# Virtually Living Together

## A Design Framework for New Communication Media

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## ABTRACT

In this paper, we discuss the possibility of a holistic approach in the design of new media for interpersonal communication. The key argument is that if we base our design on daily practice, this may inhibit truly innovative ideas from taking form, and, on the contrary, if we design using pure intuition and visions, the design is likely to fail due to a lack of connection to daily practice. Scenario-based design makes us envision new media while field observations such as ethnographic studies, retain the ties with everyday life. This duality can also be implemented, as we will describe, in a design that makes a bi-language / bi-levelled understanding of a product possible.

## Keywords

Blue-sky research, *emotional communication*, interaction design, industrial design, inter-family communication, scenario-based design, telepresence.

## 1. INTRODUCTION

Modern communication media often express themselves in terms of quantity rather than quality [11][17]. In terms of personal, inter-family communication with the purpose to express intention and emotion, however, people prefer an expression that conveys presence and concern. A quality of communication media that is not necessarily correlated to a medium's expressive format, rather a medium of tomorrow that could manifest itself in multiple characters, and combinations of fundamental geometrical and organic forms with roots in both nature and technology. Brave and Dahley have, for instance, proposed to examine the potential of touch for use as a mood-induction technique for emotional communication [1]. Other visionary examples that steam from a mixture of art and human-computer interaction are proposed by, e.g., Gaver & Martin [8] and Ishii & Ullmer [16]. This has inspired us to seek sensorial modalities that provide richer and subtler forms of telepresence, as opposed to traditional text, sound and image communication.

"Le coeur a ses raisons que la raison ne connaît pas" Blaise Pascal

wrote, and emotions indeed have logic of their own. The communication of emotions appears to be largely involuntary. However, its functional complexity suggests adaptive design.

Emotional communication may form part of a powerful analogue system of communication, including gestures and body language, which evolves alongside representational thinking.

One traditional approach of understanding the language of emotional communication is studies on emotional communication patterns in close relationships, such as those of married couples or couples living together [9]. By asking partners to identify specific utterance that they believed had an important influence on a discussion, it may be possible to quantify and rate the feelings the communicator intended to convey and the recipient's reactions.

Research on emotional communication in the context of computer use is usually carried out from a visionary point of view, or one that is based on socio-emotional theory and studies. The bulk of examples of the latter category can mainly be derived from experiments and theories that enable us to explain how physical expressions can be captured and analysed into a semantic meaning, such as [7]. Rosalind Picard [21], in her studies of affective communication, shows a possible balance in between, which is, nevertheless, strongly influenced by classical cognitive science.

We would like to refer to our area of research as *telematic emotional communication* – a type of communication media that serves other than purely practical purposes. Basic questions that need to be examined are, for instance, what non-verbal communication can actually express and how media-richness and multi-modality affect the outcome. Our approach is to design functional prototypes that make assessment of concept design solutions possible. In this context, the design process becomes an important tool in our research.

Promising design approach can be found in the *Presence Project* [23] and Philip's project *"Vision of the Future"*. Devices for emotional communication in the latter project are attractive on two levels; as objects in their own right, as they are made of rich material to last and be cherished, and as carries of messages of special significant [20].

The art of crafting communication media is one of the major fields of computer-supported co-operative work (CSCW) [13] [25]. Within the CSCW community, there have been discussions about the role of user-centered system development – e.g. in close

participation with users, prototype systems have been developed and evaluated. In particular, the Scandinavian model of System Design for CSCW situations has been debated [18]. This includes the use of prototypes, workshops, and action-based research. In this context it has also been questioned whether this design approach is sufficiently efficient in making innovations functional. Ehn [6] claims that there must be a balance between tradition and transcendence – the 'dialectical foundation for design'. If we mainly base our design on daily work practice, this might inhibit truly innovative systems from taking form. And on the contrary – if we design using pure intuition and visions, the design is likely to fail due to a lack of connection to daily practice. The core question is whether there are design methods that fulfill this bi-leveled ambition.

## 2. DESIGN COMMUNICATION MEDIA – DIFFERENT APPROACHES

Through numerous examples it has been shown that traditional design methods for software engineering are not sufficient in the design of new communication technology. Traditional methods neither fully understand nor capture the needs and the situated use of everyday technology, such as inter-personal communication technology [28]. Most methods are neither powerful enough 'to jump the gun' to new solutions. Hence it has been argued that there is an emergent need for new design approaches. *Envisioning Design* is an example of such an initiative. By using non-standard forms of representation, it is possible to provide a holistic and contextualized view of the design space [22]. *Participatory design* is another design approach, according to which traditional requirement specification pays insufficient attention to the social context of technology. The only way to avoid this is by focusing on the intended user and his / her social context throughout the design process [10].

In order to understand the contextual use of communication media better, we have moved our notion from use and interaction to inhabitation of communication media. This happens mainly through all new interfaces, new devices, that begin to inhabit our everyday lives, such as, telex, e-mail, cellular phones, pagers, videoconferences etc. A part of the issue is to shift the understanding of the rational use through cognitive models to understand how this new communication media inhabit our lives from the sensual and the emotional response [26]. Similarly, Hughes et al. [14], for instance, argue that field work methods involving ethnography are capable of providing exhaustive material and analyses of how new technology is used in home environments. Using this approach O'Brian found [2] that the presence of technology within the home is absorbed so completely into the routines of home life that it becomes yet another way in which these routines can be articulated.

In our work have we used scenarios as a prime means of developing new communication media. They can be a "test bed" for new concepts. Experience has also shown that the use of scenarios that are treated as equally plausible and equally probable leads to designs that are more robust in a variety of alternative futures [12] [3]. In the final discussion will we talk about how pieces from these approaches could fit into a design framework. The three different design activities were;

- "Future Home Environments and Media Forms" – using situation scenarios,
- "Virtually Living Together" – using Observations and Invention and, finally,
- Prototype building – using design that is based on semiotics.

At the beginning of this project, we sought a broad viewpoint, which mainly concerned how information technology (IT) works in private and social life, with a focus on the home environment. Our cultural focus was a Swedish environment and an ordinary family or individual households.

We have focused on situations where:

- people use IT in their home environment,
- IT is, or may be, present in social activities,
- the conditions of private life, rather than technological opportunities are important.

It was important to use a creative, design-like, visual and qualitative method in our research. The primary design tool was "situation scenarios", a scenario-based technique that enables a large number of aspects to be quickly available.

In the second design phase, we focused on the specific use and needs for communication and technology in people's homes. The general question was:

- How should a household product be designed to provide indirect and sensorial communication between family members living apart?

When we analyzed this question, some specific questions emerged:

- What exactly are people's communication needs (with whom do people communicate, how do they do it and why do they do it)?
- How do people act and what do they do when they arrive at home and leave home?

In this phase, an alternative scenario-based design was applied. Observation and Invention, originally developed by IDEO [27], is a scenario-based design method that includes early observations of real users in real contexts. In this method future characters and scenarios are developed on the basis of present observations, and they will move the matter to a future use of a virtual system. Finally, metaphors help to construct conceptual models and to find corresponding representations.

The third design approach that we used was to develop prototypes of some of the key concepts developed in the scenarios. A couple of these industrial design models have been further taken into functional prototypes with integrated technology. By integrating the specific semiotic qualities that are based on the observations and the scenarios into industrial design models, we have found methods to assess the concepts of new communication media in a physical form.

In the next chapter, we will describe the different design activities in more detail. Finally, we will discuss the development of a framework of methods as presented here.

## 3. FUTURE HOME ENVIRONMENTS AND MEDIA FORMS – SCENARIOS

The starting point of the investigation of "Future Home Environments and Media Forms", was a workshop organised to clarify the various aspects of the use of IT and social life. The outcome of the seminar was categorised into a number of items that each puts the finger on aspects that affect the impact IT may have in the domestic space.

- Naturally, in order to understand how IT can fit into our homes and our private lives, we first have to understand the significance of the home itself. Different cultures are open in various degrees to the new contact surfaces, and intrusions on private life, that the information technology may generate [4].

Other important aspects are:

- Media consumption and IT use; throughout the day we absorb different kinds of information, driven by the question "what has happened?".

- The role of IT in social activities; even when we spend time with friends, IT might enrich our social life instead of, like TV, merely providing passive entertainment.

- Socialising over IT; the basic incentive for many of these activities is people's attraction to, and interest in, other people, rather than the aesthetic or entertaining value of the media.

- How people will furnish their homes, as socialising over IT becomes more common.

### 3.1 Situation Scenarios

In this project, a prototype for a partly new kind of scenario technique was used. By systematically generating a number of scenarios/situations, based on a number of set criteria, and then visualising the scenarios, a large number of aspects can quickly be available.

The technique is interesting because it offers a way of working in a structured way with qualitative aspects that cannot be quantified. Scenarios are often used for putting the use of the product (or system) in the middle of a chain of situations; the user just did one thing, is on his way to do another thing, and so on. In this case, the scenarios describe momentary situations, where the dynamics lie in the presence of other people, activities or media. A product, for example a pocket telephone, that is perfectly adapted to the professional context, in terms of both functionality, aesthetics and user behavior, often feels strange in private context like the bedroom or dining table. What makes one product work in one context and fail in another is a complex cocktail of aspects, which can be obviously visualized in situation scenarios.



*Figure 1, Situation Scenarios : A woman watches breakfast TV while having breakfast. A personal activity, everyday situation, focus on the TV.*



*Figure 2, Situation Scenarios : A man is listening to the radio while polishing his shoes. A personal activity, everyday routine, focus on the radio program.*

After the search of information, a brainstorm was carried out in order to find as many different aspects of the problem as possible. Then a number of criteria were defined in order to achieve maximal variation in about 40 scenarios, which were defined later. These scenarios, which consist of situations in private life where IT or similar aids are or may be present, were illustrated to make the situations more realistic. Simplified pictograms were used, which described the structure of the situation. The scenarios make it possible to see similarities and differences between different situations. With the help of the collected material, three product concepts were formulated as examples of the three important roles that IT can play in private life.

## 3.2 Conclusions

The scenarios helped us identify the different roles that IT can play in a social context. Even if it is already known, it is of special interest that IT offers new contact surfaces. With the help of modern technology, a number of devices for keeping in touch with other people have emerged, such as letters, telephone, telefax, mobile phones, pagers, video conferences etc. These all have different features and possibilities, and a certain technology cannot replace another. The technologies available today are intended for direct and fully concentrated interaction, while it is obvious that people often are involved in two or more activities at the same time, and that social interaction takes place at several levels. Through the use of other senses, technologies and configurations, new supplementary kinds of contact surfaces can be created.

One of the results from the scenarios is a design proposal that involves other senses and that offers a new way of communication. "The White Stone" (see below) is an object that offers a sense of presence and compassion merely through the sensation in your hand, and which is technically based on, for instance, simple GSM technology that is available today.

The dynamic characteristics of scenarios in combination with a systematic diffusion of criteria and the brainstorming technique can help the participants in a project to think in new ways and to find new aspects of a problem. Used in a sensible way, the method can quickly provide an overview of a problem as a departure point for further analysis, and it offers a possibility to structure non-quantifiable aspects. The limitations should be well defined so that the material does not become too vast. Furthermore, the criteria should be defined in a way that is not contradictory, but helps to generate a large number of situations.

## 4. VIRTUALLY LIVING TOGETHER – OBSERVATION & INVENTION

The second step in the design process become to narrow the area to family communication in order to form a basic understanding of how communication between family members takes place, and of how new forms of communication technology can improve social contacts between family members, even if they live apart. It was equally important to bring real users in real contexts into the design. The basis for this design activity is *Observation and Invention*, a design method that embeds early observations of real users in real contexts with visionary scenario-based design [27].

### 4.1 Observation & Invention

The key in *Observation and Invention* is to base future design on present observations. Future characters and scenarios are being formed, which will move the stage to the future use of a virtual system. Metaphors help to construct conceptual models and find corresponding representations. We will elaborate on each of these three steps below.

Firstly, in order to base scenarios in real needs and situations, a number of observations is made, on "real people" that represent different categories of families, representing different ages,





*Figure 3, Observations : Key theme - the key was carefully put at its place, usually on a special key holder.*

social situations and type of living. It is especially interesting to observe and identify key themes, actions or ways of handling items that are very similar, and to collect quotes. Observations, although, can take many different forms. The emergent field of rapid ethnography [15] give several alternatives how get into the contextual use of technology.

Eight rapid ethnographic studies were performed (in two series of four families each). The observations and discussions took place in their homes, and most of the material was videotaped but not transcribed.

The following aspects were of special interest:

- How everyday practice affects social contacts between friends and family members.
- When and how to talk to family members.
- The procedures for leaving and entering home.

When analysing the records of the observation, it is important to filter out relevant quotes and identify key themes, actions or ways of handling that are very similar. The quotes and key themes

become here the user's and the designer's voice in the design process, and they are clearly separated and well distinguished. On the basis of the observations, future scenarios and characters were created.

In the second step, scenarios are used to move from the past to the future, hopefully with correct assumptions about the changes in people's behavior and preferences. First, characters maps and situation sampling maps are created. Specific characters are created for the scenarios in order to keep the scenarios connected to different users. Visual tools help the designer to understand the character by sketching a drawing, or "being" the character for some time. Then multiple scenarios are created and used to explore changes in context. A useful scenario model is to make "A day in the life...". By using a number of identifying events, activities or designs, it is possible to compare alternatives.

The final step in Observation and Invention is to develop visual metaphors.

The general idea is not to find a suitable metaphor for the final design, but to explore the power of a range of metaphors, and to distil appropriate attributes that can influence on the design. These metaphors are usually called "throwaway metaphors" [19]. With the help of three fundamental paradigms for digital communication media: person - tool – media, sketches are made in order to explore the attributes.

## 4.2  Conclusions

We found that the interviewees usually had more technology in their homes than they realised, and that they used technology for all sorts of activities throughout the day. They woke up to their morning bell, they used technical devices to prepare breakfast, they listened to the radio, watched TV, talked on the phone, worked with their PC's, listened to music, washed their clothes etc. with the use of everyday technology. We realised that not only young people acknowledge new and convenient technology. One older woman found that some modern technology suited her well, for example the wireless telephone that she could bring out in the garden or put beside her bed when she feels ill at night.

We were told that the use of the telephone usually changed when the families in our study had children. Before, they could spend hours on the phone, but now it had become a device for interchanging practical information. In many cases, they acknowledged the importance of new technology for solving daily and practical issues. However, being "reachable everywhere and all the time" may be problematic.

One teenager reflected that he did not have deep conversations with his father on the phone and that he wanted to know what his father was doing.

*"My father always has practical excuses for calling me..."*

Two other persons expressed also the frustration with being only semi-connected to their relatives:

*"I stopped using the answering machine when I never could return the phone calls in time"*

*"I often feel guilty about not having enough time to call my mother"*

We found:

- a great need to improve the communication between family members who live apart,

- that practical arrangements and discussions often are an "excuse" to just talk,

- that family communication does not have to be direct, often it is preferable that it is abstract, and

- that the desire for privacy is not in accord with the desire to receive information.

*Figure 4, Scenarios of the White Stone using "A day in the life..." model : A child in search for her grandfather from the kindergarten.*

*Figure 6, The Frame : Concept prototype.*

The rich conceptions based on the observations resulted in fewer, but richer, scenarios compare to those scenarios developed with the use of "situated scenarios". In this context, the integration of key themes and quotes from the observations into the fictive characters and scenarios is a central activity.

As mentioned, visual tools, like snapshots and storyboards, and scenario models of "A day in the life..." are important tools for evaluating these different scenarios.

# 5. UNDERSTAND THE EXPERIENCE – PROTOTYPES

The next step of our design was to develop ideas by thoroughly exploring the interaction when these communication artifacts are being used. We thus designed industrial design models from the key concepts developed in the scenarios. Some of these industrial design models have been further taken into functional prototypes. To some extent, the evaluation is still work in progress, are we starting to uncover issues like;

- What criteria must be met to make it possible to experiment with feeling over distance with the carrier, and barrier, of telecommunication media?

- Could we use these functional prototypes to experiment with interaction in telematic emotional communication?

The vast majority of the users seemed to consider most new everyday technologies in domestic environments to be too bulky and difficult to use. By integrating the specific semiotic qualities that are based on the observations and the scenarios into industrial design models, our major design goal hence became to blend new functions into temporary objects instead of inventing completely new products.
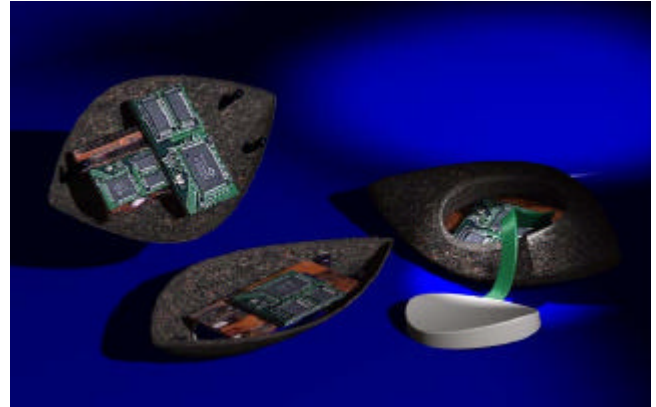


*Figure 5, The White Stone : Functional prototype.*

We wanted to design something that would introduce new styles of communication into an existing everyday object. Similar concepts has been explored by, e.g. [8] [16] [20] [24], but as these represent almost the only one that have been published we ignored the overlapping and designed what we felt was right. Next, we give a brief overview of our developed artifacts for emotional communication.

## 5.1 The White Stone

The idea of "The White Stone" is to make sublime communication and a sense of presence possible between two people, if possible by using cordless transmission. Today, there are a number of alternative technologies that can be used if you want to talk to another person, or that in some other way conveys information in words. However, there is no commercially available technology that offers the sense of touch or presence, which, together with body language, is very important when people meet in real life.

"The White Stone" is a white, round, electronic product about the same size as a pager. It should be used in pairs, which are automatically connected to each other only.

For example, you give one to your friend and keep the other one for yourself. Through sensors, for example heat or touch sensors, "The White Stone" can detect if someone takes it in his or her hand, and in that case it sends a signal to its sister "Stone", which will then beep (or produce a similar sound).

When the counterpart takes the stone in his or her hand, it will detect the touch and send a signal back to the first stone, which will be warmed up by an internal heating device. In this manner, two people can keep in touch and feel each other's presence in another way than by talking over the phone. As mentioned above, "The White Stone" does not replace the telephone or other communication devices, and it will never replace a personal encounter. On the other hand, "The White Stone" offers another contact surface between people – communication on a different level.

## 5.2 Personal portraits - The Frame

Most people have the same routines when they leave or arrive home. When arriving home, a common first activity in our study was to check if there was any mail in the mailbox (or on the floor
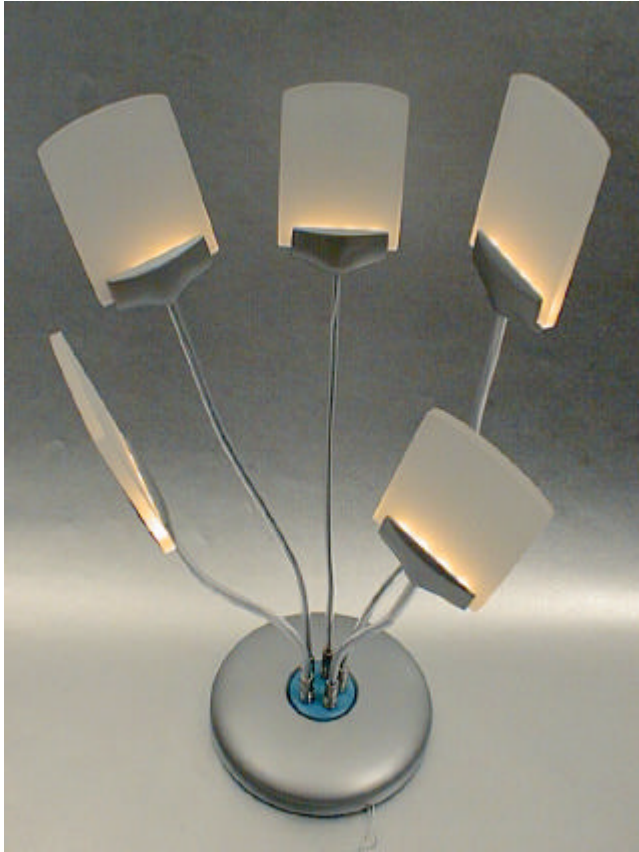
*Figure 8, 6th sense : Evaluation prototype.*

for those with apartments). Then the key was carefully put at its place, usually on a special key holder.

*The Frame* is based on whether a person is home or not (on/off). 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 indicator was conceived as a photo that rises when a person is at home and is dimmed when the person is not at home.

## 5.3 Light sculptures - 6th sense

When you enter a Scandinavian home in the wintertime you will soon realise the importance of light, and how different lamps are crucial for the carrying out of work and daily house-care even in the daytime. But the use of light is also essential to show that you are at home and to manifest the presence of life.

*6th sense* is a light sculpture. Through telecommunication it responds to the remote fluid of electricity or water. Place its sensors in an apartment belonging to someone close to you. By varying the intensity of the warm light from the multiple small light bulbs it becomes a living sculpture.

## 5.4 Furniture - SoftAir Communication

One of the qualities of a family household is the possibility to be alone even if living together. The awareness of life, care and closeness seems to be fundamental in social life.



*Figure 10, SoftAir Communication: Demonstrational prototypes – made for an art exhibition.*



*Figure 9, SoftAir Communication: Scenario.*

The *SoftAir Communication* chairs are a vision of communication with the use of a mundane everyday artifact. Sensors in the inflatable chairs pick up weight and movements, which "wake up" a remotely located chair, and with the use of embedded light and sound we can show our presence. When two or more chairs are used simultaneously, it is possible to interact through the chairs with the other person.

## 6. CONCLUSION

The idea of using professional industrial design competence in the project turned out to be a great success. Industrial design models maybe made out of rich material in order to establish a relation with its user in form and function. However, the use of our prototypes differs. In order to assess these approaches, the usability in terms of proof of concept, demo value, technical challenge and value in use should be considered.

Generally speaking, our different prototypes have been categorized into:

- Concept prototypes, that make it possible to demonstrate an idea in shape, color and weight.

- Demonstrational prototypes which are normally constructed for specific purposes and work best at exhibitions.

- Functional prototypes thus make it possible to test and evaluate certain aspects of the design solutions.

- Evaluation prototypes, finally, make it possible to carry out field tests.

This categorization has helped us to select appropriate levels for the prototypes, and thus saved us tremendous amount of time. We have developed, and will continue to develop, approximately 10 different prototypes that cover the range from concept prototypes to functional prototypes. Currently are we building evaluation prototypes with a Sensor-GSM toolbox that enable a flexible and robust platform for field tests.

## 7. DISCUSSION – ENVISIONING NEW COMMUNICATION MEDIA

We have found several indicators that a framework of design methods that concurrently apply down-to-earth grounding as well as blue-sky innovations, could be a great support in the design of new communication media. This duality reflects the way designers work and it can be implemented, as we will describe, in a bi-leveled understanding of a product.

Rapid ethnographic studies, character driven scenarios and interaction design prototypes have been our major design tools. We have thus expanded the use of scenario-based design to involve observations and prototype construction. The design framework broadly consists of the following components:

| ACTIVITY | FUNCTION |
|----------|----------|
| Observations | Base our innovations in a real context, bridge between cultures. |
| Characters | A map of plausible users and context |
| Scenarios | Leap from the present to the future |
| Prototypes | Understand the user's experience |
| Field studies | Assess the design in a real context |

In our experience, the main advantage of putting scenarios in the middle of this design loop is that they make us think about many levels of interaction at the same time. Scenarios also embody information about the environment, persons, and details, as well as other objects and activities  - hence they reflect the complexity of the real-world interaction between people, and with things.

As discussed above, our major design approach is to integrate new functions into temporary objects, instead of inventing completely new products. We hence wanted to design something that introduced new styles of communication into existing everyday objects. In this way, we hoped to create a bi-leveled understanding of our designed communication artifacts, objects that are known and provide a basic functionality that we already know, but also facilitate the development of new communication media.

We would like to argue that this design framework enable, and maybe even emphasis, such a bi-levelled design. However we need to investigate our design framework further, thus we plan to continue to use and develop this design approach in future work.

## 8. Future Work – Media Mappings

Finally, even if this paper were focused on outlining this design framework, we would like to address some issues concerning this communication medium.

We would like to explore communication media that convey impressions of presence and concern, which are qualities that are not very well understood. Our driving idea is that the richness in ambient media could be found in the mapping between the input of activity and its expression. The main purpose is to express intention and emotion.

In the four exemplified prototypes, we try to explore different ways of reacting to daily activities, and played with ambient forms of expressions that communicate awareness. The general approach is to respond in a domestic environment to a known activity as a sign that someone is at home, alive and healthy.

Our prototypes should thus be seen as an experiment on how we can interact and communicate with our bodies, and manifest our awareness, and emotional presence. The design goal is to enable bi-language communication through bi-leveled design. Our hypothesis is that adaptively is the core key. We believe that if we support adaptively, we could support the development of a new language in a specific communication media. We noted, for example, that some families had developed new personal code languages for beeper communication, due to that beeper allows a flexible use. Our idea is to provide a basic language that is very easy to understand, and at the same time make it possible to develop a new shared language that is based on touch, gestures, light, heat and sound. Using this approach we might start to understand how to enable emotional communication in new telepresence media. This is a working hypothesis that we will continue to investigate. Our first field study is an ongoing evaluation of the $6^{th}$-sense lightsculpture that will be used by 4 families during the study.

## 9. ACKNOWLEDGEMENTS

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