DESIGN PRINCIPLES FOR SOCIAL NAVIGATION TOOLS

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Abstract. Social navigation is an alternative to the prevailing methods for navigating metaphors. It utilises the fact that most information navigation in the real world is performed by interaction with other people. Based on literature studies and user studies on social navigation we have developed six principles that have to be taken into consideration when designing systems for social navigation in order to make the navigational experience more efficient, qualitative and enjoyable. The principles are Integration, Trust, Presence, Privacy, Appropriateness and Personalization.

INTRODUCTION

Social navigation offers an alternative to the prevailing methods for navigating metaphors [Benyon and Höök, 1997]. Instead of relying solely on abstracted representations of the space, social navigation utilises the fact that most information navigation in the real world is performed through talking to other people. When we need to find information about an illness, we talk to our relatives, friends and medical doctors, when we are lost in a city, we approach people walking by, etc.

Social navigation can happen in many different forms, ranging from following a group of people that we do not know, to approaching an expert in a field asking for advice on how to find information. One may distinguish between *direct* and *indirect* social navigation [Dieberger, 1998, Svensson, 1998]. In direct social navigation, we talk directly to other users. In indirect social navigation, we can see the traces of where people have gone through the space, as for example in the Footprints system [Wexelblat and Maes, 1998].

Furthermore, social navigation may be *intended* or *unintended* by the advice-giver. An example of intended social navigation would be when we recommend someone a place to visit, while paths through the woods can exemplify unintended navigation.

Another distinction can be made for when the advice-giver is one particular person, known to us, or when it is just a group of anonymous users that have happened to navigate through the same space as us. In-between these two extremes, we may have groups of users that are similar to the navigator in terms of interests, profession, knowledge or task. The advice-giver may also be an agent [Foner, 1993][1].

The question is how we can provide for this kind of behaviour in the information spaces we create in electronic spaces? We have had a look at existing systems that support social navigation in one way or the other. Also, we will draw conclusions from studies of navigation

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[1] Another relevant example is FireFly where Collaborative Filtering is implemented as a method of using others navigational experiences: http://www.firefly.com.

and information seeking in the real world. Our findings indicate that there are six design issues that need to be considered when designing systems that support social navigation.

Underlying our design approach is the view that navigation should be a delightful experience, part of navigation is goal formulation, and we need to recognise the risk of making users anxious about getting lost or cognitively overloaded [Höök et al. 1998]. In this, we break with the usability testing tradition that focuses on efficiency in terms of time spent and number of errors. Instead we focus on the quality of the experience and the final destination/goal [Höök and Svensson, 1998].

This paper will begin by describing our user studies and also try to pin down what is important for systems that should support social navigation. From the user studies and studies of existing systems the design principles will emerge. We will then try to apply the design principals on two domains where social navigation could be of help. Finally, the conclusion, supported by user studies, features of existing systems and the two systems we are applying our principles to, will point towards the necessity of taking the six design principles into account when creating systems with social navigational abilities.

IMPLICATIONS FROM USER STUDIES

When searching for information and when navigating in various different spaces such as cities, on sea, on the WWW, people often rely on the advice of other people rather than more abstract tools such as maps, search engines, etc. Social interaction is (of course) basic to human behaviour, and therefore well learnt and efficient [Dunbar, 1997]. In order to design navigational tools, it is important to clarify those characteristics of social navigation that are crucial in this context. Six on-going studies in the PERSONA[2] project provides us with some insights into what social navigation is:

- A questionnaire at the Edinburgh Fringe festival
- An ethnographic study of navigation at the Edinburgh Fringe festival
- A series of open-ended interviews concerning everyday information seeking/navigation activities
- An ethnographic study of information navigation at the Scotsman, a newspaper in Edinburgh
- A study of the use of "outlouds" in work environments
- A study of cognitive abilities and search in large information spaces

Previous work of the project members that we have considered include:

- A study of video conferencing through the rubric of social navigation, evaluating some of its concepts through the practices and achievements of users working with each other and with remote partners [Munro, 1998, in preparation]
- Study of libraries and librarians in the creation of real information spaces [Munro, 1998b]
- A study correlating spatial ability to information search time [Dahlbäck et al., 1996]

Our design ideas also stem from our substantial literature review including:

- An analysis of studies of adaptive navigation systems in order to investigate when and where adaptive navigation is useful [Höök and Svensson, 1998]

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[2] Personal and Social Navigation, http://www.sics.se/humle/projects/persona/web/index.html

- An analysis of work and awareness of other workers as a basis for navigation among work tasks [Munro, 1998a]

- An analysis of cognitive, personality, cultural and other factors influencing navigational behaviour [Sjölinder, 1998].

- An analysis of spatial relations in movies [Persson, 1998a].

- An analysis of narratives as a means to achieve coherence in information spaces [Persson, 1998b].

- Analyses of the use of sound in interfaces as a means to illustrate space [Macaulay et al. 1998].

Taking all this together we get a picture of social navigation that we use as a basis for the design principals for systems that support social navigation. First of all that social navigation is a crucial component in peoples' everyday behaviour. It is used both by people with good spatial skills as well as bad. It is blended with various other strategies for getting to the destination, such as reading maps or logical reasoning about the space. There is no clear-cut line between pure information navigation, decision-making, or the actual navigation as activity. As people start to navigate, they may well alter their goal and start browsing; they make decisions on how to act not only in terms of where to go, but also in terms of what to do in the space, etc. They will also navigate in contexts of other people, asking for advice, following people, etc. Navigation is almost never an activity that can be studied in isolation [Macaulay, 1998].

Let us provide a list of our studies that have guided our design work:

- The need for users to put trust in the advisor varies with different domains [Impicciatore 1997, Macaulay, 1998] (sometimes availability is more crucial)

- It is important that users are allowed to attach meaning/experiences/personal landmarks to the space, in particular, for older users [Sjölinder, 1998]

- Indirect social navigation happens at work places where people are peripherally aware of each others activities [Munro, 1998a]

- Adaptation of navigation in e.g. hypermedia runs the risk of confusing users more than actually aiding them [Höök and Svensson, 1998]. In order for adaptive navigation to work, the system must:
  - leave the interface somewhat predictable so that users do not feel lost,
  - it should not force users to interpret advanced annotations, thus distracting them from their main tasks,
  - finally, the adaptive navigation support should not *change* the structure of the space.

- Narratives can be an additional way for people to describe, comprehend and remember geographical and informational spaces [Persson, 1998b]

- Sound and other modalities may well be useful alternatives or complements to verbal/textual instructions (choice of *modality*) [Macaulay et al., 1998, Sjölinder, 1998]

- Some users are more prone to experience "spatial anxiety" – they feel anxious when moving around in unknown territory, do not like to use maps, etc. [Sjölinder, 1998]

DESIGN PRINCIPLES

INTEGRATION

The tools that support social navigation should be made an integral part of our everyday tools. Anja Syri [Syri 1997] talks about the importance of the ability to adapt generic CSCW systems to their working environment. One of the reasons for many CSCW systems that fail to incorporate CSCW functionality into the WWW is their inability for integration in the browser [Trevor et al. 1997]. So for instance, the Alexa system[3] is a tool that supports social navigation on the WWW. What it does is to recommend links to follow based on what other people have done in the past (a form of indirect social navigation). However, the tool itself is not integrated into the browser. It is our belief that this will have a negative effect on usage.

In the same way, if we want to use social navigation as a part of providing help in MS Word it should be integrated with Word's help system instead of being a separate tool that the user needs start explicitly.

In general, integration stresses the importance of communicating the knowledge of how the application making use of social navigation and the tools for social navigation are related to one another.

PRESENCE

When navigating socially, presence of other users is naturally important – otherwise the navigation wouldn't be social. Such presence can be communicated by any information artefacts; simply by identifying others actions in the space we can feel a certain presence of others. [Munro, 1998, in preparation]

The notion of other people present in a computer environment is more than real-time presence of another user. Different information artefacts (articles, annotations, etc.) can communicate the existence of a person, even if s/he is not currently there.

One type of presence can be seen in systems such as ICQ[4], a tool through which you can see if other users are on-line. However, this tool only gives the user a real-time notion of other users on-line presence. In contrast, a simple function such as a counter on a web-page, telling you how many people have been there before you also gives a notion of presence – we know others have been there before.

Another system that lets you know of others presence in a very straightforward way is the footprints system [Wexelblat and Maes, 1998]. They try to replicate what happens with paths in a forest – if many people have taken the same path, it is wide and there is no overgrowth, but if few people have walked along a path it is overgrown, i.e. you can tell it is not frequently walked along.

TRUST

We need some kind of knowledge of whom we are following or taking advice from. What knowledge does s/he (they) possess? What are his/her/their intentions with being here? The task that we are currently pursuing and the context of the current space is also relevant to who we may approach to ask for advice. For example, if a user is trying to locate advice on personal health care, the source and quality of the information will be crucial [Impicciatore,

1997]. As expressed by Macaulay [1998], "knowing who inscribed a particular piece of 'informal information' (i.e. gossip) on the palimpsest[5] is as useful as knowing the reliability of the source of a formal piece of information".

One initiative to deal with the trust factor has been taken by the Health on the Net Foundation[6]. They have created what they call the HONcode. A web-site can be HON certified, which means that the site has been examined by the HON Foundation and certain quality measures apply to the information on the site. HON certified sites get a seal to put on their site declaring that it is certified and thus the users of the site can trust the information more. The only problem is that anyone can copy the image and put it on an uncertified site.

APPROPRIATENESS

Is it always appropriate to provide socially enhanced spaces, or can a social space alienate users, making them unwilling to go there? In some cases anonymity, might be what is desired. Considering, for instance, entering parts of the WWW that contains sensitive data, in that case it might not be a good idea to introduce direct social navigation.

Also, we need to realise that social navigation is an extremely broad concept and contains a vast amount of different "utilities" to enhance navigation. So in one system indirect social navigation may be a good idea whilst in the same system direct social navigation is not at all helpful. Phoaks [Terveen et al., 1997] is a social filtering system for Usenet. However, we need to bear in mind that when doing this kind of indirect social navigation over such a vast domain it will be of help depending on what kind of newsgroup we are looking at. Some newsgroups are not suitable for this kind of social navigation. Miller [Miller et al., 1997] show that the GroupLens system is much more effective in specialised newsgroups (e.g. Linux software), rather then extremely common newsgroups (e.g. humour) were social filtering is almost of no benefit.

PRIVACY

Viewing social navigation from the perspective of the advice-provider, it might be very important to know that my traces are recorded (for indirect navigational systems), or that novices and other people that I do not know may approach me and ask questions (as in direct navigational systems). This privacy issue has been recognised in several chat-systems and a basic feature in chat-systems such as PowWow and ICQ is the ability to set different levels of "online visibility". So, for instance, I can choose to go into *do not disturb* mode or *free for chat* mode.

Another issue of privacy is telling the user about the discretion policy of the information he conveys to the web site, either by submitting the information explicitly or by just navigating through an information space. This is especially important in systems were the user needs to register in order to use the system.

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[5] A palimpsest originally referred to a medieval manuscript, which was re-used, so that the previous layers could be partly seen through the top. Later it also came to be applied to paintings, which had been created in a similar fashion. In this context it refers the statement that "Newspapers are like palimpsests – one paper is written on top of another. " [Macaulay, 1998]

[6] Health on the Net Foundation: http://www.hon.ch

Social navigation provides excellent opportunities for tailoring navigational advice to individual users' tasks, knowledge or abilities. When looking at social navigation in the real world we observe interesting phenomena. When conducting direct social navigation (i.e. communication with another person to solve a navigational task) it is often the case that "advice-givers" tailors their navigational instructions to the "advice- seeker" subconsciously. Of course, this tailoring may not always be a benefit, but if we can match the right giver and seeker the likelihood of success increases.

The chat system PowWow[7] uses something called on-line guides. These are expert PowWow users that have been granted "guide" status. Newcomers to the system can at anytime during the day go to a special "chat room" and ask guides questions concerning the system. This is an easy way to tailor (or personalise) the PowWow help system.

APPLYING THE PRINCIPLES

Once the design principles are established the next question arises: how to apply them? We demonstrate their use by applying them to two different systems to be used in different domains. The systems focus on different aspects of social navigation and will therefore stress different principles. Both systems are currently under implementation and the following section discusses our design ideas.

In our first example we look at **shopping food over the WWW**. We look at aspects of shopping from a social navigational perspective. What are the goals of the shoppers and how do these goals correlate to social navigation? What requirements can we identify for social navigation that are useful in this domain? We also introduce the Social Navigator, a general tool that can be used for social navigation in different domains.

A different approach, specialised on a specific information domain is navigation in the **pharmaceutical information space**. Navigating through information related to health care in general and pharmaceuticals in particular together with other users will also address the six design principles that are described earlier, but more care can be taken to adapt to the specific needs of the information space and the individual sub-groups of users.

SHOPPING OVER THE WWW

In the shopping domain, we find a range of users from different backgrounds, gender, age, education, etc. entering with a more or less clearly defined goal. Sometimes this goal can be very definite, e.g. to buy milk and cheese, sometime the need is very vague, e.g. to buy cheap ingredients from which a posh 8-person dinner can be cooked. There are numerous interesting constraints that these users need to consider: the cost, their personal preferences, allergies, ecological issues, and the season, time required for the shopping, etc. Navigation in this domain involves both a physical navigation in the actual store, but also navigation in the information space where we are informed of products, as well as in a decision space where the constraints needs to be considered.

When we do our shopping in stores today, we are affected by what other people are doing in the store, what friends have recommended, what the expert in the deli recommends, what we have heard about what is available cheaply, etc. – all of these are examples of social navigation. In an electronic store, we can well imagine both agents, traces of other people, as well as human experts providing help and information.

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[7] http://www.tribal.com

Even if a lot of the tools for shopping on-line will help users to avoid navigation (instead of walking around in the store, we can say get the same things we bought last time through just keeping our profile, or we can instruct the agent to get what we want), there are still reasons to navigate through an electronic store since we sometimes need to see goods before buying them. Stores are also interesting since so much effort is put into their organisation in order to sell as much as possible. Many shoppers rely on this organisation in order to be able to find what they need, which makes navigation in the space one of the core activities. At the same time, for some tasks (when we know what we want to buy), we would not mind a quite different interface where we do not navigate, but just type in what we need.

On the negative side is the fact that food markets are organised quite differently in different countries, in fact, goods are also different, as well as people's relationship to the food and the experience of it. But on the other hand, this allows for quite interesting cross-cultural studies.

Social Navigation in the Shopping Domain

The social navigation support for the online shopping domain is developed with use of a framework called the Social Navigator. The Social Navigator makes use of three different concepts that cover most types of social navigation that a user will conduct:

- A means by which users can get in touch with other user watching the same spot in the information space (e.g. the same web page in a web space, or the same room in a MUD) (enables *direct social navigation* – DSN)

- A means, by which users can see where other groups of users have gone through the space, objects they have chosen, etc. This may be based on either the whole user population or parts of it that conform with a particular users interests/knowledge/task/abilities (enables *indirect social navigation* – ISN)

- An agent that provides navigational instructions (overview, rote, and narrative), is able to teleport (transport) the user to a specific spot in the space, or suggest particular objects of interest to the user (similar to recommender systems) and that may connect the end user with human agents when reaching its limitation (enables agent-mediated social navigation) – ASN

As a remark to the use of the term agent should be said that an agent does not necessarily have to be realised as a graphical entity with a face, lip movements, speech, etc. It may well use a text-based interface and achieve the same or better results in terms of the users' trust in the system [Sproull et al.1996].

The social navigator can either be supplied with modules for ISN, DSN, and ASN or make use of generic modules. In our work we created new modules since we wanted specialised behaviour.

Implementation

In the shopping domain we aim to implement a rich environment where several different ways to do shopping are possible. The shopper can enter a hypermedia space similar to the spaces available on the net already today (e.g. http://parkhallen.nerikes.se/, http://www.gmp.se/ica, http://www.nk.se/demo/html/).

The shopper might navigate the shop in different manners: through exploration (walking around), through approaching an agent (the ASN) that directs the user in simple cases or puts him/her in contact with human agents, or possibly through indirect social navigation. In indirect social navigation, the user will see where other shoppers are in the store right now.

This will be visualised using dots in an overview map, where each dot represents an individual user.

Shop employees will be visualised slightly different from shoppers. The idea is that a shopper will approach a shop employee, much in the same way she would do in the real world when approaching a shop employee in the deli. It is our belief that this will increase the feeling of a personalised shopping experience. Simple personal profiles and recipes (chosen in the past) will also help a personal agent (ASN) to match shoppers and what kind of recipes to recommend. So, for example, if I specify that I am a vegetarian my personal agent will not recommend recipes containing meat too me.

It should also be possible for a shopper to view another shopper's profile and recipe list. This will increase the likelihood of social interaction and also direct social navigation.

Finally, the shopper can also take a completely different approach and talk to her personal agent, using quite a fuzzy language to express his/her needs, and the agent will then shop on behalf of the user. The personal agent can understand needs as "buy spaghetti" without having to know exactly which brand or amount is required, and when in doubt, will search for alternatives that are presented to the user. In some distant future, the idea is that this agent will negotiate with other agents in order to find the cheapest goods available. The agent will also follow the user's actions over a longer period; thereby getting to know about user preferences, as e.g. which brand of spaghetti is preferred.
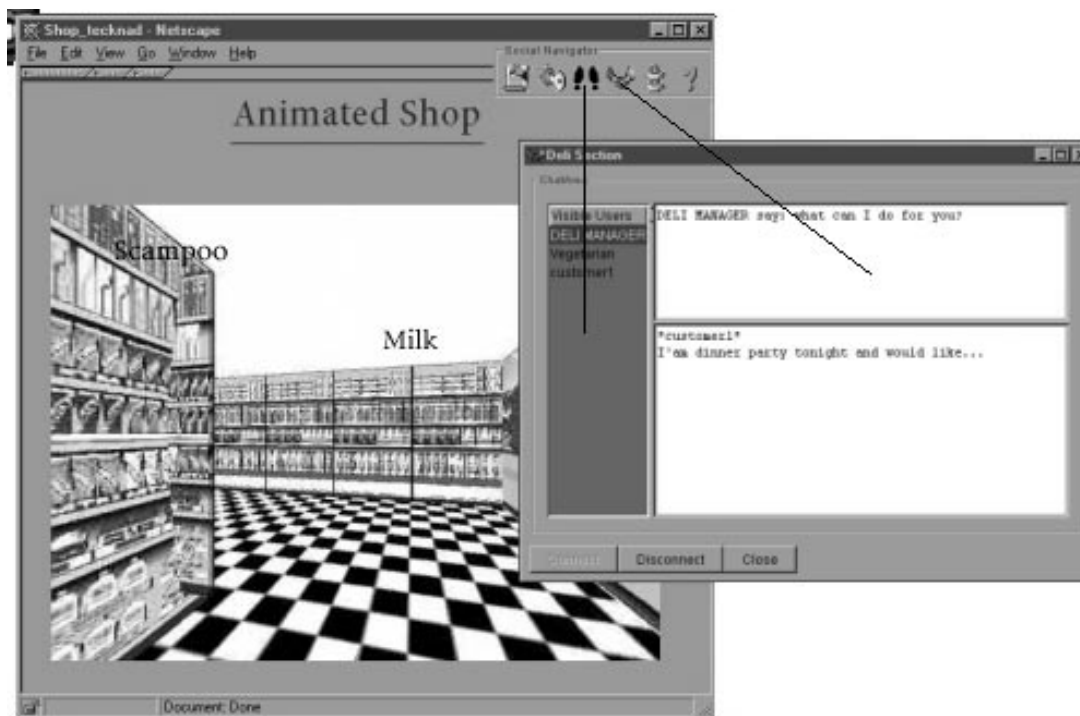

Fig X. Customer1 is currently in the Deli section. Her DSN and ISN module is open (the same) and she is currently talking to the Deli manager. In that section there is one more (visible) customer. In front of her she has the milk section and to the left is the toiletries.

In the shopping domain we believe that special care has to be taken for

- *Appropriateness* – we do different kinds of shopping where social navigation can be more or less helpful.
- *Integration* – some of the shopper are elderly people and the tools need to be easy accessed.
- *Personalising navigation* – the shopping experience is personalised.

PHARMACEUTICAL INFORMATION SPACE

The pharmaceutical information space is vast; there is a large amount of information stored in databases, documents or just as practical or methodological knowledge in people, and all this information is distributed world wide. There are also large cultural differences between people from different countries. What might be regarded as proven medical therapy in China (such as acupuncture) is in many cases regarded as unproven methods and, by some, even as quackery [Barret, 1998]. There is a large diversity of people accessing the information. There are health care professionals, such as nurses, physicians, specialists, veterinarians, dentists, etc. There are also patients, some with chronic diseases who also have relatives – usually also greatly concerned with the medical issues of the disease. Another set of important actors in this information space are different authorities and pharmaceutical companies providing information to the previously mentioned groups of people, not mentioning the information exchange between the people in those groups.

How is information retrieved in the pharmaceutical information space? Looking at the group of health care professionals, in general, and physicians in particular, we can see that they get a lot of information from each other. In [Smith, 1996] a summary of several studies on the information needs of doctors has been made. It indicates that a large source of information for doctors is other colleges.

So, if we for a moment go back to thinking in terms of social navigation, then that is what we have right in front of us in that situation. Doctor A is seeking knowledge on a specific area and asks doctor B about it, since he knows that doctor B's assessment can be trusted. Either A gets the information from B, B tells him to ask C who might know, or B tells A to look in another information source (textbook, database, MEDLINE, etc). The question we must ask us at this point is can such aspects of social navigation be included in a user interface to a computer system? Previous attempts at creating such an index of organisational knowledge has been done, for instance Answer Garden [Ackerman, 1996].

If we turn to the patients and their relatives instead, we have a large variety of different users with different needs. One example, out of several, is people with disabilities, who represent a large consumer group of medicinal products. One can imagine that they would have great benefit of accessing such an information system. Can social navigation help these people in their search for information? We hope to find the answer being yes.

In this domain Quality is a big issue, it is crucial that the information collected in qualitative. On the same time quality is a relative concept, quality means different things to different people at different points in time. One important component of quality is, knowing where information comes from, or from a social navigational perspective, who am I actually talking to. This fact stresses the importance of having knowledge of the identity of other people in the information space.

We believe that the six principles previously mentioned need to be considered when designing a system for social navigation in the pharmaceutical domain. How do these principles apply and what relevance do they have in the pharmaceutical information space?

Application of Principles

Integration is a key issue. The main task of health care professionals is taking care of their patients, which usually leaves little time for browsing, or navigating an information space with a computer. If we can integrate tools for social navigation with the information retrieval tools or information entry tools that are used today, we can both save time and get more qualitative information and health care. If we have a separate system for information retrieval and social navigation, it might not be used.

Trust the information! When navigating through medical information it is crucial that the information is of high quality, or trustworthy if you will. The reason is obvious: if the information that is retrieved is incorrect, the results can be disastrous, even fatal [Impicciatore, 1997]. Trusting the information requires qualitative control of the information, which can be made through documented peer review. In [Silberg, 1997] four core standards for defining the quality of information are listed: *authorship*, *references*, *disclosure*, and *timeliness*. These core standards have to be applied to published information, in order to increase trust of the information, by ensuring qualitative information.

There are important issues of *privacy*. Take for instance the case of an American insurance company finding out that you have a genetic disease. Such a discovery could have fatal effects on your and your children's ability of getting medical insurance. Therefore all information, regardless of it being of the character of a medical record or a navigational trail through an information space, must be securely protected. If your insurance company finds out that you have been reading a lot of information on medication for a specific genetic disease, they might get suspicious.

Appropriateness is a key issue that in some sense is related to privacy. If you are browsing the information space as a patient with a genetic disease and you can see many other people around you that might not be appropriate. The user might feel watched, or monitored which is definitely not the feeling we want to invoke, taken into account the previously discussed privacy issues.

Presence can be very important in other situations. Examples can be found in existing systems, such as Medscape[8] or the Body[9] have integrated "Ask the doctor" spaces, where the visitors can get expert advice from knowledgeable experts. There are even some systems providing chat support. In these situations, presence is wanted.

Personalization is key in order to be able to reach out with the right information at the right moment. Since the information space is so vast, we are in great need of making the space that the HCP needs to search for himself as small as possible, but still containing the information that he is interested in. This is where recommender systems could come into play. Another factor of personalization is the adaptation to the individual user's needs. If the user has poor spatial abilities, a model for navigation that enhances the users spatial ability should be provided. The same applies to other disabilities.

A system to support all of these issues for the pharmaceutical domain is under implementation.

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[8] Medscape: http://www.medscape.com

[9] The Body: http://www.body.com

CONCLUSIONS

The two domains that are described in this document are of rather different character. One domain is used for more leisure-time purposes, where factors as the enjoying browsing experience, avoiding getting lost and maybe also getting into contact with other unknown people in the space are important. Whereas the other information space is used for professional purposes or private, health care related purposes, where information quality, efficiency and privacy might be more stressed issues. However, both domains incorporate social navigation as a key component.

As we can see in the description of the two domains, the six original design principles that we have identified are applicable in both domains. We need to consider the issues that they deal with in order to create a system for social navigation that actually works.

Finally, our conclusion is that in order to build in usable social navigation into computer systems of today, we have to deal with the factors of Integration, Trust, Privacy, Presence, Appropriateness and Personalization.

The next step ahead of us is to implement systems that cohere to the six principles that we have stated and, by performing user studies, verifying our statements.

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