ABSTRACT
Location information contains a huge promise in the area of awareness technologies. In PePe project, automatic location detection was investigated as part of a mobile presence system. A field study with twelve young adults was conducted to explore the usage habits of sharing location information. The participants defined, named, and shared on average twenty meaningful locations with their friends. They found the location information as the most relevant mobile presence attribute, due to a fact that it gave good overview on the status of the other users. We focus on analyzing how the participants named locations and how they used location information in the context of mobile presence. The participants utilized shared meanings of locations in naming and storing them to the PePe system. We classified the created locations as generic locations, points of interest, and geographical areas. The presented results will facilitate in designing location enhanced mobile awareness systems.

Categories and Subject Descriptors
H.5.2 User Interfaces H.5.3 Group and Organization Interfaces

General Terms
Design, Human Factors

Keywords
Location awareness, mobile presence, mobile applications, user experience.

1. INTRODUCTION
The meaning of location in communication has varied in the process of time and communication technological development. In the era of non-technology mediated communication, communication and especially social life took place in proximity with other human beings. Telephony and telegraph, with certain limitations, made communication possible with people who are not sharing the same physical place. Fixed telephony was the first communication technology that allowed people to be in contact with each other elsewhere than in proximity. As the phone was in the fixed place and the caller knew the callee’s location, telephone conversation started usually with a question ‘How are you?’ [20]. Recently, mobile communication technologies have made communicating and socializing with peers possible regardless of the location. Accordingly, the meaning of location is not anymore related to ability to communicate but it rather defines suitability to communicate. Today, people tend to assess framework of communication based on location [17], which is seen in the way of starting the phone conversation by asking the other’s current location or availability. This is one of the factors that have stressed the need for studying and developing location based services in communication context.

Presence is one of the key concepts related to studying the meaning of location in the context of communication. International Society for Presence Research (ISPR) [14] provides an extensive definition of presence from various perspectives. The definition starts as follows: Presence (a shortened version of the term "telepresence") is a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience. Further, ISPR defines social presence: "Social presence" occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities.

Location is not the only relevant piece of information about user’s context that is used in assessing suitability of communication. Context-awareness is another concept closely related to topic of this paper. Dey [6] states that: A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user’s task. Presence or awareness technologies can be seen as systems gathering and providing relevant context information needed for assessing suitable time, space and channel for communication.

Mobile presence system, PePe, studied in this paper provides both automatically detected (location) and user generated information (status text, images, and availability) on user’s context. The other users were able to see this information from a contact list of their mobile phones. The combination of location information and other presence attributes provided information on user’s current ability and availability to communicate. The system was designed to facilitate group coordination and assessing suitability of social interaction. The PePe system worked in Series 60 OS mobile phones.
The present paper focuses on analyzing the role and the meaning of location information in the context of mobile presence. Understanding these aspects can inspire designing better and more advanced location enhanced awareness systems.

The reminding of the paper is structured as follows. The first section presents related research and the approach. Second, the test participants, study set up, technologies used, and methodology are described. Next, the results are presented, covering both quantitative and qualitative analysis of the data. Finally, the concluding part of the paper summarizes the main findings and presents some future research interests.

2. RELATED WORK

Awareness, including location awareness, has been studied widely in the fields of HCI and CSCW. For instance, Dourish et al. [7], [8], Gutwin et al. [11], and Whittaker et al. [26] have studied awareness in workplaces where real-time groupware systems are in use. They have concentrated on the impact of awareness information on work. Dourish et al. [8] found that awareness information in a work context may lead to spontaneous connections and building a sense of community. These studies have focused on the usage of groupware systems in workplaces and thus do not take into consideration leisure use of such systems.

Jones et al. [15] presented a framework of location-aware community systems. The basic framework was divided into people-centered and place-centered techniques as well as asynchronous and synchronous systems. They also elaborated the people-centered category by adding such location parameters as absolute user location and co-location/proximity. Most of the awareness technologies, such as the PePe system presented in this paper, belong to the synchronous people-centered category, meaning that the system conveys user’s location information to other users in real time (see e.g. [2], [3], [12], [13], [18], [19], [21], [22], [25]).

Milewski et al. [21] presented Live Addressbook providing presence cues to the telephone users. The system allowed the user to publish his availability, location (which actually meant the telephone number at which the user can be reached), and message as presence information for the other users in both PC and mobile contexts. They found that status information is useful for telephone communications but updating presence information should be better supported in such a way that the privacy regulation is easy for the users.

Tang et al. [25] presented Awarenex prototype as the next iteration of ConNexus. Awareness enabled mobile users to maintain awareness of their colleagues with Palm devices and mobile phones. Location information that the prototype provided to other users referred to the current or the most recent locale where the user has been active in using the system. It also informed how long time ago the user was active. Tang et al. stated that the prototype provided meaningful awareness information to anyone, anywhere, to facilitate making contact with each other.

Oulasvirta et al. [22] described ContextContacts, which continuously tracked the user’s location and shared it, as well as other context information, with the other users. They found that the system was used for interruptibility inference, channel selection, progress monitoring, and location monitoring.

The above mentioned studies have gained user understanding on awareness systems. However, little work has been done to investigate the role and the meaning of location in the context of mobile presence, especially in leisure communication. We concentrate on these specific themes in this paper and exclude more general findings related to usage behavior.

Smith et al. [24] and Consolvo et al. [5] have investigated user behavior related to location requests. In a study of hypothetical location requests, Consolvo et al. [5] found that the most important factors affecting location disclosure were; who was the requester, why the location was requested and what were the most useful location details for requester. Smith et al [24] presented a social location disclosure service, Reno, and reported results of a pilot study. Reno system allowed a user to define labels for relevant places and share those via SMS either automatically or manually. They found that location disclosures were interpreted on the basis of shared understanding on context between sender and recipient. The main difference between Reno and PePe systems is that Reno sends user’s location information directly to the defined recipients based on request, whilst PePe systems updates user’s presence information, which the “recipients”, i.e. subscribers can view when needed.

Meaningful places are studied in the field of computer science. Ashbrook and Starner [1] and Zhou et al. [27] have developed algorithms facilitating definition of significant or meaningful places for a user. Their work is based on logging user’s movements as GPS data and clustering it in order to find out the most often visited places. (See also Marmasse [18]). These studies are focused on algorithms and thus do not take into consideration the role of the meaningful locations in social context.

In addition, Fagerberg, et al. [9] studied what kinds of notions of places users formulate by the help of GeoNotes. System that allowed a user to attach information related to a certain geographical area and let other users to view this information.

Environmental psychologists have investigated the meaning of a place. They approach the concept of place e.g. via function or experience of a place [4], [10] or place behavior associations [16]. Canter’s [4] model of representation of place consists of physical attribute, activities and conception. Especially the latter two attributes are investigated in this paper as well, but from communication and mobile presence point of views.

2.1 Our Approach

This paper aims at exploring the users’ ways to define and name locations and share location information by the means of mobile presence in their daily lives. The PePe system allows users to define and share the meaningful geographical locations with other users. Research questions of the study aim to focus on the most significant aspects of location information in this context:

- What are relevant locations that people want to share with peer group by the means of mobile presence and how are these locations named?
- What is the role of location information in relation to other presence attributes?

These aspects of presence or awareness technologies have not been explored widely in the field of HCI and CSCW. This paper stresses the importance of gaining theoretical knowledge on the user behavior related to defining and sharing locations.
dynamically with other users and thus constructing meaning for locations in the context of mobile presence.

3. THE STUDY
A field study that aimed to gain understanding on usage of location enhanced mobile presence system, PePe, was conducted in Helsinki, Finland. The participants were mostly high school students or recently graduated from high school. Together, they formed a coherent social network. Obviously, users formed smaller groups having closer relations with each other than with the rest of the group. Thus, existing social networks were present, which was crucial in order to gain realistic understanding on usage of the PePe system in daily life.

3.1 Participants
There were twelve participants, four were male and eight female. All users were 19 years old. Users were recruited in such way that they naturally formed a group of friends. This ensured that the users had a bigger group of persons in their Private Presence with a possibility to share the location information. Sharing location would have been unlikely if users were strangers to each other. We wanted the participants to be young adults due to a fact that social networks and social life are often important them. This is a reason why they are active participants for testing social applications, like PePe [23]. At the age of 19 teenagers or young adults are no longer restricted to the small geographical area where they attend to school and in hobbies. Young adults have friends and acquaintances in large area and they socialize with a large group of people. Having users that go to the same school and live in the same area would not have shown the need for viewing the locations.

The participants had 4-8 years experience with mobile phones. Most of them got their first at the age of 11-13. All users had experience with multiple phone models; they all had had more than two phones before the current phone model. Only one user had a series 60 phone that was used in the test, whilst the rest of the users did not have previous experience with smart phones. All participants had some experience with Instant Messaging application with PC; most of them used Microsoft Messenger.

3.2 PePe System
Location enabled mobile presence, PePe, studied in this paper, worked on Series 60 OS mobile phones. It allowed mobile phone users to share their status information, including location, and see others’ status information. Location was detected by using the cell ID, thus no additional hardware was needed.

Updating location information was automated. First, users needed to create locations to the PePe system. When the user was for instance, at home, s/he created a location called “home”. Location information was then updated automatically every time when the user arrived to home. When the user was in a location that was not created, the system informed it as “unknown location”.

The users were also able to update their status manually by the means of short status text, status image and availability icon. The user could choose between three pre-made availability icons, doors, that illustrate being available (open door), not available (closed door), and busy (half-opened door). The user was able to express her status with two lines of free form text. The status image could be taken with a camera phone or it can be ready-made graphics.

The other users were able to see location information as well as the other presence information from a contact list of their mobile phone. Location information was shown to other users exactly as the user had defined it (see Figure 1 middle).

There were two levels of sharing presence information: private and public. On the private level, all presence attributes (location, availability icon, status message and image) are shared. Subscription to private presence requires authorization from the publisher. On the public level, only an availability icon is shared.

![Figure 1. Public presence view on the left. Private presence view in middle. Blocked presence view on the right.](image)

The users were also able to block their presence information from other users. In such cases, the other users were not able to see any information from the blocking user. Different status information can be seen in Figure 1.

The PePe system worked in test environment, including test server and test version of the PePe application. When the user updated their presence status, it was sent to the presence server. The server then sent the update to the users who had subscribed to the current presence information, so that they always had the updated presence information. The server also gathered a log of the basic usage activity of PePe, such as number of updates (both manual and automatic updates) and times when presence information was viewed. The test worked on regular network and the participants used their own subscriber connections. This made the usage as normal as possible.

3.3 Cell ID Positioning
The system utilized cell ID’s in positioning because they were easily available and did not require any additional hardware. If GPS had been chosen, a separate module would have been needed, and it would have decreased usability of the system. Furthermore, GPS is not available indoors. From the users’ perspective, the cell-ID-defined locations were inaccurate. Users find it hard to understand that a location will also be defined by cell ID boundaries. Multiple cells sometimes overlap one location. These technological limitations caused some confusion for the users, but they did not have a strong impact on the results.

3.4 Study Setup
The study The study consisted of several steps: an introduction session, a usage period of three weeks and final interviews. In the introduction session, the participants were introduced to the main goals of the study and the mobile presence application. The configuration and other setting were prepared for the users so that they were able to start using the system easily. The participants were also told how to contact the test leader in case of a problem.

The participants were asked to use the test phones like their own phone during the pilot period and encouraged to use the presence
application like they would use it in real life. The test procedure included a task of marking the places they visited during three days during the test period. Two of these days were predefined, and the third was defined by the user.

The qualitative data was derived from one-on-one in-depth interviews. The final interviews were conducted immediately after the usage period. Each interview took from between one to one and a half hours. The interview consisted of the following themes: general experiences of usage, publishing the user’s own presence information, naming and use of location information, watching others’ presence statuses, and privacy. The interviewees were asked to show how they used the system and give examples of both their own and other users’ presence statuses. The users defined a sociogram of the relationships with the other. The interviews were recorded and transcribed. The different ways user feedback was gathered can be seen in Table 1.

Table 1. Methods for gathering user feedback

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-to-one interview</td>
<td>After the field study the participants were interviewed individually.</td>
</tr>
<tr>
<td>PePe server logs</td>
<td>The status changes were gathered automatically during the study. Both automatic location updates and manual status text/image changes were recorded.</td>
</tr>
<tr>
<td>PePe client log</td>
<td>Defined locations, text examples and image examples were gathered from PePe client log.</td>
</tr>
<tr>
<td>Location diary</td>
<td>Users kept a diary for 3 days during the pilot. Two days were pre-defined by test leader and test users defined one day by themselves.</td>
</tr>
</tbody>
</table>

4. Results
This section presents both statistics illustrating the usage activity and the results of the qualitative field-study of the PePe system.

Overall, the participants experienced PePe as a nice addition to contact management and useful in group coordination. All participants thought the location information was the most important and useful presence attribute since it gave a good overview of the status of the other participants. Status text and status image were equally important. Manually updated availability information was a nearly useless attribute according to the participants. From privacy regulation point of view, all participants stated that location sharing as it was designed in PePe system was acceptable. The users were aware of the locations that they shared with the selected contacts and therefore the risk of disclosing harmful location information was extremely small. They appreciated the possibility to stop using PePe whenever they wanted, even though they did not do that for reasons of privacy during the study.

Due to the fact that the participant group was coherent and all knew each other fairly well, eleven of twelve users gave all the other participants an access to their private presence. This provided fruitful grounds for studying the meaning and usage of location information in the context of mobile presence. According to the logs, most of the participants were active in using the system.

4.1 Statistics
The quantitative data was gathered from the server log and the presence client log.

The average number of locations that the participants defined to PePe system was 24 per user, varying from 8 to 43. Median of the number of locations was 23. This means that the participants created most of the places where they used to spend time to the system.

The average number of automatic location updates was 75 per user per day, varying from 47,3 to 156. The automatic location updates depended on the areas where users were moving during the field study. The participants who moved around the city actively, due to work or hobbies, caused numerous location updates. Even small changes in location in city centre (walking up one street) caused several location updates.

The participants updated information manually on average 5 times per day, varying from 2,5 to 9,5. The status texts were updated manually more often than images: 4 out of 5 of the manual updates were text updates. The availability information was changed only very few times. Figure 2 illustrates that the automatic updates were significantly more frequent than manual ones.

4.2 Shared Meanings of Relevant Locations
The locations that the participants defined and shared with other users were mostly users’ homes, their friends’ homes, bars, coffee houses, schools, workplaces, sports arenas, and shops in the city centre. The participants utilized the shared meaning locations when naming locations in the PePe system. Often a certain location did not only refer to a place on a map but it also reflected for instance activity, social context and availability of the user. When the user’s location was, for example at school, the other users knew where the school was located, what the user was doing, most probably with whom she was, and a cue of limited availability. In addition to shared meanings, some locations were named with nicknames that the participants had created by them selves. Overall, the participants understood a location as a place, a building, or geographical area having a specific meaning for the peer group.

The locations that the participants created to the PePe system can be classified in three categories as follows: points of interest, generic locations, and geographical areas. Some users defined location by utilizing combinations of point of interest and geographical area or generic location and geographical area.
The PePe application log shows that the participants named the locations more specifically in known areas, such as in the home district, than in the areas that are more unfamiliar to the others. Thus, familiarity of the area for the location information provider and other users was an important factor affecting how the location was named in the case of mobile presence.

The majority of points of interest and generic locations were situated relatively close to participants’ homes or schools. These locations are specific since in most cases they refer to a point on a map. Geographical areas were used when in the location was more distant and thus not necessarily familiar for the other users.

**Point of interest** signifies a place that is generally known by the local people, such as a certain ice-stadium or a certain movie theatre in a city. In most cases, points of interest were named according to their official names, or generally known nicknames and thus they were easy to locate. For instance, “Stocca”, which is commonly used nickname for a shopping centre, was created as a location.

Sometimes the users had given their own nickname for a point of interest making it look and feel more personal. One user put it as follows:

>I gave funny names for locations, but never wrong ones. I think that everyone knew them. (Participant 6)

Amongst the participants, the link between the nickname and the real location was evident. For instance, “the better arena” referred to a newer, bigger, and thus better ice-stadium in Helsinki. The participants did not have any difficulties in understanding the meaning of “the better arena” but someone else, e.g. interviewer did not have any kind of idea of its meaning.

A point of interest not only contained information about the user’s current location, but also their activity and possibly other contextual attributes. For instance, being at a movie theatre includes information on social context, i.e. being most likely in proximity with other people, physical context, i.e. being most likely indoors, and finally limited availability due to the presented cues. Even though points of interest do not provide explicit information on the other contextual attributes than location, they are effective in conveying user’s availability and framework of communication.

**Generic locations** signify a place that can be located only by people belonging to the user’s social network. “Krista’s home” and “work” are examples of generic locations; their informational content is extremely narrow without knowledge of a person who is in that location at a moment. This an important observation from privacy point of view; the participants were able regulate location disclosure simply by using generic names for locations.

Due to a fact that the test users knew most of the places where their friends used to go frequently, generic locations also referred to a certain place on a map. When a user was at “Krista’s home”, his friends knew the real location since they knew Krista and the location of her home. The characteristic for generic location is that it cannot be located without knowing the person who has defined it, named it and knowing something about their daily routines and/or living conditions. One of the participants stated this as follows:

>When Krista was at home, for instance, everyone knew where she lives, and thus where she actually is at that moment. (Participant 11)

In few rare cases, a participant had defined her friends’ home as a location, which was unfamiliar for the rest of the participants. The location was named using the same logic than naming known friend’s homes but the reference to an actual geographical location was missed.

**Interviewer:** What kinds of locations did you have there?

Participant 5: … then I put Riitta’s home there, she’s my skating friend, this group [the other participants] doesn’t know her.

The other users did not know this participant’s real location when she was at ‘Riitta’s home’, but still they had general understanding of her social context. In this case, location information facilitated the users’ need for assessing the other user’s framework of communication, even if it did not reveal user’s explicit geographical location.

Generic locations are usually very descriptive; most of them refer to a certain known place as well as other contextual attributes that are often familiar to the other users. For instance, “at home” informs the user’s social network about the exact geographical location, physical and social context. This is possible due to the fact that the other users know where the “home” is, who the user is living with, and what the “home” is like. Therefore, generic locations provide useful information for assessing user’s availability to communicate.

**Geographical areas** signify locations such as a district, a city or a country. For example, when the participant left from the capitol area of Finland, they named the location just by using the name of the city or country where they were spending time.

Participant 2: I had there, let me see… “Ice stadium”, “Inkoo”, “Krista’s home,”Tammiisaari”

**Interviewer:** So, you had different kinds of locations there, like a city names or your friend’s home, why?

Participant 2: Just for the case that people saw where I am. When I wrote “Inkoo”, they knew that I’m at our cottage. Then “Tammiisaari”, well I guess that everyone knew that I’m going to go there. When I was

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**Table 2. Location categories with examples and proportions.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Points of interest</th>
<th>Generic locations</th>
<th>Geographical areas</th>
<th>Combinations</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations</td>
<td>“movie theatre”,</td>
<td>“home”,</td>
<td>“city”,</td>
<td>“work &amp; District”,</td>
<td>Nick names</td>
</tr>
<tr>
<td></td>
<td>“café”,</td>
<td>“friends home”,</td>
<td>“district”,</td>
<td>“café &amp; district”</td>
<td>that were difficult to interpret</td>
</tr>
<tr>
<td></td>
<td>“shopping mall”</td>
<td>“school”,</td>
<td>“country”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion</td>
<td>39%</td>
<td>33%</td>
<td>10%</td>
<td>7%</td>
<td>11%</td>
</tr>
</tbody>
</table>

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The PePe application log shows that the participants named the locations more specifically in known areas, such as in the home district, than in the areas that are more unfamiliar to the others. Thus, familiarity of the area for the location information provider and other users was an important factor affecting how the location was named in the case of mobile presence.

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there I used to tell what I’m doing with the [status] text.

This user went to spend a weekend in a city called “Tammisaari” and they decided to define it in the PePe system and name it simply by using the name of the city. An interesting observation is that this user felt that they do not need to provide more specific information of the location. Generally, the participants disclosed more specific information on familiar areas than more distant locations.

However, cell ID positioning did not support this kind of user behavior. In order to continuously inform the others about being in a certain city, the user should have named all the cells that cover the city.

Sometimes geographical locations were used to signify some particular place, instead of the area in general. According to the participant “Inkoo”, another name of the city mentioned in the quote, meant actually spending time in a cottage. This was understandable for the rest of the participants, since they knew that the user’s family’s cottage is there. “Pirkkola” is yet another example of geographical area that had a special meaning. It is a district or a sports park in Helsinki, but it meant an indoor ice-skating rink for the participant who named the location. Thus, the user group knew that “Pirkkola” means that the participant is in figure skating exercise.

In the context of mobile presence, geographical area is not as effective in informing of the availability to communicate as a point of interest or a substantial location. However, it certainly provides information about reachability, or the user’s availability for meeting in real life. The role of geographical areas is different from substantial locations and points of interest in this particular context of use.

**Combinations.** Analysis of the created locations stored in the PePe client log showed that the participants sometimes used two methods in naming locations; they combined point of interest or generic location with geographical area. For example, a location label “at work, Hagalund” consists of generic location “at work” and geographical area “Hagalund”, which is a district in the metropolitan area of Finland. This participant had also created another location with label “Hagalund”. Thus, she clearly had a need for differentiating these two places.

Participant 9 had created locations “Esso, Laru” and “Esso, Maskun”. These represent a case where the user wanted to distinguish a café of a gas station where she was spending time by combining a point of interest and geographical area.

Most of the combinations were used to distinguish two or more locations that were either in the same district or had similar location label such as a brand of a point of interest.

**4.3 Unknown Location**

There were often situations when location information was “unknown”. Interestingly, it had a clear indication of person’s status and even whereabouts, although it did not inform anything specific. The fact that the participants knew each other’s daily routines allowed them to deduce a person’s status based on an “unknown location” note. For instance, it indicated the user might be traveling from a previous location to a new location. One of the participants put it as follows:

It was funny when I was waiting for my friend in a café. She had been at home and then it [location information] changed to “unknown”, I knew that she was coming. (Participant 10)

To most of the users, an “unknown” location was equated to “on the move”. In cases where an “unknown” location remained for a longer period of time, those who watched the information thought that a person did not want to reveal their current location. In these situations there were no means of locating a person.

**4.4 Criteria for Defining Locations**

All of the participants pointed out that the most significant criterion for defining a location was time.

I didn’t bother to define a place if I just stopped by somewhere. (Participant 3)

Like the participant says, quick visits were not created, even if they were visited frequently. For instance, no one had created bus stops or metro stations even though some of the users used to wait for transportation in such places almost in daily basis. The sufficient period of time for defining a location varied according to users. For some, approximately half an hour that was spent in a shopping mall was enough for creating a location, but for someone else it was not. The participants agreed about the fact that time determines if the location is defined, but making any accurate estimation of the length of time is difficult.

Sometimes the users did not create a location even though they spent there fairly long time. One reason for this was that tinkering with a phone was not experienced socially acceptable everywhere. Participant 4 put it as follows:

I didn’t define my grandma’s home because I didn’t dare to use my phone during the visit. (Participant 4)

Another very humane reason why a location was not always created was the fact that it was forgotten, as described in the following quotation:

Interviewer: Was it easy to define a location?

Participant 5: Yes, it was easy, but the thing was that I sometimes forgot to do that. For example, when I went to the exercise, I was thinking that I when I get there need to put it. But I didn’t remember it until on trip back home.

However, the participants rarely forgot to define locations. They said that the most important locations were always defined, even though it was forgot once or twice.

**4.5 Relation Between Location Information and Other Presence Attributes**

All participants stated that location information was the most important presence attribute. It informs where the others are, and what they are doing. In many cases, it also conveys user’s social context. The other attributes, images and status texts, were used to provide additional information on the location, current activity, and mood. Further, status text was used for group communication. Even if status texts and images were updated rarely, the participants appreciated them since they made the status more
personal. Figure 3 shows examples of images used to help describe locations.

![Figure 3. Examples of images supporting location information](image)

Images also provided additional information on activity. They were often related to eating, drinking, or sleeping. Some images were of objects related to activity, like an image of a TV-screen. Examples of activity related images can be seen in Figure 4.

![Figure 4. Examples of images conveying information on activity related to a location](image)

In most cases the use of the status text could be divided into three categories: additional information, greetings for the group, and in-group coordination.

**Additional information** informed often activity in the specified location. The participants had for instance following status texts: “Watching Kalle Palander”, “Studying Physics”, “Trainings->”

**Greetings** were used just to cheer up others and they did not relate in anyway to user’s location. “Sleep well!”, “Good Luck Aschen!” are examples of greetings.

**In-group co-ordination** was a clear motivation for using status texts. These kinds of status texts were used for informing about and organizing social events. An example of organizing an event is “Everyone! Arpeggios concert today! German church. At 20”.

5. **FUTURE RESEARCH**

Forgetting to define a location in the system identifies a need for supporting users in the task. An algorithm defining user’s relevant locations [1], [17], [26] could be utilized as a tool for creating locations automatically or suggesting them for the mobile presence users. In addition to usefulness, another interesting topic in this case would be user acceptance; the participants stated that PePe supports well privacy regulation needs, and therefore changes in this process requires thorough investigation. Another way of solving the problem of forgetting to define locations would be to allow users to do that beforehand.

Another interesting topic to be investigated is usage of collaborative user-created meanings for places [8] in the context of mobile presence. The collaborative nature in naming locations would also ease the process of defining the locations in the location disclosure system.

The participants suggested that the status images and texts are often linked with locations. This observation suggests that the users should be able to associate other presence attributes with location information.

6. **CONCLUSIONS**

A study of the PePe system with twelve participants was conducted in Finland. The participants were able to easily define locations that they wanted to share with other user. The study focused first on gaining the understanding of the users’ ways to construct meanings for locations, and second, sharing and using location information in the context of mobile presence.

The results brought out that automatically updated location information was the most important presence attribute, whilst manually updated information was additional. The participants utilized shared meanings of locations when defining them in the PePe system. The ability to name the locations facilitated both privacy regulation and providing descriptive location information. The locations were categorized as points of interest, generic locations, and geographical areas. They had different kinds of roles in mobile presence usage. The first two were used mainly for assessing user’s framework of communication, whilst the latter provided more general awareness information. In addition, participants’ interpretation of an “unknown” location was a remarkable factor in mobile presence usage. In most cases, it was interpreted as “on the move”.

The study shed light on the location specific themes concerning mobile presence user behavior. The results, together with previous research, will help in designing more acceptable and advanced location enhanced mobile awareness systems.

7. **REFERENCES**


