–306.

The Hug

Physicalness, Expressivity

The soft form suggests the user reaching to hug. Communication is initiated by squeezing the left paw, and speaking the receiver's name into the microphone. Once it is connected to the remote hug, senders can squeeze, stroke, hug, or pet the Hug. The sensor data is compiled and transmitted to the remote pair through light, heat, and vibrations. Communication is terminated by squeezing the right paw. Lights and sounds signal incoming hugs. During the hug, the sender and receiver have an open voice channel. Up to four hugs can be stored in a queue; these are signaled on the base using a gently blinking light.

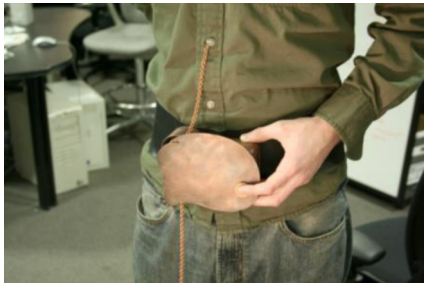


Gemperle, F., DiSalvo, C., Forlizzi, J., and Yonkers, W. 2003. The Hug. In *Proceedings of the Conference on Designing for User Experiences (DUX'03)*. ACM Press, 1–4.

Tug n'Talk

Physicalness

The device consists of a belt-buckle form factor with an attached pair of chains. One chain connects to the user's shirt and one dangles below the device. Tugs on the bottom chain are transmitted to a paired belt and represented as tugs on the chain connected to the shirt itself. Each belt also has a button on it to interrupt a tug in process.



Harry, D. 2007. Tug n ' Talk: A Belt Buckle for Tangible Tugging Communication Abstract. Presented at alt.chi 2007, http://www.media.mit.edu/~dharry/tugandtalk/tugandtalk_FINAL.pdf.

United-Pulse

Physicalness, Expressivity

United-pulse is composed of two rings which are not completely closed. The inside of each ring contains a pulse measure system. When one of the partners closes the gap, the skin resistance of the fingertip is used to close the circuit of the ring. As a consequence, he/she feels the other partner's heart rate, which is transmitted by vibrations of the ring. The data are transferred through a wireless connection (e.g., Bluetooth). The prototype consists of a small vibration motor that translates every heartbeat into a small vibration. Depending on the heart rate, the vibration motor runs faster or slower. The prototype measures the pulse by an ordinary PClinked pulse oximeter.

Werner, J., Wettach, R., and Hornecker, E. 2008. United-pulse. In *Proceedings of the 10th International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI'08)*. ACM Press, 535–538.

Wearable Touch

Physicalness, Expressivity

The device is a matching pair of wearable devices akin to wrist watches that allow instant, one-to-one communicative exchanges between wearers. Exchanges could occur through, short, whispered conversation or, even more discreetly, through sending and receiving the warmth of haptic touch.

Howard, S., Vetere, F., Gibbs, M., et al. 2004. Mediating intimacy: Digital kisses and cut and paste hugs. In *Proceedings of the 18th British HCI Group Annual Conference on HCI (BCS-HCI'04)*. 45–48.

white stone

Physicalness

The concept consists of a set of two white, round electronic stones which are connected to each other only. Through heat and touch sensors the unit detects if someone holds it in his/her hand. As soon as someone keeps his/her stone, the stone sends a signal to the remote unit, which will then beep. When the counterpart takes the stone in his or her hand, it detects the touch and sends a signal back to the first stone, which will be warmed up by an internal heating device.

Tollmar, K., Junestrand, S., and Torgny, O. 2000. Virtually living together. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'00)*. ACM Press, 83–91.

ShoddyPop

Gift Giving

ShoddyPop is an email server that is rather unreliable. Ease of sending is preserved, and senders can be sure that their message will be delivered, but the delivery time is subject to variation. This means that recipients and senders cannot rely on the time of delivery to drive the tempo of a response, allowing the recipient to take their time before replying, or even to craft their reply over a number of days.

Lindley, S. E., Harper, R., and Sellen, A. 2009. Desiring to be in touch in a changing communications landscape. In *Proceedings of the 27th International Conference on Human Factors in Computing Systems (CHI'09)*. ACM Press, 1693–1702.

Love Egg

Gift Giving

The user speaks into the small end of the egg in order to record a message for her/his partner. He/she then returns it to the dish. It then transmits the message to the dish, which in turn transmits it over the internet to the other egg. This egg then begins to roll around in the concave dish: when the egg is held to the lover's ear, the message plays from the large end of the egg.

Kaye, J. 'Jofish' and Goulding, L. 2004. Intimate objects. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'04)*. ACM Press, 341–344.

Audible Gifts

Gift Giving

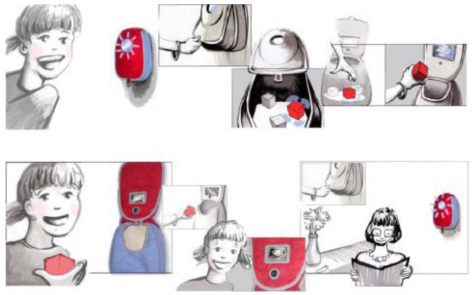
The concept consists of a set of a speaker and a microphone controller. Users can leave voice messages. These two devices are not connected to each other and hence are not designed for couples to hold a regular conversation. Contrary, the device is designed with a daily limit of 5 minutes for the length of any given message.

Bhandari, S. and Bardzell, S. 2008. Bridging gaps. In *Proceedings of the 26th Annual CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI'08)*. ACM Press, 2763–2768.

Bag of Gifts

Gift Giving, Expressivity

The bag hangs permanently in the children's playroom or bedroom wall and is connected to an Internet network. A video message is recorded by a the user using conventional video chatting hardware and software this is sent to the Bag of Gifts and registers as the light on the front of the bag glowing. The remote person opens the bag and takes the trinket out that is vibrating. On removing the trinket from the bag a message plays on the video screen on the inside of the bag flap. Once the message finishes the user can replace the trinket inside the bag to activate a video recording sequence. They then record their response, which is sent when they close the bag flap.



Feltham, F., Vetere, F., and Wensveen, S. 2007. Designing tangible artefacts for playful interactions and dialogues. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 61–75.

Cut and Paste Hugs

Gift Giving

The device allows partners to capture images, articles, sounds, video clips and then annotate them with their personal commentary, perhaps adding symbols. The device allows "digital hugs and kisses" to be layered over instrumental communication; these intimate gifts can be stored, reviewed and reused in an ongoing intimate dance.

Howard, S., Vetere, F., Gibbs, M., et al. 2004. Mediating intimacy: Digital kisses and cut and paste hugs. In *Proceedings of the 18th British HCI Group Annual Conference on HCI (BCS-HCI'04)*. 45–48.

Emotion Container

Gift Giving, Expressivity

The multimedia products are designed to be given as special presents. They have a small screen, a loudspeaker and a scent compartment. They are carriers of messages of special significance. Instead of calling someone up and leaving him/her a message, users can send audio messages.

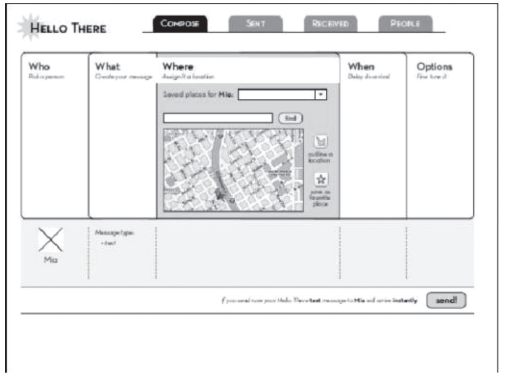
Lambourne, R., Feiz, K., and Rigot, B. 1997. Social trends and product opportunities. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'97)*. ACM Press, 494–501.

Hello There

Gift Giving

Hello There enables people to send audio messages associated with a particular location and time. When a message is recorded and sent, their partner only receives it when they are physically in a particular geographic spot on or after a particular time. Messages are recorded on a computer via a web-based interface. The sender of the message uses a map interface to select a geographical region to associate with the audio message. When the receiver is physically located within those geo-coordinates they are notified that they have a message. They are able to listen to the message and record a response. Using a website the sender can check to see which messages have been received and listen to responses.

King, S. and Forlizzi, J. 2007. Slow messaging. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 451–454.



i.Fuzz

Gift Giving

The i.Fuzz is a light-weight, semi-disposable multimedia appliance that enables users to leave pre-recorded messages at different physical locations to be serendipitously discovered by one's intimate other.

Vetere, F., Gibbs, M. R., Kjeldskov, J., et al. 2005. Mediating intimacy. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'05)*. ACM Press, 471–480.

Magic Bottle

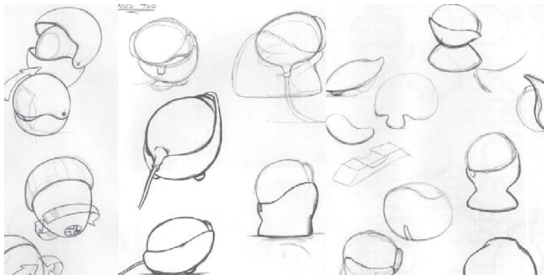
Gift Giving, Expressivity

It uses light to indicate a message, touching the bottle to activate the message and shaking the bottle to erase the message. The bottle has the addition of a stopper that needs to be removed to allow the message or sound to be heard and has a lip on the opening that affords a holding to the ear.

Feltham, F., Vetere, F., and Wensveen, S. 2007. Designing tangible artefacts for playful interactions and dialogues. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 61–75.

Seed and Pod

Gift Giving, Expressivity



The concept is two sets of a seed and a pod. The seed contains an opening with a microphone for speaking or recording sounds and a speaker for the transmission of the content. The seed is used to talk and listen into while the pod represents the base that the seed nests into in order to send the data content. When one of the users sends a message, the seed begins to glow. When the seed is touched or picked up, the speaker end of the seed also illuminates and the message starts to play after a one second delay. When the message is completed, the user shakes the pod to erase the message and the speaker end of the seed illuminates to encourage a response. To respond, the user talks or records sounds into the microphone end of the seed. The seed is glowing throughout; once completed, the seed is placed into the Pod, at which time the data is transferred and this is indicated by the light moving through the Seed to the Pod to indicate a flow of data. When the data is sent, the Pods lights turn off.

Feltham, F., Vetere, F., and Wensveen, S. 2007. Designing tangible artefacts for playful interactions and dialogues. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 61–75.

Pool of Memory

Gift Giving

The Pool of Memory is a visual community messaging system that allows input from several, even remote, locations and output to a central place and the remote input locations. The visual messages are short videoclips containing sound. The short audiovisual messages are played in order of creation. To allow people to construct sequences of narrative, new messages can be connected to previous ones, creating chains of messages. Recording a message takes place in front of a small panel mounted in a public place.

Battarbee, K., Baerten, N., Hinfelaar, M., et al. 2002. Pools and satellites. In *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques (DIS'02)*. ACM Press, 237–245.

SynchroMate

Joint Action

SynchroMate is a round device attached to the palm that supports serendipitous synchronous communication by exchanging not only the message itself but also that a message is being composed.

Gibbs, M.R., Vetere, F., Bunyan, M., and Howard, S. 2005. SynchroMate: A phatic technology for mediating intimacy. In *Proceedings of the Conference on Designing for User Experience (DUX'05)*. 37–41.

TACT

Joint Action

TACT is a set of small, portable, wireless communicant objects with a low-resolution tactile surface. In the surface of each device two differently-colored points move around randomly. The points have the property of leaving a trace of light behind them when they advance. Each point represents one member of the couple, and two connected TACTs always display the synchronized images of the two colored points. By touching the point that represents him/her, a member of the couple can take control of it and trace simple figures with his/her fingertip, but doesn't have access to the other one's point, which is simultaneously represented on both surfaces.

Hoffmann, C., Jumpertz, S., and Marquet, B. 2007. On nurturing strong-tie distant relationships. In *Extended Abstracts on Human Factors in Computing Systems (CHI'07)*. ACM Press, 2411–2416.

Distributed Hide-and-Seek

Joint Action

Users have preinstalled maps of each other's homes on their consoles (a PC with touch-screen). By selecting and dragging icons onto various positions on the map, the user places virtual gifts (or hiding points) at locations in the remote person's house. These hiding points are transmitted to the grandson's console through the internet, but are kept hidden from him. The aim of the game is to move around the home to find the gifts. This user waves a "magic wand" (a Bluetooth-enabled PDA) around each room looking for invisible gifts that can only be found by the wand. As the child moves around the house, his location is tracked on the other person's computer. During the play, there is constant voice communication. The hider uses a touch screen to allocate virtual gifts in the seeker's location. A selection of default gifts (comic characters) is provided for the hider to choose from. When a gift is found (represented by the wand landing on a comic character), a sound reward is played to both the hider and the seeker. The toggle button provides both players with the ability to interchange their roles in the game.

Vetere, F., Nolan, M., and Raman, R. A. 2006. Distributed hide-and-seek. In *Proceedings of the 20th Conference of the Computer-Human Interaction Special Interest Group (CHISIG) of Australia on Computer-Human Interaction: Design: Activities, Artefacts and Environments (OZCHI'06)*. ACM Press, 325–328.

InPhase

Joint Action, Awareness

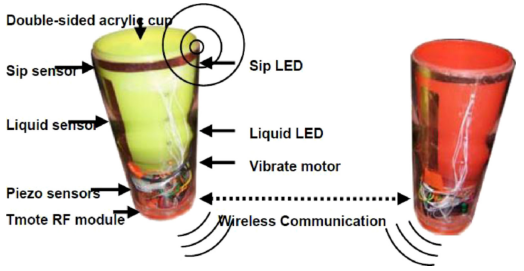
The InPhase system is an ambient indicator that will notify two remote users when, for example, they are both opening doors, windows, or curtains; watching the same TV channel; sitting on a sofa; or in the kitchen at the same time. Depending on the frequency of coincidences, the level of activity in the receiver varies. Therefore, changing the sound of the chime depends on the frequency of coincidences for certain groups of actions. Likewise, it is possible to use lights or actuators (instead of sounds) to notify the receiving party.

Tsujita, H., Tsukada, K., and Siio, I. 2009. InPhase. In *Proceedings of the 27th International Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA'09)*. ACM Press, 3401–2406.

Lover's Cup

Joint Action, Awareness

Two cups are wirelessly connected with each other. If the user holds one cup, it triggers soft glowing processes for the remote cup. When a person is drinking, the rim of the other cup begins to glow. Additionally, the cup displays the level of the liquid inside of the paired cup. If both owners take a sip at the same time, both cups are glowing at its maximum illumination. If a person shakes the cup, the other will vibrate. When used for social events, toasting two cups together activates them into a pair of Lover's Cup.

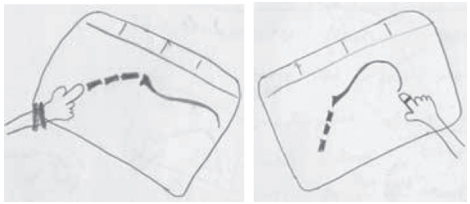


Chung, H., Lee, C.-H. J., and Selker, T. 2006. Lover's cups. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 375–380.

MatchUs Board

Joint Action, Gift Giving

Both partners have a synchronized MatchUs Board which uses multi-user touch input and display technologies. Using their fingers they can draw on their board. The drawings synchronously appear on both boards.



Bhandari, S. and Bardzell, S. 2008. Bridging gaps. In *Proceedings of the 26th Annual CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI'08)*. ACM Press, 2763–2768.

Mutsugoto/PillowTalk

Joint Action, Expressivity

A custom computer vision and projection system enables users to draw on each others' bodies. Mutsugoto is installed in the bedrooms of two distant partners. When both partners are in bed and wearing a special touch-activated ring visible to a camera mounted above, a computer vision system tracks the movement of the ring. It then transmits the virtual pen strokes to and projects them on the body of the remote partner. If the partners' movements cross, the lines will react with each other and illuminate.

Hayashi, T., Agamanolis, S., and Karau, M. 2008. Mutsugoto: A body-drawing communicator for distant partners. In *ACM SIGGRAPH posters on SIGGRAPH'08*. ACM Press, 1.

PlayPals

Joint Action

PlayPals are a set of wireless dolls which are supposed to be used for playful remote communication. PlayPals are a set of figurines with their mechanical arms that provide children with a playful way to communicate between remote locations. PlayPals is designed for children aged 5-8 to share virtual copresence.

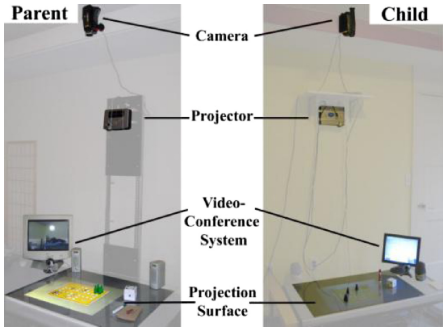
Bonanni, L., Vaucelle, C., Lieberman, J., and Zuckerman, O. 2006. PlayPals. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 574–579.

ShareTable

Joint Action

In each home, the system consists of a projector, a camera, and a videoconferencing system. The videoconferencing is used for face-to-face communication, while the camera-projector system allows both users to view items placed and manipulated on each other's table. Since the surface of the table is dry-erasable, the parent and child can add notes and drawings with markers.

Yarosh, S. 2008. Supporting parent-child interaction in divorced families. In *Proceedings of the 7th International Conference on Interaction Design and Children (IDC'08)*. ACM Press, 33–36.



SyncTV

Joint Action

SyncTV is a system for sharing a common TV channel. When one partner selects a channel to watch, the TV channel of the remote person automatically changes to the same channel.

Tsujita, H., Tsukada, K., and Siio, I. 2008. SyncDecor. In *Proceedings of the Working Conference on Advanced Visual Interfaces (AVI'08)*. ACM Press, 449–453.

Together Aquarium

Joint Action

The partners coordinate the task to take care of fishes. They can involve in various activities (such as feeding fish, changing water, checking temperature of water).

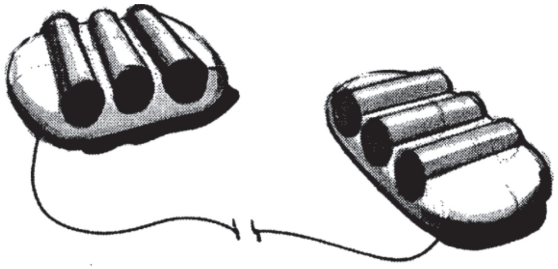
Bhandari, S. and Bardzell, S. 2008. Bridging gaps. In *Proceedings of the 26th Annual CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI'08)*. ACM Press, 2763–2768.

inTouch

Joint Action

InTouch consists of a pair of synchronized distributed rollers that each consists of three cylindrical rollers mounted on a base. Two people can roll their hands over the devices which afford unbounded rotary motion between two people who can twist the rollers back and forth. As a consequence, there is a force feedback circuit. When one of the rollers is rotated, the corresponding roller on the remote object rotates in the same way. This behavior can be achieved using haptic (force-feedback) technology with sensors to monitor the physical states of the rollers and internal motors to synchronize these states.

Brave, S. and Dahley, A. 1997. inTouch. In *Extended Abstracts on Human Factors in Computing Systems Looking to the Future (CHI'97)*. ACM Press, 363–364.



OrganicDiscourse

Memories

OrganicDiscourse generates tree-ring visualizations that grow daily, based on the couples' unique IM patterns.

Lottridge, D. 2006. OrganicDiscourse: A reflective display for communication patterns in intimate relationships. In *Proceedings of the International Conference on Computer Supported Cooperative Work (CSCW'06)*.

Memorabilia Manager

Memories

The device is portable and allows the experience of creating and reviewing the memorabilia. Users can compose digital and non-digital forms into a meaningful mosaic. It would be a type of 'family blog' that facilitates simple recording of family events.

Kjeldskov, J., Gibbs, M., Vetere, F., et al. 2004. Using cultural probes to explore mediated intimacy. *Australas. J. Inf. Syst. 11*, 2, 102–115.

SMOKS

Memories

Among others, the SMOK neckline is outfitted with a microphone to automatically record any intimate sounds or whispers. Recorded sound memories can be played back by raising the SMOK arm and bringing the hand close to the ear. The cuff has a small speaker that whispers back the recorded sounds.

Berzowska, J. and Coelho, M. 2006. SMOKS. In *Extended Abstracts on Human Factors in Computing Systems (CHI'06)*. ACM Press, 538–543.

Traveling Book

Memories

The Traveling Book is a set of collection and containment of items (e.g., letters and drawings) along with digital content such as voice messages, photos, and video. The book is added to or modified by each person and traded either through the mail or when the couple meets in person.

King, S. and Forlizzi, J. 2007. Slow messaging. In *Proceedings of the Conference on Designing Pleasurable Products and Interfaces (DPPI'07)*. ACM Press, 451–454.