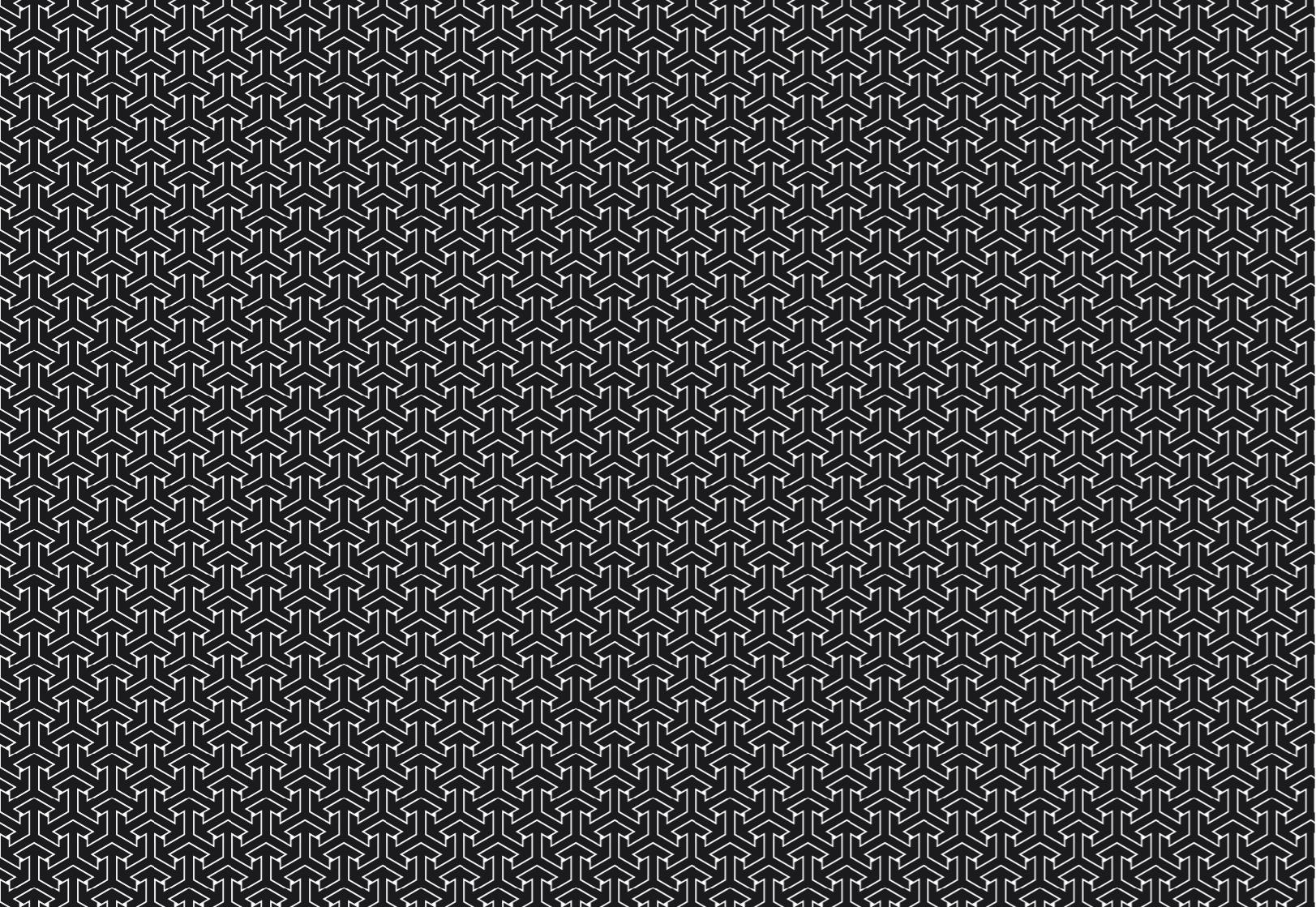
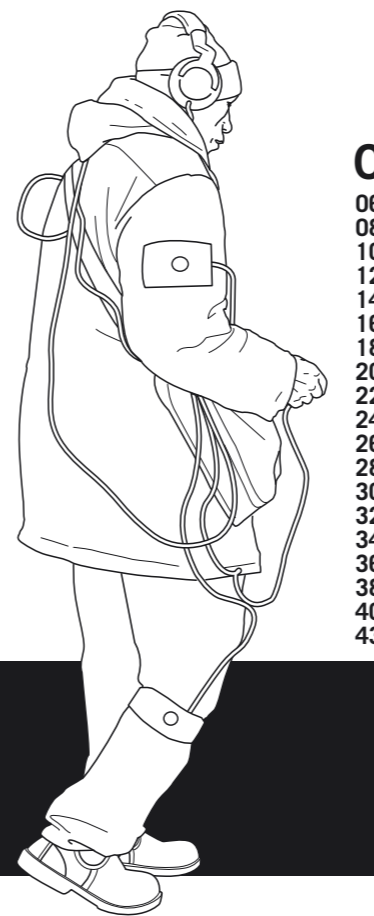




MOBILE LIFE

THE
MOBILE SERVICES
PROJECT





CONTENTS

- 06 HALFWAY REPORT FOREWORD BY PROF. KRISTINA HÖÖK
- 08 INTRODUCTION: FROM MOBILE WORK TO MOBILE LIFE
- 10 MOBILE TECHNOLOGY AND EVERYDAY CREATIVITY
- 12 MOBILE MEETINGS: FACE-TO-FACE AND SCREEN-TO-SCREEN
- 14 DESIGNING THE SEAMS BETWEEN REAL AND VIRTUAL ARCHITECTURE
- 16 STRETCHING THE LIMITS OF MOBILE TECHNOLOGY
- 18 DESIGNING INTERACTION WITH MOBILE TECHNOLOGY
- 20 INTRODUCTION: CREATING NEW MOBILE SERVICES
- 22 HOCMAN – SPARKING INTERACTION ON THE ROAD
- 24 CONTEXT PHOTOGRAPHY – CAPTURING THE INVISIBLE
- 26 MOBITIP – TIPS AND HINTS FROM PEERS
- 28 BACKSEAT GAMES – TURNING TRAVEL INTO A FANTASY ADVENTURE
- 30 GEONOTES – VIRTUAL POST-ITS
- 32 MOBILE COLLABORATIVE GAMES
- 34 SONIC CITY – A MUSICAL DUET WITH EVERYDAY URBAN ENVIRONMENTS
- 36 PLACEMEMO – SUPPORTING MOBILE REPORTING IN A VAST WORKING AREA
- 38 EMOTO – EXPRESSING EMOTIONS IN A DIGITAL WORLD
- 40 SOUNDPRYER – JOINT MUSIC LISTENING ON THE HIGHWAY
- 43 CONTACT INFORMATION

HALFWAY REPORT

We are proud to present the “halfway” report from the Mobile Services project. The project financed by the Swedish Foundation for Strategic Research and involves researchers both at institutes and universities.

Since the project started in summer 2002, the project members have produced numerous results, have had intense discussions, and are now arriving at some useful and interesting insights. The research takes as its point of departure our understanding of today’s mobile practice in Sweden. Sweden is a country with a comparably high usage of mobile technology, making it ideally situated to take the next step in mobile technology.

The aim of this project is to lay the groundwork for this next step, preparing us for the future mobile life. We wanted to take the innovation process of

mobile services a step further, beyond intuition, inspiration and ad-hoc processes, and knowledge and methods for design to what is otherwise still for the most part considered a “black box”. In addition to producing technological innovations needed to enable the future mobile life, we also study current practices, stage future settings with new mobile services, evaluate their potential with end users, and find the forms and designs of expressions that will appeal to a wide range of people.

The researchers of the project are a highly interdisciplinary group, and come from four different organizations.

The Future Applications Lab from the Viktoria Institute in Gothenburg is a newly formed group building upon the vision of and previous work by Lars Erik Holmquist, PhD. Lars Erik worked on some of the first and most innovative mobile services researched in Sweden, such as wireless mobile awareness devices and efficient web browsers for small screens. The work in his new group focuses on creativity and innovation, and aims to develop concepts that could become products within 5-10 years.

The Mobility Studio at the Interactive Institute in Stockholm is led by Oskar Juhlin, PhD, whose previous work was in the area of intelligent transportation systems. Oskar has a strong vision for how to enhance the experience of travelling in cars and other vehicles, transforming the road into an arena for novel and truly mobile experiences.

The Social Computing Group from the Swedish Institute of Computer Science in Kista outside Stockholm, is led by Martin Svensson, PhD. Martin recently completed his thesis work on social navigation, showing how it is possible to use traces of other users to help guide us through the information space. His current vision is to move from web-based applications to navigation in the real world, where social trails can be left as virtual traces for others to use.

Finally, the newly formed group INVOLVE at the department of Computer and Systems Science at Stockholm University/KTH, also in Kista, is formed from my ideas on affective interaction. We aim to make users more emotionally involved with mobile services, with both body and mind, through novel expressive channels such as gestures, colours and animations.

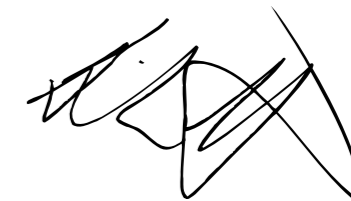
When these four groups come together and discuss our empirical findings, compare experiences from the design of mobile services, share notes on our studies with end-users of those services, and so on, the sum is larger than the individual parts. In the first half of this report we want to share some

of the conceptual insights we have arrived at so far.

The second half describes each of the specific mobile service we have developed in some more detail.

While this is intended an easy to read overview of our work, there are also extensive scientific reports on most of our results. So far, the project has produced more than 35 reports of high scientific quality, all of which can be obtained from our websites. And if you want to know more, please feel free to contact us for more information!

KRISTINA HÖÖK



FROM MOBILE WORK TO MOBILE LIFE

If we take a closer look at how mobile phones and other small devices are actually used, we find that the underlying commercial assumptions that determine how this technology is designed do not always fit with what people actually do. Mobile phones are used in all settings – even those that we might consider prohibited, such as classrooms or fitting rooms.

Teenagers share mobile phones among themselves, rather than keeping them as individual possessions. In the car, the travelling salesman will manage his daily duties as well as family commitments.

The use of mobile technology has become an everyday phenomenon.

We use advanced computing and communication devices in everyday settings, both in work and leisure. Functionality that was previously only available in stationary environments have moved out from the offices and into the streets, out in the public. Mobile technology is now used in many places and situations where it was previously impossible to communicate and be reached.

Our research in this project is based on an understanding of today's

practices, ranging from anonymous motorcyclists' traffic encounters to intimate relationships. In our studies, there are many examples of mobile technology use that are far away from instruction manuals and commercials. Take for example a scene from our studies, where a young girl receives a phone call while trying on clothes in a fitting room. Or think the boy who answers his phone during class, a place where phones are banned – he says “but it's no problem”. Mobile technology enable us to push the limits of what activities belongs in what place. And picture a group of teenagers, who share the mobile phone among themselves, so that they all can take part of the phone call. Someone tells calls and tells them that they are in “the wrong place,” because it's more fun somewhere else. Or imagine the girl who composes a text message, very carefully choosing her words, and reads it aloud to her friends to get their consent before sending it.

The classic user scenario, which assumed one user–one mobile phone, is no longer always valid. Young people find creative new ways to use a technology originally designed for remote personal communication, to make it

fit into their practice of socializing in groups.

And it's not just the lives of teenagers that have been transformed. When we spent time with a salesman travelling around Sweden, this revealed the intricate and interesting balance between how people utilise mobile technology in the car. The salesman would handle not only work tasks, such as planning future business meetings or managing his calendar, but also arrange family events. Mobile technology allowed him to juggle work tasks while driving the car and maintaining contact with family.

These examples indicate that inventing new mobile technology is a complex process, because such technology has a tendency to enter into people's work and private lives, changing the social textures of activities.

In the following pages, we provide some glimpses of our current thinking about these issues. This is a halfway report, and therefore we will not provide you with too many straight answers or ready-made solutions. Instead, we hope to stimulate further thoughts and debates on the problems and opportunities associated with researching services for mobile life.

FURTHER READINGS

Esbjörnsson, M. and Juhlin, O. (2003). Combining Mobile Phone Conversations and Driving - Studying a Mundane Activity in its Naturalistic Setting. In Proceedings of ITS'2003, 10th World Congress and Exhibition on Intelligent Transport Systems and Services. Ertico, ITS Europe.

Esbjörnsson, M., Juhlin, O. and Östergren, M. (2003). Motorcycling and social interaction – Design for the enjoyment of brief traffic encounters. In Proceedings of Group'2003 – International Conference on Supporting Group Work. ACM Press.

Rudström, Å. and Höök, K. (2003). Designing a Mobile Social Service for a Mall: User experiences of Kista Galleria. SICS Technical Report No. T2003:26.

Rudström, Å. (2003). An ethnographically inspired study of a shopping mall and mobile life within. SICS Technical Report No. T2003:25.

Vesterlind, D. (2003). Shared Spaces Shared Responsibility: Designing for Non-Obstructive Browsing In Proceedings of IRIS'26, 26th Information Systems Research Seminar in Scandinavia. Weilenmann, A. (2003) Doing Mobility. Doctoral dissertation, Gothenburg Studies in Informatics, Report 28, June 2003.

Weilenmann, A., (2003) “I can't talk now, I'm in a fitting room”: Availability and Location in Mobile Phone Conversations. In Environment and Planning, special issue on Technology and Mobility, ed. E. Laurier, volume 35, (9) September, pp 1589 - 1605, Pion Ltd.

MOBILE TECHNOLOGY AND EVERYDAY CREATIVITY

We believe that mobile technology should be designed to support not just “serious” work activities, but also other aspects of mobile life. While this includes games and entertainment, we must also consider services that allow everyday creativity, encourage reflection and exploration, promote social connections, and provide cultural and intellectual stimulation. Mobile technology is a new medium with infinite possibilities, and should be treated as such – not just as a means to make us more efficient workers.

In everyday life, the boundaries between different roles and activities often blur. At breakfast, we might adopt family roles and responsibilities.

At work we take on professional roles such as waiter, farmer, office worker or boss. At breaks, we adopt more relaxed and private social roles.

Shopping makes us aware of our consumer rights and obligations, while with friends we become entertainers, gossipers, and therapists. Travelling may turn us into tourists, sports into players and teammates, and so on.

Every role means shifting responsibilities and allegiances vis-à-vis other people, and thus fundamentally affects how we set priorities.

Information technology has mostly been developed for professional use. The desktop computer was designed to support document workers, the mobile phone was introduced as a communication tool for busy professionals. Thanks to the wireless Internet, we will soon have access to electronic information anywhere,

at any time. But should the only purpose of mobile technology be to extend our working hours until they completely take over our lives? History teaches us that as the price drops, technology gradually becomes adopted for everyday use, and people will find uses of technology that go far beyond the original intentions. The mobile phone is a good example of this – while still important in professional use, it has also become a way for grandparents to keep in touch with their children, teenagers to flirt, or friends to coordinate meeting points on a Saturday night. It has changed from being an expensive status symbol to become a natural part of our everyday life.

In this project, we have strived to design services that involve all aspects of mobile life. For instance, in Sonic City, the city becomes a musical instrument. By walking through everyday streets, you create your own musical composition. In Context-Aware Photography, we enhance the act of taking digital photos. By giving the photographer access to many more variables than just the image, she can capture “invisible” factors like ambient sound and temperature. In eMoto, we support the affective component of mobile messages, by allowing people to communicate emotions, not just information. And Soundpryer creates social connections between drivers by letting them listen in on each other’s car stereos, providing insight and awareness of co-located drivers.

These and other examples show how mobile technology can go beyond work and into everyday life. As the boundaries between our roles continues to blur, it not only becomes more and more difficult to tell leisure and work apart – it also becomes difficult to tell what is a mobile service and what is just another part of our everyday activities. Ultimately, we will not think of this new technology as computers or services, but regard it simply as a part of the fabric of our mobile life.

MOBILE MEETINGS FACE-TO-FACE AND SCREEN-TO-SCREEN

Everyday meetings are governed by intricate protocols. We glance at each other, nod, slow down, turn, to perhaps finally initiate a conversation. As the devices we carry on our persons become equipped with wireless networking, they will also start to meet. These meetings are similarly governed by complex protocols, to enable peer discovery, ad hoc networking, and efficient information transfer. Because of this, we will soon not only share our physical appearance with others, but also exchange digital information, recommendations, music and pictures. But the meetings that happen between machines must be better adapted to the meetings between people.

As a person moves throughout the day, she encounters others in different situations. She meets acquaintances, family members, colleagues and friends, all with which she might be engaged in on-going activities. In working life, many meetings are arranged, but random encounters can also be useful: “Oh, now that I see you I remember that I should have talked to Margret”; “Excuse me, can you tell me where to find the office of Dr. Johnson?”. Random encounters can also be a source of enjoyment in themselves, as when kids meet up in the playground.

Everyday encounters have an important experiential quality. Swift meetings between people who do know each other make city life enjoyable. And most people enjoy leisurely walking the streets and looking at other

people in public places.

In mobile life, when people meet, their personal devices also meet. The mobile phone connects to another phone over Bluetooth or an infrared link. Laptops and handheld computers meet each other over wireless network in ad hoc mode.

In our projects, we have taken such technology as an opportunity to enrich and support these encounters even further. In Collaborative Games, kids meet at the schoolyard at the same time as their game pods connect to enable multiplayer gaming. In Hocman, motorcyclists drive by each other, get a brief look at the way they drive and the looks of the bike, while their PDAs also meet, playing sounds for the drivers as images and texts are exchanged. And in MobiTip, as people file into a restaurant for lunch, their phones meet to exchange tips and recommendations.

But the way people meet face-to-face is different from the way they meet “screen-to-screen”. On the Internet, people post information on web pages, share ideas in newsgroups and chat rooms, and engage in anonymous communication with others. However, the way people are anonymous on the Internet is not the same as the way people are anonymous in public places. If someone’s device has provided you with a recommendation during an encounter (“this restaurant sucks!”), it might often be possible to figure out which person was the source. But perhaps that person did not want to you to know it was her recommendation – especially if you are, say,

the owner of the restaurant! There are many codes for conduct in real life that can be difficult to teach a computer – and after all, we wouldn’t want our machines to embarrass us by doing something inappropriate. For the mobile setting we need to find the proper balance for the means for social interaction, and to design the sharing information in a way that is acceptable for each situation.

From a technical perspective, it is entirely possible to initiate a screen-to-screen meeting between people who are in proximity of each other. The problem lies in the fact that the communication protocols of machines are different from the social protocols of people. For instance, how do we include only the devices of people who perceive themselves as having a meeting with? People do not engage in conversations with everyone at a café. Drivers focus their attention more on drivers in front than those behind. Machines have no way of reading this type of social protocol.

We have to continue to fine-tune the technical means of supporting communication by matching it with those specific situations that are also seen as meaningful encounters by the users.

DESIGNING THE SEAMS BETWEEN REAL AND VIRTUAL ARCHITECTURE

Architects have long experience in perfecting not only the functional qualities of buildings and urban space, but also their aesthetic qualities.

Mobile technology is a much more flexible and powerful design material than concrete and steel, the design of virtual spaces layered on top of physical space is not yet well developed. If we want to help end-users understand the virtual and real space, it is not enough to create more refined positioning systems or support for seamless access to networks everywhere. Instead, by designing architected seams and allowing for active co-construction of space we can support an understanding of the dual nature of mobile services – and create a better dialogue between the “real” and the “virtual”.

In mobile life, we move through both real and virtual places at the same time – and one affects the other. The fact that a mobile phone communicates with the nearest base station, and a PDA needs a hotspot to access the Internet, creates both obstacles and opportunities. Most developers of mobile services make the assumption that users should ideally never have to worry about when and how they are connected to the virtual space – they should always be seamlessly connected. Another common assumption is that a perfect positioning system would solve the problem of connecting the virtual information to the correct physical location.

But virtual places cannot always be mapped to physical coordinates. One of the groups of this project developed GeoNotes, which was one of the first mobile services for attaching “virtual Post-It notes” to physical locations. The system allowed users to name places within the spaces covered by the positioning system. To our surprise, users started entering names not only of physical locations within the space, but also of virtual places. They created a “VIP-room” for exclusive meetings, even though such a location did not exist. They also posted notes at smaller locations than the positioning system could handle (“the lecturer’s forehead”) and created names of places covered by several hotspots.

Both the virtual and the physical are subject to change – but not necessarily at the same rate. In the MobiTip system, users can leave tips and recommendations around a shopping mall, such as “the café in the fashion boulevard is less crowded now than most other places” or “the quality of the sweaters at the jersey store is really bad”. Here, we found mismatches in terms of what happens over time in real versus virtual space. Users live in differing, private time spheres, meaning that information becomes outdated or is introduced before the corresponding real-life event takes place. Physical and digital encounters may also be mismatched. In HocMan, a mobile service for motorcyclists, personal web pages are swapped between

bikers as they pass each other on the road. On one occasion, a biker happened to be hidden from view. A passing biker became very confused when he heard the beep that indicated that he had just passed another biker- even though there seemed to be no one there. This pinpoints the problematic nature of combining the real world with digital meetings between people.

As these examples show, we need to be careful with the notions that end-users will always be connected and therefore need not know where the connection points are, or that better positioning will solve all problems. Instead, in systems such as Sonic City, MobiTip, HocMan, SoundPryer and Placememo, we have explored and designed for alternative ways of making explicit use of the seams between virtual and

real worlds.

Through making the digital architecture more or less visible in the design of mobile services, and even, in some cases, explore functionality that builds on information or functionality being tied to certain digital places or the movement between places, we are, in effect, creating architected seams. The architecture may show up on the end-user’s device as concrete notifications of the location and properties of a connection. It may be conveyed through indirect means such as changing the background colour of some interface when in range of some other device or hotspot, or it may be made explicit in the physical space instead. Functionality may become available only in certain digital places, or when devices pass by. All of these require

substantial understanding from the end-users to make sense – thus the need for careful design rather than seamlessness.

We also explore ways of making users active co-constructors of these virtual and real architectures. Users can name places, make couplings between real and virtual objects, and create and re-create the virtual spaces that go beyond the real. Through this active process, users will also learn about and define the seams. By designing architected seams and allowing for active co-construction of space we can better support end users in their understanding of the dual nature of future and current mobile services.



CREATING NEW MOBILE SERVICES

To explore the properties of the mobile settings, and investigate the different themes, we have developed a number of prototype services. Common between them all is the focus on supporting future mobile life.

In order to create an understanding of today's practice, and to create a map of the design-space, we have used a number of methods, both established and innovative. These include ethnographic studies of today's mobile life, cultural probes, surveys, and user-driven innovation. The design-process has taken various forms. Sometimes we have taken a participative approach, where users have been involved in the design.

In other cases we have used rapid prototyping, where the services have passed through several iterations of design and implementation. We have also performed different types of evaluations. These studies range from low-tech evaluations such as Wizard of Oz studies and workshops, to full-blown field trials for some of the prototypes.

In the following pages, you will find information about the services that have been developed in the project so far.

- HOCMAN** – MOTORBIKERS EXCHANGE INFORMATION DURING BRIEF ENCOUNTERS ON THE ROAD
- CONTEXT PHOTOGRAPHY** – A CAMERA THAT CAPTURES THE INVISIBLE, LIKE SOUND AND TEMPERATURE
- MOBITIP** – LETS PEOPLE SPONTANEOUSLY SHARE TIPS AND RECOMMENDATIONS IN PUBLIC MEETINGS
- BACKSEAT GAMES** – THE CAR AND ROAD BECOMES A VIRTUAL PLAYGROUND
- GEONOTES** – A SYSTEM FOR ATTACHING VIRTUAL POST-IT NOTES TO PHYSICAL LOCATIONS
- MOBILE COLLABORATIVE GAMES** – MULTIPLAYER GAMES THAT BREAK THE SCREEN BARRIER
- SONIC CITY** – CREATE YOUR OWN MUSICAL COMPOSITION BY WALKING THROUGH A CITY
- PLACEMEMO** – ALLOWS SERVICE WORKERS TO LEAVE PLACE-BOUND VIRTUAL NOTES
- EMOTO** – LETS PEOPLE EXPRESS EMOTION IN MOBILE MESSAGES
- SOUNDPRYER** – SHARE THE MUSIC ON YOUR CAR STEREO WITH OTHER DRIVERS

HOCMAN SPARKING INTERACTION ON THE ROAD



Hocman is a prototype service designed to promote and spark social interaction among motorcyclists on the road. This is a loosely organized community, which holds biking as an important leisure activity. Bikers share the passion for driving and they enjoy driving along curvy roads, hearing the roar of the engines while feeling the headwind. Even though such experiences are primarily individual, biking can also be strikingly social. Bikers like to meet other bikers and particularly so along the roads. Naturally, such meetings tend to be rather brief and geographically dispersed. In order to get more out of biking they organize various forms of get-togethers. For example, they go to large public gatherings at well-known places,

whereas smaller groups often use the web message boards and mobile phones to set up meetings.

Hocman highlights and keeps track of brief meetings among bikers. It is a piece of software developed for handheld computers capable of short-range and ad hoc wireless networking. Its operation is limited to the range of the wireless transmitter. A handheld computer allows a biker to carry it around, for example in the pocket. When the biker heads out on the roads the software continuously senses the devices nearby. Whenever a device appears two things happen: A sound alert is played in order to notify the biker that a meeting is about to take place, and an exchange of web pages is

performed automatically between the devices.

These web pages are personal and may contain the bikers contact information, for-sale ads, pictures. When the exchange is completed the encounter is logged. When the biker gets off his bike he can examine his log and read the pages captured. The pages will be helpful when planning future rides or when referencing to rides in discussions in other prevalent media. In this way, Hocman will heighten the experience of each encounter, as well as increase their frequency. It brings the Internet out on the roads – where the really interesting activities are taking place!



FURTHER READING

Esbjörnsson, M., Juhlin, O. and Östergren, M. (2002). The Hocman Prototype – Fast Motor Bikers and Ad Hoc Networking. In Proceeding of Mobile and Ubiquitous Multimedia (MUM) 2002, Oulo, Finland.

Esbjörnsson, M., Juhlin, O. and Östergren, M. (2003). Motorbikers Using Hocman – Field Trials on Mobile Interaction. In Proceedings of Mobile HCI' 03, Fifth International Symposium on Human Computer Interaction with Mobile Devices and Services, Springer Verlag.

Esbjörnsson, Mattias, Juhlin, Oskar, and Östergren, Mattias (2003), Motorcycling and social interaction – Design for the enjoyment of brief traffic encounters, In proceedings of GROUP'03, International SIGGROUP Conference on Supporting Group Work, ACM Press.

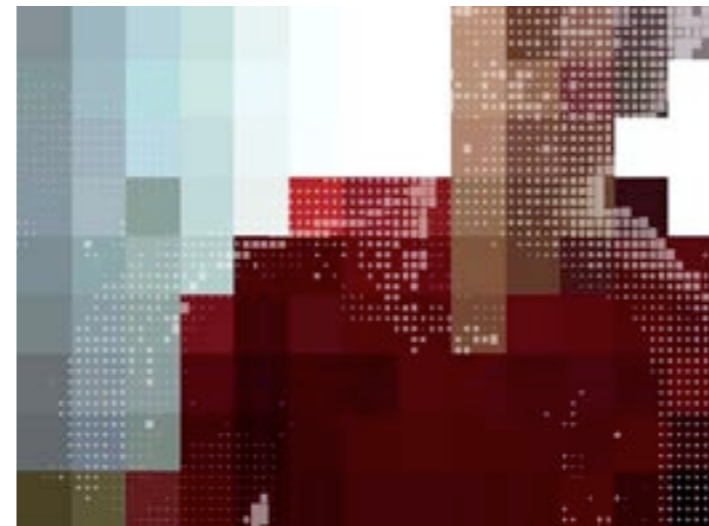
Esbjörnsson, M., Juhlin, O. and Östergren, M. (2004). Traffic Encounters and Hocman – Associating motorcycle ethnography and design, Forthcoming in Journal of Personal and Ubiquitous Computing, Springer-Verlag 2004.

CONTEXT PHOTOGRAPHY CAPTURING THE INVISIBLE

It is a summer evening. Alma is riding her bike to a party when she hears, from a distance, the familiar sound of a ferry departing from the harbour. She has been waiting for this moment and sets off towards the river walk to catch up with the huge ship. She is excited to see what pictures she can take with the sound of running engines in the background. By the river, she picks up her camera, points it at the bridge and the sky, and when the horn of the ferry blows, she snaps some pictures. She likes the way the loud noise has given the bridge a rough, pixelised look, quite different from the images taken yesterday morning when the river was quiet. She puts the camera back and heads for the party. She is eager to show Andreas the pictures she just took and wonders where he will have

With this service, we wanted to go beyond traditional conceptions of photography, and explore creative alternatives. Cameras are more than just tools for documentation, and even simple analogue cameras allow for creative practices and personal expression. Lomographers, for example, is a group of amateur photographers who make use of the peculiar optics of old Russian cameras to take unpredictable aesthetic images. As creative tools, digital cameras have the potential to transcend the mechanical and optical constraints of analogue devices, thereby giving birth to new aesthetic practices in the act of taking a picture.

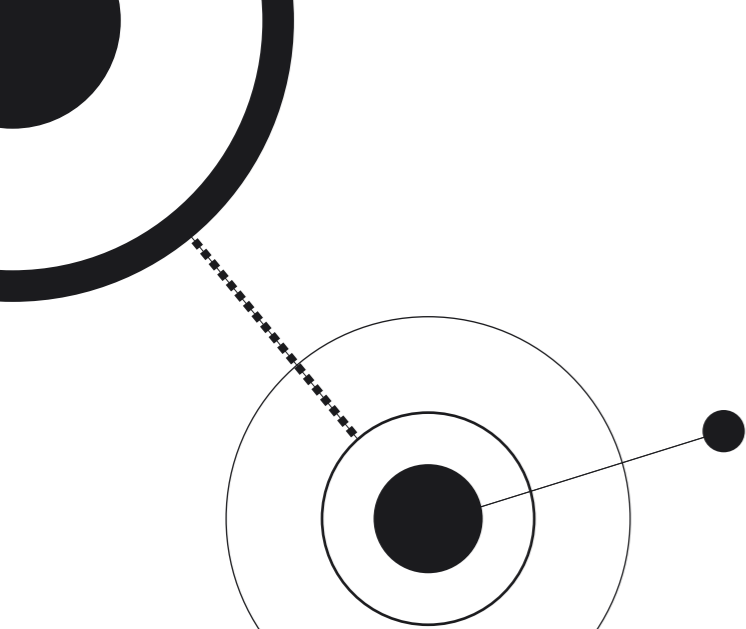
Our first approach has been to make more parameters available to the photographer. We have created a prototype camera that is capable of capturing more context than incoming light in an image: information about the physical context is gathered from various sensors (e.g. noise level, movement) and visually affects pictures as they are taken. We arranged workshops where amateur photographers took pictures with our camera prototype in different everyday settings. We observed how they sought out interesting contexts such as the sound of a departing train, or actively created a new context by screaming or moving. Our workshops with the prototype provided insight and inspiration for a new scope of possible experiences and practices in digital photography.



FURTHER READING

Håkansson, M., Ljungblad, S. and Holmquist L. E. (2003). Capturing the Invisible: Designing Context-Aware Photography. In Proceedings of Designing for User Experiences (DUX '03), ACM Press and American Institute of Graphics Arts.

Ljungblad, S., Håkansson, M., Gaye, L. and Holmquist L. E. (2004). Modifying the Digital Camera Into a New Creative Tool. Extended Abstracts of CHI'04, Vienna, Austria, ACM Press, New York.

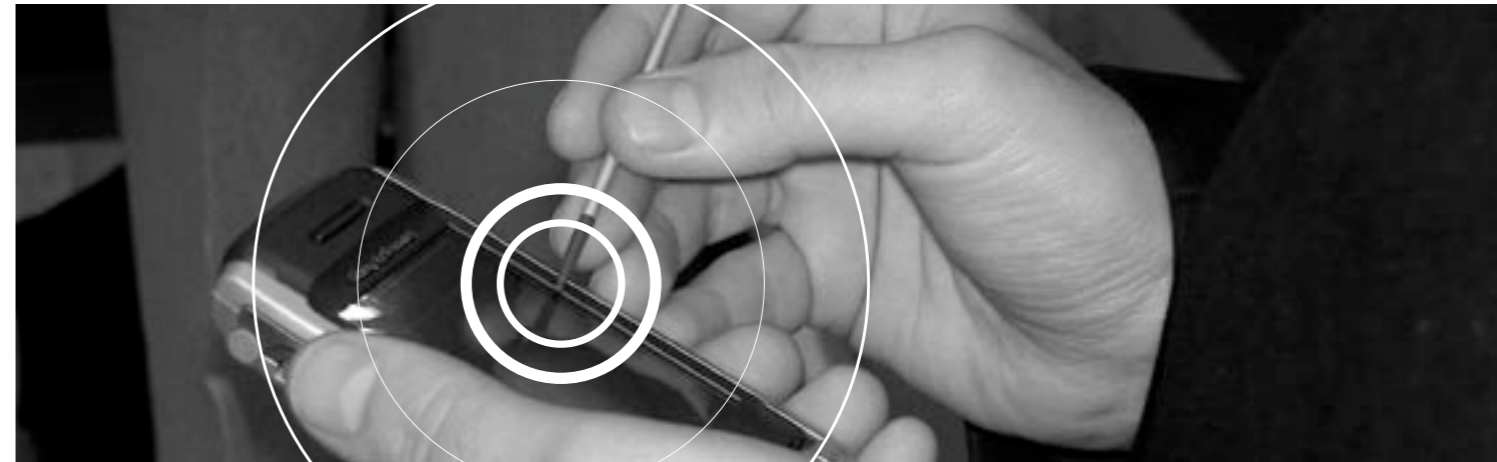


MOBITIP TIPS AND HINTS FROM PEERS

You may think that you know all there is to know about your local mall. But the mall is more than its shops and stores: it is full of people like you, with their unique knowledge about the place. Did you know that the boring café on the top floor becomes a party place on Thursday nights?

MobiTip runs on Sony Ericsson P800-900 mobile phones and allows users to enter comments, recommendations and tips about anything that they want to express an opinion on. It operates within a limited spatial scope – such as a shopping mall. Comments given by one person are made available to another when users pass each other in the mall, when they approach connection hot spots, or on demand. What the system presents in a given situation is based on similarities between you and your fellow users, and on tip popularity.

User movement, tips and reactions to tips form a web of social trails.



The storage of this web is distributed over the users' phones and over strategically placed Bluetooth hotspots. Visibility and access to tips and other functionality varies as the user moves through the mall. Nearby users will appear and disappear from the screen. Most of the time users will not be in range with any hot spot but be "floating" or connected to surrounding users in ad hoc networks. There is no need to be seamlessly connected.

An underlying assumption for an application such as MobiTip is that people are willing to contribute for the benefit of others. Experience from the world wide web tells us that this a fair assumption: people are willing to promote themselves by contributing content as well as personal information in forums such as personal web pages, edited collections of links and web logs.

FURTHER READING

www.mobilelife.org/mobitip

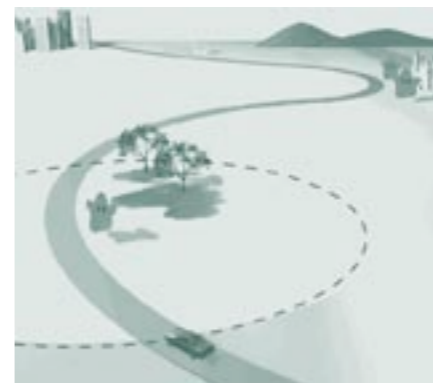
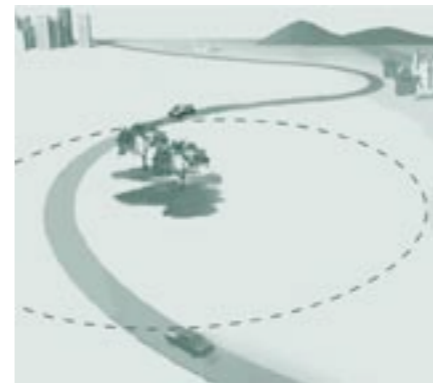
BACKSEAT GAMES TURNING TRAVEL INTO A FANTASY ADVENTURE



“Are we there yet?” For kids, travelling in a car can be very tedious – but with Backseat Games any trip turns into an exciting adventure! The game turns churches, bridges and other roadside objects into a fantasyland filled with virtual creatures, treasures and adventure. By aiming the gaming device towards objects as they are passing by, players can defend themselves against attacking creatures, collaborate with meeting players or pick up magic artefacts.

Two different prototypes have been developed on handheld computers. We used a digital compasses and GPS-receiver to connect the game to the surrounding world, and to make it possible for the player to aim at different real world objects. Ad-hoc peer-to-peer networking connects the players to each other when within range.

Mobile games have the potential to be compelling in a new way, if they include the vivid and dynamic mobile context. Car travelling is a perfect example, where the ever-changing scenes, the speed and the rapid encounters help to provide an extraordinary experience. Our research questions concern how mobile games can benefit from travelling, and we want to better understand the possible connections between games and the surroundings. It is important to carefully take into account spatial relations and to understand how the game should be designed so that the player understands what to do in this new environment. Children should enjoy exploring and travelling through the magic landscape, as well as



FURTHER READING

Brunnberg, L. and Hulterström, K. (2003) Designing for physical interaction and contingent encounters in a mobile gaming situation. Presented at the workshop on Real World User Interfaces, at Mobile HCI 2003, Fifth International Symposium on Human Computer Interaction with Mobile Devices and Services.

Brunnberg, L. and Juhlin, O. (2003) Movement and Spatiality in a Gaming Situation – Boosting Mobile Computer Games with the Highway Experience. In Proceedings of Interact 2003, Ninth IFIP TC13 International Conference on Human-Computer Interaction.

GEONOTES

VIRTUAL POST-ITS

Charlie, a student at the IT-University in Kista, had huge problems with an assignment he got at a seminar. He wanted to see if he could get some help from one of his fellow students. Using his handheld computer, he posted a virtual note about this on the entrance to their seminar room. Hopefully someone would see it at one of the next seminars, and perhaps he would get a reply before the assignment was due.

GeoNotes is a location-based information system where users are allowed to both read and write short pieces of text that are positioned in the physical world. Via wireless handheld terminals, users can access a virtual world of information that overlays the physical world where they live. The posted information can be anything from greetings to recommendations and comments on other people's notes. To handle the potential information overload users are equipped with a range of functionality that allows them to sort and sort out notes that they are especially interested in.

Initially the positioning system is built around hotspots in a WLAN network but with increasing use it gets more and more specific. Users that want to post notes in the system also gets to choose a physical object to which they want to attach their note. They get to see a list of objects that are previously named around the hotspot to which they are currently connected. They can either choose one of these objects or add a new one to the list. This way it is the users that decide the granularity of the positioning. There can be small objects such as "the lecturer's forehead" or larger objects such as "the university". It is all up to the users to decide.



FURTHER READING

Petra Fagerberg, Fredrik Espinoza, and Per Persson. (2003) What is a place? Allowing users to name and define places, In CHI '03 extended abstracts on Human factors in computing systems, Ft. Lauderdale, Florida, USA, pp. 828 – 829, ACM Press, New York, NY, USA.

Per Persson and Petra Fagerberg. (2002) GeoNotes: a real-use study of a public location-aware community system. Technical report, (T2002:27), Stockholm, SICS.

Persson, P., Espinoza, F., Fagerberg, P., Sandin, A. & Cöster, R. (2002) GeoNotes: A Location-based Information System for Public Spaces, in Kristina Höök, David Benyon and Alan Munro (eds), Readings in Social Navigation of Information Space, pp. 151-173, Springer Verlag.

MOBILE COLLABORATIVE GAMES

FURTHER READING

Sanneblad, J. and Holmquist, L. E. Designing Collaborative Games on Handheld Computers. Sketches and applications of SIGGRAPH 2003, ACM Press / ACM SIGGRAPH.

Sanneblad, J. and Holmquist, L. E. (2003) OpenTrek: A Platform for Developing Interactive Networked Games on Mobile Devices. In Proceedings of Mobile HCI 2003, Fifth International Symposium on Human Computer Interaction with Mobile Devices and Services, Lecture Notes in Computer Science vol. 2795, Springer Verlag.

In Pacman Must Die! the classic computer game gets a unique twist. As in the original game, your game character must run through a labyrinth and “eat” coloured dots. But some of these dots are on one of the other players’ computers! You can “enter” another player’s screen through a door in the labyrinth. When this happens, you still use your own controls, but must look at the other player’s screen to see where you are going. If she is cooperative this will be easy, but what happens if the other player tries to block the screen – or even runs away with the screen when you are playing on it?!

Our close collaboration with the academia has given us the opportunity to let students help us out with creating advanced research prototypes.

One such example is the Collaborative Games project, which started as a university course in mobile applications development. The students were given the task to design and implement a multiplayer game for mobile devices, which required the players to collaborate verbally in order to succeed. The students first got a brief introduction to games development and were taught on how to use the mobile platforms GapiDraw and OpenTrek. The result of the course was twelve different games, many of which introduced totally new interaction techniques. There was everything from collaborative adventure games where players had to combine game characters with different abilities, to strategy games where up to six players would collaborate to defend Earth from space invaders.

To see how people would respond to these Collaborative Games, we found some eager test subjects – high school student at a local café. The students quickly got into the games, and soon started to interact; talking to each other during the games, hiding or revealing displays to each other, sometimes running away to make it harder for another player to win! Even in this small test, it was clear that the boundaries between “virtual” and “real” world interaction started to blur, showing how mobile gaming can turn into a very social experience.

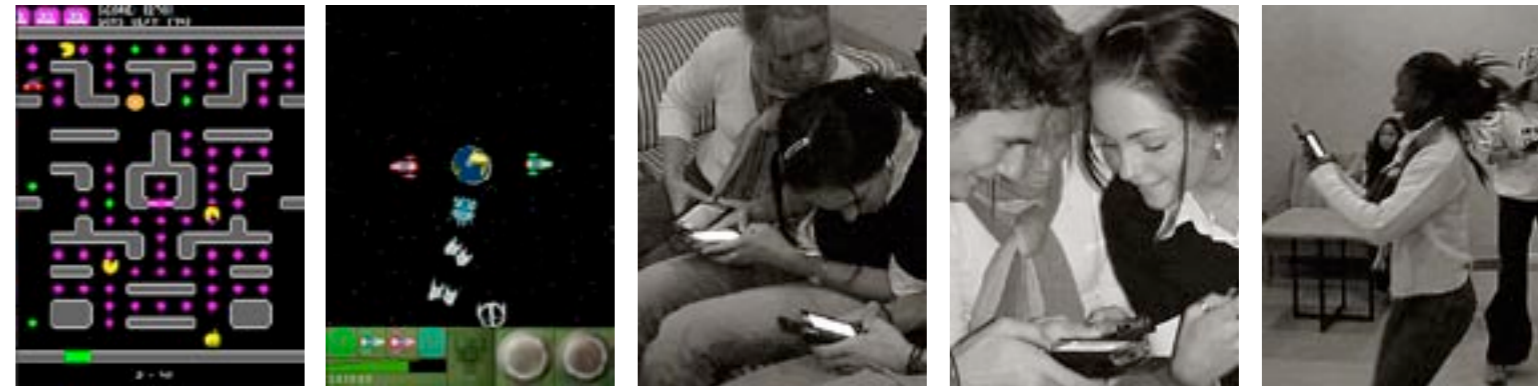
PLATFORMS FOR MOBILE LIFE

The GapiDraw graphics platform for most mobile operating systems (including PocketPC, SmartPhone, Symbian and Palm) can be downloaded from:

www.gapidraw.com

The OpenTrek networking platform for PocketPC can be downloaded from:

www.opentrek.com

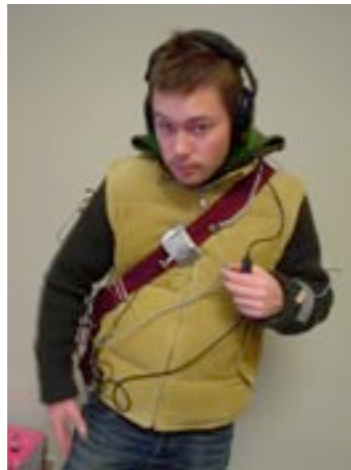


SONIC CITY A MUSICAL DUET WITH EVERYDAY URBAN ENVIRONMENTS

Nocturnal dub ambiences, pollution as echo chambers, drumming traffic noises, singing street lights, but also scratching tramway bells by approaching walls, grabbing metallic railing as guitar strings, turning corners towards a chorus... In Sonic City, people can create live electronic music by simply walking through a city and interacting with their everyday urban environments. A wearable system consisting of sensors, a microphone, a micro-controller, a small laptop running an interactive music program and headphones, gathers sensor-based information about the user's actions and her environment. It then maps this in real time to process city sounds collected by a microphone, and the result is output through headphones. When wearing this system, one engages into a musical duet with the city: urban atmospheres, random encounters and everyday activities all participate in turning urban sounds into a personal soundscape of live music you listen to as you are walking.

Sonic City has been tested by a variety of people in their own everyday environments such as one person's way to school or in another one's favourite street. The users felt that the music was essentially created by the city. However, as they became more involved in their surroundings, they found various ad hoc tactics to participate in the music creation, improvising their interaction with the city: they suddenly changed their path towards odd places (a construction site, a dark corner next to an electricity chamber, etc), and used local interaction resources at hand such as metallic objects. Some deliberately fooled the system by shadowing the sensors in order to modulate the city's input!

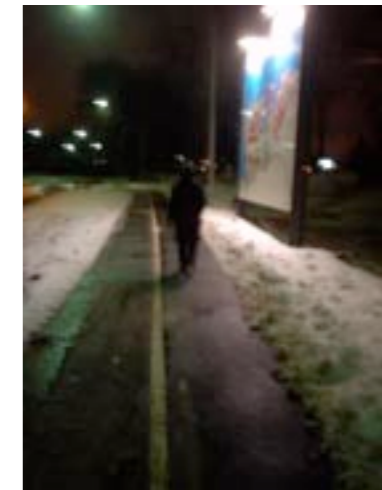
At the cross-road between urban exploration and experimental music making, Sonic City shows how mobile technology can open for new types of creative practices integrated into everyday life.



FURTHER READING

Gaye, L., Holmquist, L. E. and Mazé, R. (2002) Sonic City: Merging Urban Walkabouts with Electronic Music Making. In Companion of UIST'02, 15th Annual Symposium on User Interface Software & Technology, Paris, France.

Gaye, L., Mazé, R., and Holmquist, L. E. (2003) Sonic City: The Urban Environment as a Musical Interface. In Proceedings of NIME'03, New Interfaces for Musical Expression, Montréal, Canada.



PLACEMEMO SUPPORTING MOBILE REPORTING IN A VAST WORKING AREA

The road inspector is out on his daily inspection tour. He identifies a broken road sign, but the traffic situation does not allow him to make an immediate stop. Instead he uses PlaceMemo to save the geographical position and record a voice-memo, so that he won't forget about it as he always used to do. Later the same week, before heading out on the same road stretch, he listens through the memos. The map gives him a rough idea of where the reported malfunction is situated, and by reviewing the message he knows what equipment to bring. Back on the road he concentrates on identifying new faults. When approaching the position of the broken road sign, he can hear the memo played in its entire length just before he reaches the broken sign. He gently decreases the speed of the lorry and halts it without jeopardizing the safety for others, and then

The PlaceMemo prototype was developed to facilitate infrastructure management tasks, like identifying, reporting and taking care of malfunctions along the roads. The vast working area of road inspectors makes it hard to remember all the identified defects and organise work to fix them. This system enables the inspectors to associate memos to geographical locations along the roads. Our design supports the simultaneous handling of reporting and receiving reminders while driving.

Additionally, the memos could easily be shared among colleagues, to for instance enable job rotation.

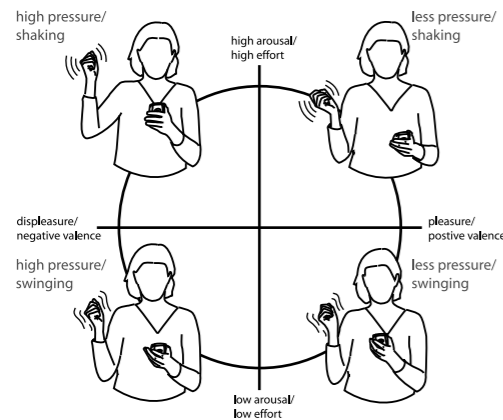
The design choices were based on the requirements found in an ethnographic field study, and the service is based on handheld mobile devices equipped with GPS-receivers. We were interested in the development of innovative mobile services, and also wanted to gather knowledge on how to take advantage of different contextual factors.

PlaceMemo is interesting from a commercial perspective, since there are many occupational groups that work with infrastructure management in vast settings. We have started initial work towards commercialisation of the concept.



FURTHER READING

Esbjörnsson, M. and Juhlin, O. (2002). PlaceMemo – Supporting Mobile Articulation in a Vast Working Area Through Position Based Information. In Proceedings of ECIS'2002, The 10th European Conference on Information System, University of Gdansk, Poland



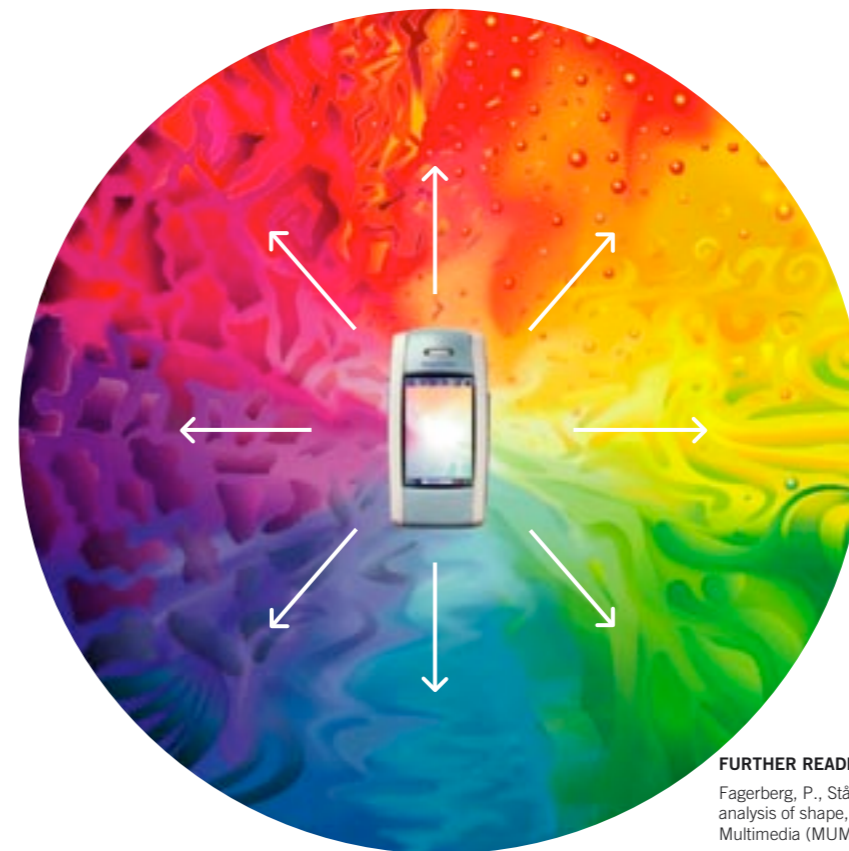
EMOTO EXPRESSING EMOTIONS IN A DIGITAL WORLD

eMoto is an emotional messaging service built on top of SonyEricsson P800/P900 mobile terminals. There are two aims of this application, users should truly feel what they are communicating when they express emotions in messages; and there should be few limits to the range of emotional expressions that they can communicate. In eMoto, users first write the textual content of an SMS-message and then adjust the emotional expression in the background of the message. The adjustments are done through affective gestures picked up by sensors on the stylus pen that comes with the SonyEricsson phone. These gestures in turn fill the background with colours, shapes and animations. Both the gestures and emotional expressions are derived from an analysis of the characteristics of natural body language.

In communication between people emotions are an important part of getting the true meaning of what is actually said. People convey their emotions in various ways, for example, through their body posture, their tone of voice and through facial expressions. eMoto brings this notion of emotional meaning into digital design.

Since emotions exist both in our minds as well as in our bodies, it is necessary to introduce new modalities to address both. In eMoto combinations of two basic gestures let users intuitively express a large amount of emotions. By also letting them choose their own emotional expressions instead of having these predefined, eMoto aims to capture the fact that people express themselves differently, and that their choice of expressions may depend on context and whom they communicate with.

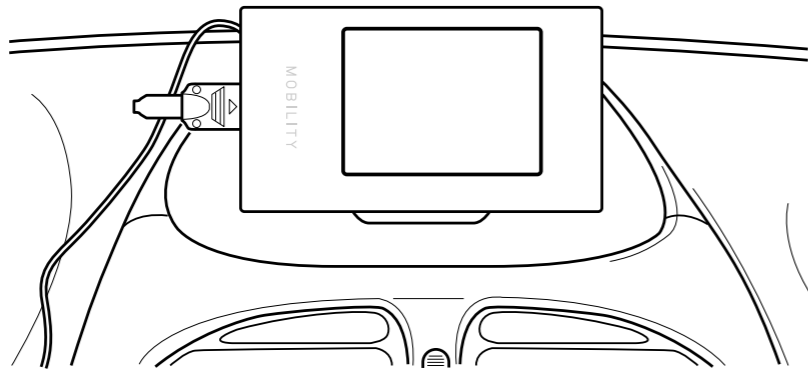
Sandra is about to send a message to her boyfriend telling him how much she loves him. But how can she express herself through a simple text message? Luckily she has eMoto on her phone, and so she easily can enhance the emotional expression of her message. While adjusting the emotional expression she feels how much in love she is and how happy he will be when he gets her message.



FURTHER READING

Fagerberg, P., Ståhl, A. and Höök, K. (2003) Designing gestures for affective input: an analysis of shape, effort and valence. In Proceedings of the conference on Mobile Ubiquitous Multimedia (MUM'03), Norrköping, Sweden, ACM Press.

Fagerberg, P., Ståhl, A. and Höök, K. (2004) Affective Messages – Emotionally Engaging Interaction. To appear in Journal of Personal and Ubiquitous Computing, Special Issue on Tangible Interfaces in Perspective, Springer (to appear).



SOUNDPRYER JOINT MUSIC LISTENING ON THE HIGHWAY

Mattias attaches his PDA, with built-in Wi-Fi card, to the dashboard and starts the Sound Pryer application for an alluring music experience. As he hits the road, Sound Pryer plays his favourite music in the car stereo. After a while driving bores him. Suddenly, the screen is filled with an icon of a red lorry. He says to himself: "It must be that one over there", as the latest song by Cardigans fills his loudspeakers. SoundPryer returns to play his own music when he passes the lorry and sees it fall behind in the rear mirror. Mattias thinks "Cool guy. I have to get that music at the next stop."

We present SoundPryer, which is an implemented peer-to-peer application of mobile wireless ad hoc networking for PDAs. It accomplishes music eavesdropping in traffic encounters, by streaming MP3 files via the Real Time Protocol. The metaphor used to guide the design of SoundPryer is that of a "collaborative" MP3 player. A user can play his or her own music, but also tune into other players and hear what they play as long as he or she stays within close proximity. As such the SoundPryer application serves pure entertainment purposes: the fun of listening to music, either his or her selection or somebody else's. It draws on the idea that people take an experiential and aesthetic interest in the surrounding traffic and that they are willing to share music since people are almost anonymous to each other in that situation. Still the visual contact provides for a special and tickling

FURTHER READING

Axelsson, Fredrik and Östergren, Mattias, SoundPryer: Joint Music Listening on the Road. In adjunct proceedings of UBIComp'02, Lecture Notes in Computer Science, LNCS 2498, Springer Verlag.

Östergren, Mattias, Sound Pryer Field Trials: Learning About Adding Value to Driving Proceedings of the workshop Designing for ubicomp in the wild: Methods for exploring the design of mobile and ubiquitous services, at MUM'2003, Norrköping, December 2003.



WEBSITE
WWW.MOBILELIFE.ORG
E-MAIL
INFO@MOBILELIFE.ORG



KRISTINA HÖÖK
INVOLVE
DSV, SU/KTH
FORUM 100
SE-164 40 KISTA
SWEDEN
KIA@DSV.SU.SE, KIA@SICS.SE



LARS ERIK HOLMQUIST
FUTURE APPLICATIONS LAB
VIKTORIA INSTITUTE
HÖRSELGÅNGEN 4
SE-417 56 GÖTEBORG
SWEDEN
LEH@VIKTORIA.SE

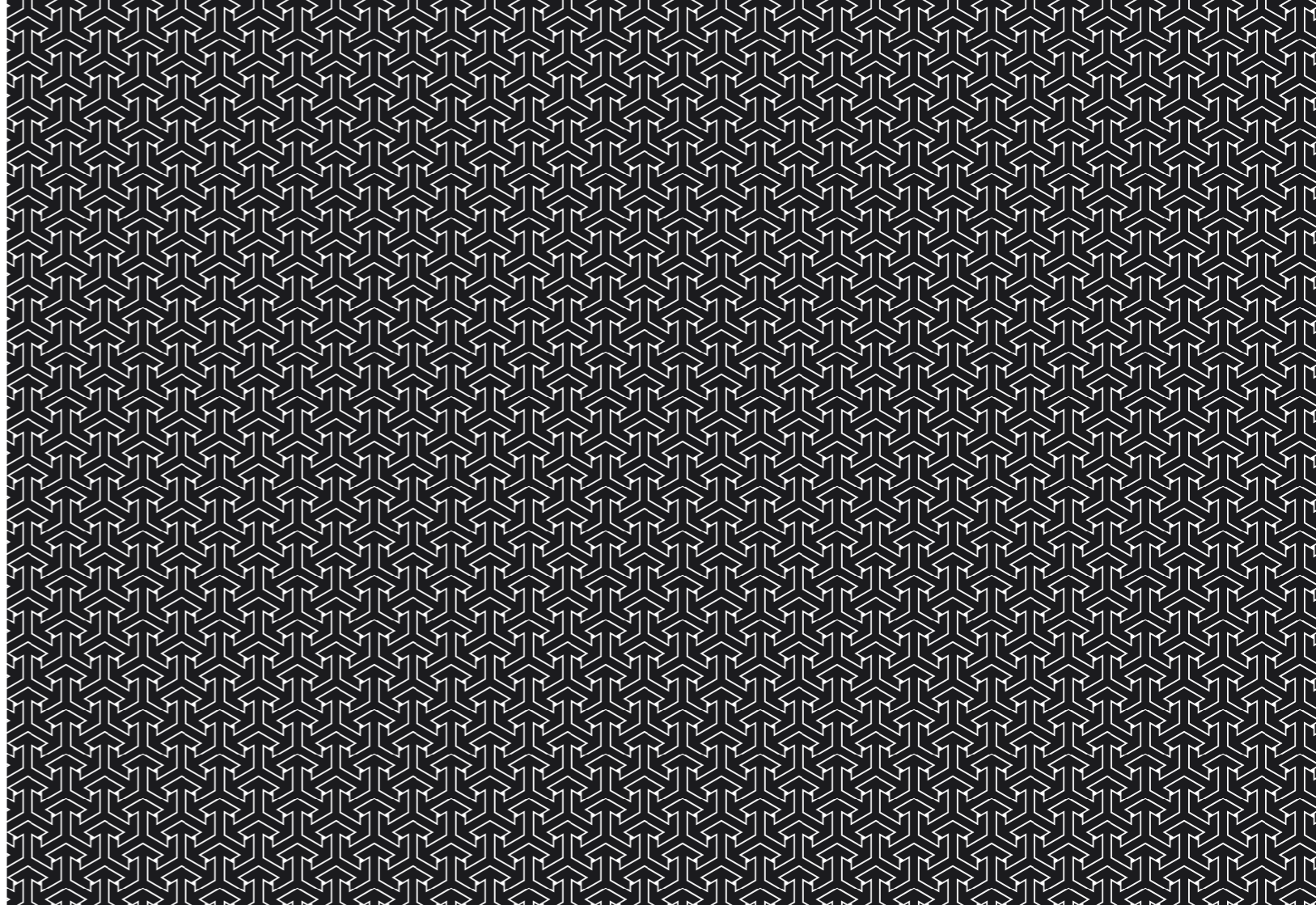


OSKAR JUHLIN
MOBILITY STUDIO
INTERACTIVE INSTITUTE
KARLAVÄGEN 108
BOX 24081
SE-104 50 STOCKHOLM
OSKARJ@I.II.SE



MARTIN SVENSSON
SOCIAL COMPUTING
SICS
BOX 1263
SE-164 29 KISTA
SWEDEN
MARTINS@SICS.SE





WEBSITE
WWW.MOBILELIFE.ORG
E-MAIL
INFO@MOBILELIFE.ORG