THE USERS' MAGIC LOUNGE

Niels Ole Bernsen
The Maersk Mc-Kinney Moller Institute for Production Technology
Odense University, Denmark
nob@mip.ou.dk

Summary: Virtual co-presence systems (or virtual meeting places) represent a major step beyond the single user - single system paradigm which has dominated the field of interactive human-computer systems for decades. Developers of virtual co-presence systems are faced with large design spaces for the analysis of which conceptual tools are much needed. The paper presents a basic task model for interacting with virtual meeting places, fleshed out with empirical data on how a group of users envision to interact with a particular virtual meeting place. The basic task model was identified on the basis of responses to a user questionnaire that was issued as part of the participatory design process for developing the virtual co-presence system Magic Lounge.

Keywords: Virtual co-presence systems, participatory design, human-human-computer interaction.

1. Introduction

Virtual co-presence systems (or virtual meeting places) represent a major step beyond the single user - single system paradigm which has dominated the field of interactive human-computer systems for decades. It seems reasonable to expect that, in five-to-ten years time, most human-computer systems and interfaces will include aspects of virtual co-presence. Developers of virtual co-presence systems are faced with large design spaces for the analysis of which conceptual tools are much needed. This paper presents a collective users' view of a particular virtual co-presence system, the Magic Lounge. The users' view was identified from the responses received to the first user questionnaire that was issued as part of the participatory design process for developing Magic Lounge.

Magic Lounge [1] is a virtual co-presence system which is being developed by the Maersk Mc-Kinney Moller Institute for Production Technology (MIP), the German Research Centre for Artificial Intelligence (DFKI), the French Informatics Laboratory for Mechanics and Engineering Sciences (LIMSI), and Siemens AG. The Magic Lounge project which started in July 1997, is sponsored by EU's Esprit Long-Term Research as one of thirteen collaborating projects in Intelligent Information Interfaces for the broad population [2]. Based on a collaborative systems platform developed at MIP, the Magic Lounge project is scheduled to develop three increasingly advanced prototypes of a generic virtual co-presence system whose hallmark is *interoperability*. Users will be able to participate in virtual meetings in Magic Lounge using a range of different access devices, from workstations equipped with one or more screens of various sizes,

cameras, microphones and loudspeakers, to PDAs, ISDN video equipment, mobile phones and ordinary telephones.

The participatory design process for Magic Lounge involves an end-user population consisting of eight inhabitants of some of the smaller Danish Isles. Inhabitants of the smaller Danish Isles are among the users who stand to benefit, perhaps enormously, from future virtual co-presence technologies. The Magic Lounge user group consists of islanders with very different professional backgrounds who share an enthusiasm for advanced computer systems technologies which allows them to participate in the Magic Lounge project without prior training and extensive supply of novel equipment.

As a start of the participatory design and evaluation process which will continue to the end of the Magic Lounge project in the year 2000, the user group received the First Magic Lounge Questionnaire in September 1997. Prior to that, the user group had received the Magic Lounge Technical Work Description and some of the users had participated in the project's kick-off meeting in early July 1997. Responses to the questionnaire came in from everybody before the end of October 1997. The questionnaire included 24 questions and was developed as follows. At MIP, we had committed to presenting an early Magic Lounge prototype at the European IT Conference (EITC'97) Exhibition in Brussels, end November 1997. We considered our own specification of that prototype as a structured answer to a series of non-technical questions about the functionality of Magic Lounge. We then expressed those non-technical questions in what appeared to be a natural sequence relative to the practical use of Magic Lounge and sent the questionnaire to the user group. In addition, and in order to avoid entirely irrelevant responses based on false initial conceptions of the Magic Lounge, the user group received a very brief description of the purpose of Magic Lounge. Obviously, this description should avoid influencing the users so that they would answer the questions in the questionnaire in certain ways rather than others. So we settled for a description of Magic Lounge which in our view was the minimum one imparted to the users already, i.e.:

> The Magic Lounge is an electronic information space in which to meet, communicate, discuss and do joint problem solving. The Lounge has on-line connections to the rest of the world through the Internet and the World-Wide Web as well as through static and mobile telephone, mobile telephone with a screen, ISDN videolink and fax. It may be used by any community of users, for instance by those living on the smaller and often remote Danish Isles.

In response to the questionnaire, the user group provided a wealth of information which has been presented elsewhere [3,4]. The users' desiderata concerning the virtual meeting place they want have been analysed in [5]. This paper focuses on the structure of interaction with, and within, Magic Lounge, and the functionality proposed by the users as attached to that structure. The structure of interaction with, and within, Magic Lounge was partly anticipated in the First Magic Lounge Questionnaire whose 24 questions were:

> 1. For what purposes would you use Magic Lounge?
>
> 2. In your opinion, for what purposes would other inhabitants of the Danish Isles use Magic Lounge?
>
> 3. What would be the advantages of using the Magic Lounge compared to working with telephone, fax, travels, letters, emails and individual access to the World Wide Web?

4. What would you have to do to visit the Magic Lounge using your current equipment (please describe the equipment you would be using)?

5. Where should one get to after entering the Magic Lounge (an entrance hall or a specific meeting room)?

6. How might you be represented when you turn up in the hall or meeting room? (Others using the same equipment as yourself might be represented in the same way or they might have several choices of how to be represented in the ML).

7. Ideally, how would you prefer to be represented (you might have several choices of how to be represented in the ML)? Should you have the possibility of deciding how others will be represented on your screen?

8. Imagine that you have a specific purpose in getting to the ML today: what is the purpose? (It would be useful if you would "act through" several ML visits serving different purposes when answering the questions to follow).

9. How do you establish contact with the people you meet or have planned to meet?

10. How do you find out who are "in your proximity" (in the hall or in other rooms)?

11. What would you do if you did not want to be disturbed by others during the session but, rather, want your own room?

12. How would you reach a common decision on what to do, such as going to a separate room, if you hadn't already decided?

13. Which supporting instruments (tools, materials etc.) would you need for the session? Describe each of them.

14. Describe a full ML session. Be careful not to embark on a very complex account because the description may then easily run over many pages (which is OK if you can manage to do it). Refer to one of the purposes you mentioned under (1) above.

15. How would you communicate during the session? Which forms of communication would you use the most?

16. What would people do if they were too late for a session and needed to know what had happened before their arrival?

17. How would one find out who was presently contributing to the session?

18. If a group session was private, should non-invited ML visitors have the possibility of finding out that the group was in ML? Should they also have the possibility of finding out which people were now meeting somewhere in ML?

19. What should happen, if anything, when a participant temporarily leaves the session?

20. What will you do if you need to meet again later concerning the matter addressed in the session?

21. If you are to meet again, how should it be ensured that your private room is still available and has not been changed or modified in the meantime?

22. Should it be possible to address one or more selected session participants without the others watching or listening in?

23. Which kinds of rooms are needed, such as an entrance hall, private meeting rooms, others - which?

24. Are there any other questions which needed to be asked?

In what follows, Section 2 presents the structure of interaction with, and within, Magic Lounge as it has emerged from analysis of the First Magic Lounge Questionnaire. The structure is presented as a model containing a partially ordered series of "analytical units" of interaction. This model might be applicable to virtual meeting places more generally. The expression 'analysis' (of user input) means that the users' input to the specification of Magic Lounge has been systematised and, to a limited extent, extrapolated by the author. Sections 3 and 4 follow the model presented in Section 2, analysing the users' input concerning the functionality required for each analytical interaction unit. Section 3 describes the steps involved in a basic task model of interacting with Magic Lounge. Section 4 describes a number of additional issues of importance to the interaction. Section 5 concludes the paper.

2. Interaction Structure

The basic structure of interaction with Magic Lounge and, possibly, with any virtual meeting place, is as follows:

1. Initial situations of use ->
2. Go to the virtual meeting place ->
3. The meeting complex and its facilities ->
4. (Optional) navigate in the meeting complex ->
5. Communicate in a room ->
6. Leave the meeting complex.

Steps 1 through 6 thus represent a basic task model of interaction with, or in, virtual meeting places. According to this model, interacting with a virtual meeting place may be represented as involving six steps, one of which (step 4) is optional. In step 1, the user is not in the virtual meeting place but is getting ready to go there. In step 2, the user goes to the virtual meeting place. In step 3, the user arrives at the virtual meeting complex and considers the facilities that are available in different rooms and workspaces. In practice, the user is likely to consider only some of them, for instance by going straight into a specific meeting room or remaining in the entrance hall, but they are all being described as part of step 3. In step 4, the user navigates

around in the meeting complex. This step is optional because (a) some virtual meeting places may not be complex, and (b) the user may go straight into a specific meeting room and later leave the meeting complex from there. In step 5, the user does what virtual meeting places are meant for, i.e. communicates with others. In step 6, the user leaves the meeting complex.

In addition to steps 1 through 6, interaction with virtual meeting places involves at least three additional issues which do not represent sequential interaction steps, and are not uniquely associated with any one specific interaction step:

A. Representation of oneself and others.
B. Privacy.
C. Magic Lounge automatic support.

Issues A through C may, however, be associated with the interaction steps above as follows:

1. Initial situations of use [**B**] [**C**] ->
2. Go to virtual meeting place [**C**] ->
3. The meeting complex and its facilities [**A**] [**B**] [**C**] ->
4. (Optional) navigate in meeting complex[**B**] [**C**] ->
5. Communicate in a room [**A**] [**B**] [**C**] ->
6. Leave the meeting complex [**C**].

3. The Basic Task Model

This section presents an analysis based on the users' input of the functionality needed in Magic Lounge at each of the six steps in the basic task model. All user input concerning low-level interface details, such as that calling a user to the Magic Lounge could happen through a blinking Magic Lounge icon on the user's screen, has been omitted. Low-level interface details are best considered once the functionality needed for the application has been determined. It should be stressed that the analysis in Sections 3 and 4 is *incomplete compared to a workable specification* - there is a threshold where extrapolation from the users' input turns into independent design problem solving, and the author has tried not to go beyond that threshold. In addition, the analysis is *not necessarily as focused as one might wish.* The potential lack of focus affects a large number of aspects of the users' input, ranging from the overall conception of the tasks and types of virtual meetings which Magic Lounge should enable [5] to the localisation of a certain functionality to a specific step in the basic task model. Both the incompleteness and the potential lack of focus are due to the obvious fact that the users in the participatory design process did not work together to produce a working specification - nor did they work together with the Magic Lounge developers - but gave their input separately. Still, the users' input to the specification of Magic Lounge is rich in contents and goes a long way towards opening up the design space around Magic Lounge to further exploration and design decision-making.

Step 1. Initial Situations of Use of Magic Lounge

At the users' end we find the various, user-specific devices used for accessing Magic Lounge: screens of various sizes, sometimes several at a time, cameras, microphones, loudspeakers, mobile phones, PDAs, ISDN video equipment, fax machines etc.

Initial situations of use are situations in which one "gets ready" to go to a virtual meeting place, either now or in the future. There are at least three initial situations of use of Magic Lounge:

1.1. The user *just decides to go* into Magic Lounge whereupon the user performs step 2.

1.2. The user *is called* by an identified person or group to a meeting at a certain time (now or later) in a certain room in Magic Lounge. The user may either have to do nothing (having merely been notified of the meeting, e.g. that it is up in 15 minutes), perform step 2, or may have to accept, reject, or propose time changes by answering the message. The person or group calling may already be in Magic Lounge or may themselves be called by Magic Lounge due to previous arrangements which Magic Lounge executes automatically.

1.3. The user *pre-arranges* a meeting to take place at a certain time in a certain room in Magic Lounge with certain specified participants, either whilst being in the Lounge or being outside it. In the former case, the user has to make take steps 2, 3 and 6 below. In the latter case, the user will have to use other means, such as email or telephone, to pre-arrange a meeting in Magic Lounge.

Given 1.1, 1.2 and 1.3, the user needs various functionalities for preparing to go to Magic Lounge:

1.4 Functionality enabling the user to go to Magic Lounge.

1.5 Functionality allowing the user to be called to Magic Lounge, either because of an imminent, pre-arranged meeting or because someone wants to contact the user, possibly including facilities for accepting, rejecting, or proposing time changes. For pre-arranged meetings, Magic Lounge may close the user's current applications and put the user into the meeting room.

1.6 How to go to Magic Lounge may depend on where in the Magic Lounge complex the user wants to arrive. In any case, authorisation will be needed because Magic Lounge is a virtual meeting place for a specific user community rather than a virtual meeting place for any internet user who wants to use it. This means that there are two possibilities for going to Magic Lounge:

1.6(a) the user uses a *general authorisation* to get into Magic Lounge; or

1.6(b) the user uses a *specific authorisation* to get into private or unannounced parts of Magic Lounge;
Magic Lounge itself verifies that the user has a right to do (a) and/or (b) without the user having to do anything.

1.7 Magic Lounge needs to know which access devices the user is using for going into the Lounge. There are two possibilities:

1.7(a) The user *tells* Magic Lounge which modalities of communication the user will be using; or

1.7(b) Magic Lounge itself *registers* the user's available means of communication without the user having to do anything.

1.8 It is possible that, already at this stage, the user (a) informs Magic Lounge of how, if at all, the user wants to be represented when entering Magic Lounge, and (b) how, if at all, the user wants others to be represented when encountering them in Magic Lounge. This is a difficult topic (see point 7 below).

Step 2. Going into Magic Lounge

Having performed the appropriate preparations, the user now goes into Magic Lounge.

Step 3. The Meeting Complex and Its Facilities

By now the user has entered Magic Lounge. Magic Lounge is a *meeting complex* rather than a single virtual meeting place. According to the users, Magic Lounge consists of the following types of virtual meeting places:

3.1 *The entrance hall.*

3.2 *Common (public) chat rooms.*

3.3 *Private and unannounced meeting rooms and conference halls.*

3.4 *Shared workspaces.*

Layout ideas for the Magic Lounge meeting complex range from the abstract (just a shared workspace) to the idea of basing Magic Lounge on a certain metaphor, such as a hotel situated in a garden.

The complexity of Magic Lounge means that the user may arrive at any token among the above types of virtual meeting place, depending on the user's purpose in visiting Magic Lounge. Let us go through the users' ideas about the facilities required of each of these types of virtual meeting place. Some functionality would seem to have to be available from anywhere in Magic Lounge. This functionality is presented first (3.1). Additional issues raised by the users are presented at the end (3.6).

3.1 Ubiquitous facilities

(a) The functionality needed for going to a specific room, including the provision of authorisation when appropriate.
(b) A meeting log which is available to inspection by late-comers to particular meetings, other meeting participants, and by everybody involved in between meetings.

(c) Searchable list of co-ordinates for all users in the user community: to enable people to get hold of others before or during a meeting, or to get hold of people who are not in Magic Lounge at the moment, it would seem useful that Magic Lounge includes a searchable list of their co-ordinates for use in this situation**.**

(d) Search: advanced functionality could enable search based on descriptions of people, their recorded actions, or desired competencies.

(e) The functionality needed to "knock on the door" of a closed meeting, either to enter the meeting or to get in contact with someone who is in the meeting.

3.2 The entrance hall

The entrance hall could contain:

(a) A list of who is logged into the entrance hall at the moment.

(b) A list of who is logged into Magic Lounge more generally at the moment - unless they are in private rooms and do not want to be listed.

(c) A board showing the user who wants to communicate with, or is looking for, him/her and when. This board may also display messages to specific users, inquiries etc.

(d) A board announcing ongoing and planned meetings, showing which meetings are regular meetings, which meetings are public and which are closed - except for unannounced meetings.

(e) A board to be used for selection of what one will participate in.

(f) Search on meeting topics.

(g) The functionality needed to organise meetings, including pre-arranged meetings.

(h) The functionality needed to make a meeting public, private or unannounced.

(i) The functionality needed to "lock" a meeting room so that is remains untouched by outsiders in between meetings.

3.3 Common (public) chat rooms

(a) A list of who is logged into the room at the moment.

(b) List of regular or invited/expected participants - when appropriate.

(c) Some kind of search might be useful for large meetings where listing those present is inconvenient.

3.4 Private and unannounced meeting rooms and conference halls

At this point, the distinction between meeting rooms and conference halls primarily refers to the number of inhabitants in a room. So a 'conference hall' is a large meeting room, no further requirements having been imposed on the particular functionality of 'conference halls' as distinct from 'meeting rooms'. It may be assumed, however, that 'conference hall' connotes other things as well, such as speaker-audience roles and

chaired or otherwise hierarchical proceedings. Meeting rooms may be general-purpose or they may be of a more dedicated (topical) nature, depending on the tasks for which they are being used.

(a) List of who is logged into the room at the moment - except, perhaps, for large meetings.

(b) List of regular or invited/expected participants - when appropriate.

(c) Some kind of search might be useful for large meetings where listing those present is inconvenient.

(d) The functionality needed to allow or deny access to people "knocking at the door" of a private meeting.

3.5 Shared workspaces

These virtual meeting places are always of a more dedicated (topical) nature, depending on the tasks for which they are being used. As for 'conference halls', no precise specification of the differences between "ordinary" meeting rooms and 'shared workspaces' were provided by the users, except that shared workspaces were to be private, have dedicated, task-oriented facilities of some kind, and be devoid of participant representations and concrete room metaphorics. The meetings held in shared workspaces are either private or unannounced.

(a) List of who is logged into the shared workspace at the moment.

(b) The functionality needed to allow or deny access to people "knocking at the door" of a private meeting.

3.6 Additional issues

(a) Will the meeting log/memory in general be available indefinitely, e.g. for years? This also applies to the rooms themselves: will it be possible to archive rooms and make them "history rooms"?

(b) Magic Lounge meeting room memory: what is a 'meeting log'? Does it only show the textual/audio communication which took place or does it also show the slides/overheads/audio tapes/video clips shown, the web sites visited, the material downloaded, the stuff produced through application sharing etc.? This other material could be available through lists of supporting material.

(c) Will the entrance hall have a meeting log (a memory)?

Step 4. Navigate in the Meeting Complex

Optionally, the user moves around in the Magic Lounge virtual meeting complex, the navigation being controlled by privacy rules (see below).

Step 5. Communicate in a Room

Given the different types of virtual meeting place in Magic Lounge, it is necessary to distinguish between communication in different rooms, following the rooms typology in step 3 above.

5.1 Ubiquitous facilities

(a) Limited application sharing facilities for linking to web sites including a general internet search function.

(b) Facilities for contacting other meeting participants individually during meetings (this may raise a particular problem for participants who are logged in via the telephone).

5.2 The entrance hall

(a) The functionality needed to make clear who is contributing to the communication at the moment.

5.3 Common (public) chat rooms

(a) The functionality needed to make clear who is contributing to the communication at the moment (such as putting people's names along their comments).

5.4 Private and unannounced meeting rooms and conference halls

This category covers a large variety of different types of virtual meeting.

(a) The functionality needed to make clear who is contributing to the communication at the moment - when appropriate. In bilateral meetings, for instance, this functionality may not be needed.

(b) The functionality needed to indicate that a participant has temporarily or permanently left the room - when necessary. In large conferences, for instance, this functionality is not needed.

(c) Advanced application sharing facilities for web access, text, images, audio, databases, programming tools etc. - as appropriate.

(d) Facilities for showing overheads and slides. Point (d) may reduce to point (c) above.

(e) Facilities for the electronic exchange of meeting material, such as programmes.

(f) Facilities for faxing overheads and other tabled meeting material to those linked up by telephone.

(g) Facilities for producing public web sites for particular meetings or series of meetings.

(h) The functionality needed to maintain a speakers list during formal meetings: getting onto the list, being taken of it, being told when it is one's turn to speak or when one should stop speaking etc. (chaired meetings).

(i) Facilities for secure speaker identification, e.g. in the case of voting.

5.5 Shared workspaces

(a) The functionality needed to indicate that a participant has temporarily left the room - if necessary.

(b) Advanced application sharing facilities for web access, text, images, audio, databases, programming tools etc. - as appropriate.

Step 6. Leave the Meeting Complex

The user leaves the meeting complex.

4. Representation, Privacy and the Roles of Magic Lounge

4A. Representation of Oneself and Others

Self-representation and representation of others are relevant to the following steps in the basic task model:

1. Initial situations of use.
3. The meeting complex and its facilities.
5. Communicate in a room.

It is important to note that the questions of whether and how to represent the inhabitants of Magic Lounge (a particular user and the interlocutors of that user) depends on, among other factors:

- the nature of the meeting [5]. For instance, large meetings impose constraints on the representation of participants which are different from those in bilateral meetings;

- the purpose (or task) of the meeting [5]. For instance, a regular topical meeting among professionals may not require any representation of the participants;

- the user's (permanent or immediate) role in the meeting [5]. For instance, it might be desirable to have a prominent representation of the present speaker or the chairman;

- the user's access devices: different access devices impose different constraints on how participants can be represented;

- the user's personal preferences. For instance, some users may want to restrict by customisation the way in which they are represented to others, and some users may want to customise the way others are represented to them.

These considerations give rise to the following dimensions of personal representation:

(1)*No representation* vs. *representation.* Representation may be by one of the following forms or combinations of them: name, alias (e.g. ID), picture icon, stored (static or dynamic) image, live (static or dynamic) image, etc.

(2)*One-level representation* vs. *layered representation.* In a layered representation, the user is represented in different but linked ways. For instance, a personal description of that user could be called up from the user's level-one representation as a named icon.

(3)Representation *as an individual* vs. representation *as an individual and as a member of a group.*

(4)*Fixed representation* as defined by the application vs. *default representation* which may be changed by the user vs. *full customisation representation* where the user may select or define the representation.

The following functionality is needed:

(a) The functionality needed to make oneself visible or invisible to others (one's voice will always be audible and possibly recognisable). This might be decided in step 1, initial situations of use (cf. above).

(b) The functionality needed to customise one's self-representation. This might be decided in step 1, initial situations of use (cf. above).

(c) The functionality needed to customise how others are to be represented. This might be decided in step 1, initial situations of use (cf. above) or from a particular room in step 3.

4B. Privacy

The handling of privacy and authorisation is among the most difficult interface design issues in the development of Magic Lounge. Thus, the answers received to Question 18 in the First Magic Lounge Participatory Design Questionnaire demonstrated that the issue of privacy is a highly controversial one which will have to be studied carefully. The question was:

> If a group session is private, should non-invited ML visitors have the possibility of finding out that your group is in ML? Should they also have the possibility of finding out which persons are now meeting somewhere in ML?

In the basic task model (Section 3), issues of privacy and authorisation arise in connection with the following steps:

1. Initial situations of use.
3. The meeting complex and its facilities.
4. Navigate in the meeting complex.
5. Communicate in a room.

1. Initial situations of use

(a) Authorisation of various kinds is needed to get into Magic Lounge, depending on where one wants to go.

(b) Authorisation is needed to arrange meetings in Magic Lounge when this requires room creation.

(c) Authorisation of various kinds is needed to access meeting logs, depending on the nature of the meeting(s).

3. The meeting complex and its facilities

It seems obvious to the author that inhabitants of the public spaces in Magic Lounge should be visible to others, i.e. that these users should not have the option of being invisible. Similarly, public meetings should be announced, for instance in the hall.

(a) Information on inhabitants: should a board in the entrance hall display who is around in the entrance hall, other public rooms and/or private rooms at the moment?

(b) Should (a) private meetings be unannounced by default so that it is up to the participants to decide to announce them on a board in the entrance hall, or (b) should private meetings be announced by default so that it is up to the participants to decide to unannounce them, or (c) should the participants always decide whether or not a certain private meeting/series of meetings should be announced?

4. Navigate in the meeting complex

(a) Private meeting rooms should be protected against intruders, for instance by requiring outsiders to "knock at the door" to private rooms.

(b) Unannounced meetings should be protected against intruders, for instance by requiring outsiders to "knock at the door".

5. Communicate in a room

(a) Functionality is needed to enable private talk between a subset of participants in meetings. One possibility is that this would be like going to another private room for a while.

4C. Magic Lounge automatic support

At the Magic Lounge end we find the automatic tasks performed by Magic Lounge itself, such as:

1. Initial situations of use

(a) Magic Lounge verifies the user's authorisation to go somewhere within Magic Lounge and to access meeting logs.

(b) Magic Lounge may verify the user's information about access devices.

(c) Magic Lounge may verify the user's information about representation of self and others (for consistency with where the user wants go in Magic Lounge).

(d) Magic Lounge notifies the user that a meeting is imminent.

2. Go to the virtual meeting place

(a) Magic Lounge registers that the user goes somewhere in the Magic Lounge complex.

(b) Magic Lounge may register the user's access devices.

3. The meeting complex and its facilities

(a) Magic Lounge verifies the user's authorisation to go somewhere within Magic Lounge.

(b) Magic Lounge enables search and calls for people in and from the Lounge.

(c) Magic Lounge keeps track of who is in the Lounge complex, and where they are.

(d) Magic Lounge maintains the notification board.

(e) Magic Lounge maintains the meetings board and allows search for and organisation of meetings.

(f) Magic Lounge maintains meeting participants lists.

(g) Magic Lounge maintains people's co-ordinates, i.e. full information of their names, affiliation, addresses, telephone number(s), fax, email, web site etc.

(h) Magic Lounge protects private and unannounced meetings.

(i) Magic Lounge maintains a log of rooms and of when rooms are being used, and notifies participants that a meeting room has not been used for a certain (long) period of time and that the room will be abolished if it has not been used again within a certain period.

(j) Magic Lounge provides facilities for representation of its virtual inhabitants as well as restrictions on representation and non-representation, depending on the nature of meetings.

4. (Optional) navigate in the meeting complex

(a) Magic Lounge registers the user's navigation (either its entire history or just where somebody is at the moment).

5. Communicate in a room

(a) Magic Lounge maintains and protects the meeting log/whiteboard. 'Protection' means that Magic Lounge protects the meeting log/whiteboard against unauthorised changes.

(b) Magic Lounge records who is communicating (speaking, writing etc.) at the moment.

(c) Magic Lounge records who has temporarily left the room.

(d) Magic Lounge provides application sharing facilities.

(e) Magic Lounge provides facilities for showing overheads and slides.

(f) Magic Lounge provides facilities for the electronic exchange of meeting material, such as programmes.

(g) Magic Lounge provides facilities for faxing overheads and other tabled meeting material to those linked up by telephone.

(h) Magic Lounge provides facilities for producing public web sites for particular meetings or series of meetings.

(i) Magic Lounge provides the functionality needed to maintain a speakers list during formal meetings: getting onto the list, being taken of it, being told when it is one's turn to speak or when one should stop speaking etc. (chaired meetings).

(j) Magic Lounge provides facilities for secure speaker identification, e.g. in the case of voting.

(k) Magic Lounge enables private person-to-person communication during meetings.

6. Leave the meeting complex.

(a) Magic Lounge registers that the user leaves the Magic Lounge complex.

Figure 1 summarises "the users' Magic Lounge".

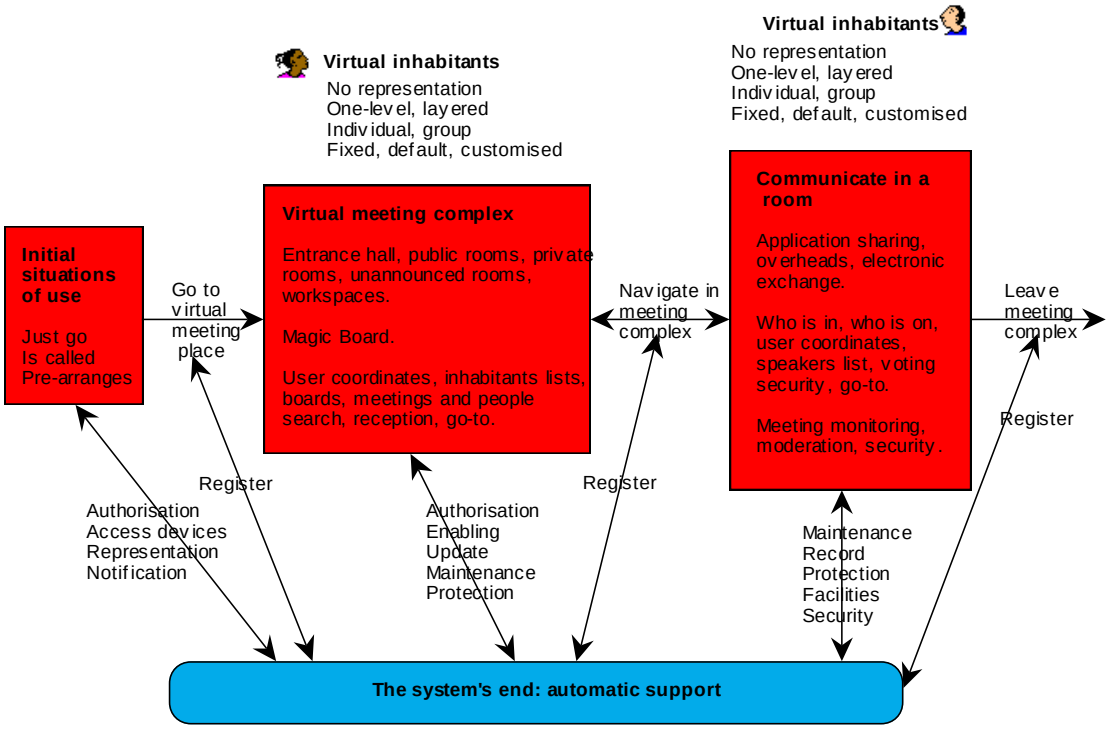

Figure 1. The "users' Magic Lounge". The three central boxes and navigation in the meeting complex involve privacy issues. The meeting complex and room communication involve representation of virtual inhabitants.

5. Conclusion

This paper has presented an analysis of the users' input concerning task performance in Magic Lounge from the First Magic Lounge Participatory Design Questionnaire. The analysis was based on a task model for visiting Magic Lounge augmented by considerations concerning the virtual representation of inhabitants, privacy, and the roles of Magic Lounge itself during interaction. Together with the theory of the dimensionality of virtual co-presence presented in [5] and in abstraction from low-level interface design aspects, this concludes the analysis of the First Magic Lounge Participatory Design Questionnaire.

References

[1] http://www.dfki.de/imedia/mlounge/

[2] See http://www.i3net.org

[3] Bernsen, N. O. and Dybkjær, L.: Magic Lounge Participatory Design Questionnaire 1: The data. November 1997. Confidential, internal Report. *Magic Lounge Working Paper* WP41-1-2.html.

[4] Bernsen, N. O. and Dybkjær, L.: Magic Lounge. Participatory specification and design ideas from the Danish isles. December 1997. *Magic Lounge Working Paper* WP41-4-1.html.

[5] Bernsen, N. O.: Dimensions of virtual co-presence. January 1998. (Forthcoming).

Acknowledgements. Laila Dybkjær and Masood Masoodian provided many useful comments on the first version of this paper.

NOB/10.1.98