# Towards evaluating social telepresence in mobile context

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## Abstract

In this paper we analyze the state-of-art in the evaluation of telepresence, social presence and copresence and propose a qualitative approach for evaluating social telepresence in mobile context. Our approach aims to meet the need of rapidly growing industries of mixed reality, social media and video broadcasting services.

**Keywords:** telepresence, presence, social presence, copresence, social media, mobile.

## 1. Introduction

Since the rise of services such as Skype, Facebook, Google Hangouts and mixed reality games, there has been a growing need for evaluating social presence of these services especially in mobile context. However, recent discussion on development of mobile services mentions that "designing with presence in mind" is beneficial for value creation, but adjustments need to be made to make the design fit mobile situations because of *spatiality*, *temporality* and *contextuality* [1]. These factors make quantitative evaluations in controlled experiments difficult and somewhat inadequate. Wagner *et al.* [2] suggest that interpretive observation methods such as ethnography should be used to evaluate presence in mobile context. Methods for measuring presence depend on the definitions: *telepresence*, *social presence* or *copresence*.

To cope with all the changing variables in mobile situations we propose a methodology for evaluating social telepresence iteratively during pilot use of a service. The methodology includes ethnographic note-taking, analysis of system usage logs, qualitative correlation analysis and structured interviews.

## 2. Presence and Its Evaluation

There is a rich and sometimes contradictory literature defining the related concepts of presence, social presence, and copresence. It is beyond the scope of this paper to review all this literature in depth. Instead we adopt the most dominant definitions for each concept as shown in Figure 1 and discuss their respective measures.
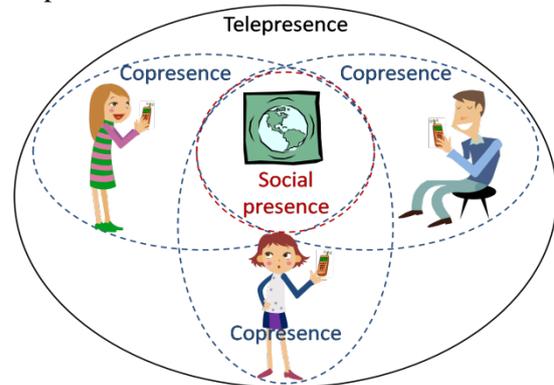


Figure 1 : Relation between telepresence, copresence and social presence

### 2.1. Telepresence

Telepresence is most often defined as the feeling of "being there" in mediated environment [3]. The concept of telepresence has been identified as a multidimensional concept with immersion, spatial/physical presence and social/behavioral realism being seen in most telepresence measurement scales [4]. Much of the research is conducted in immersive virtual reality environments. The most widely used measure for telepresence is Witmer *et al.*'s [3] Presence Questionnaire (PQ) version 3.0. They suggest that the strength of presence experienced in virtual environment results from the interaction between characteristics of the virtual environment and individual differences. Thus, PQ version 3.0 is a 4-factor model (Adaptation/Immersion, Sensory Fidelity and Interface Quality) which consists of 32

questions, for instance: "How were all your senses engaged?" and "How well were you able to control events in the environment as compared to your real-world experience?"

## 2.2. Copresence

According to Nowak [5], copresence is a psychological connection to and with another person which requires participants to feel they were able to perceive their interaction partner and that their interaction partner actively perceived them. Biocca *et al.*'s questionnaire which contains questions such as "How involved/detached were you in the interaction?" is widely used [6]. Questions are normally split into self-reported copresence and perceived copresence of others. A 5 or 7-point Likert scale is used depending on the nature of each study.

## 2.3. Social presence

Short *et al.* are defined social presence as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" [7:65]. Subsequently, measures of social presence are about the user's perception of a medium's ability to provide salience of another. In addition to measuring copresence, Biocca *et al.*'s [6] questionnaire covers also social presence. Social presence is segmented into 3 dimensions: *copresence*, *psychological involvement* and *behavioral engagement*. Each dimension is measured by different sets of questions using 5 and 7 point Likert scale.

## 2.4. Critique

In terms of the environment, presence research is heavily dominated by the evaluation experiments of virtual and mixed reality systems in a controlled environment. The questionnaires have been successful in discovering specific aspects of the self-reported experience of presence, but they do not assess the natural context of use and social context. Presence should be studied not only as a psychological phenomenon but also as a cultural experience [8]. The fieldwork of Katz & Aarkhus [9] have shown that people embrace their communication devices as integral parts of themselves while accepting the ambiguity of presence of the digital others. Furthermore, Czaja suggests that this process involves habitual practice that becomes culturally embedded over time which can only be observed through ethnographic studies [8]. Ethnographic studies provide empirical evidence of the influence of culture on the experience of presence: "presence studies are pertinent to understanding mobile cultures" [8:1]. Yet, the gap in literature on telepresence as a cultural construct has yet to be bridged.

Although questionnaires are quantitative methods, the presence-related questionnaires are noted to be heavily dependent on the participants' ability to recall their emotion and cognitions during the media experience [8]. Slater [10:450] urges us "not to take Likert scale too seriously" and argues that a new paradigm is needed for presence research that would include also physiological and behavioural data. Wagner *et al.* [2] suggest that interpretive observation methods such as ethnography should be used to evaluate presence. The ethnographic approach they proposed consists of observation, interviews and the analysis of artefacts with the use of standardized presence questionnaires where appropriate.

Moreover, in such approaches, participants may come up with practical comments to advise the researchers to change certain terms or inquire about the validity of the questions [11].

## 2.5. How to address mobility?

How can we study such a multi-layered phenomenon as social presence in mobile context? Controlled experiments and questionnaires are not sufficient to examine all aspects of a system or a service that might be relevant for re-designing and improving it. Potential variables within the dimensions of spatiality, temporality and contextuality are overwhelming. Mobile use is very often studied through pilot use of system prototypes or beta-releases of services out in the open. The culture of mobile communication includes relationships, spaces and practices of interacting through and with these technologies. Only mixed research methods may fill this gap by using quantitative methods to measure some aspects of the phenomenon in question and qualitative methods for others to reveal the nature of findings and fill the gaps [11].

# 3. Proposed Methodology

We propose to use a mixed research methodology that covers both quantitative and qualitative methods as illustrated in Figure 2. This methodology is intended to be used when prototyping new systems or services in an iterative manner. As an example, we describe how presence can be studied during a 4-week pilot use of a wearable video camera Looxcie™ [12].
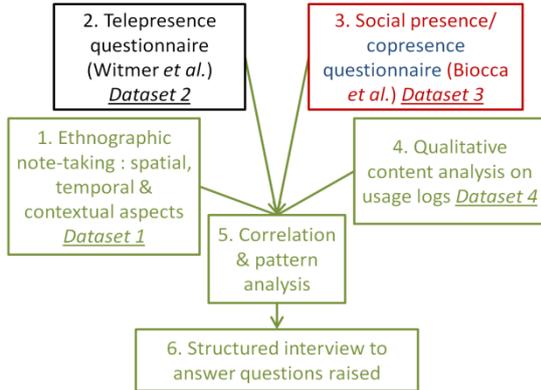


Figure 2 : Proposed methodology to study telepresence (black), social presence (red), copresence (blue) and mobility (green).

## 3.1. Step 1: Ethnographic note-taking

Ethnography is a mixture of various qualitative methods including fieldwork, case study and observation for instance [13:16]. In the context of mobile presence, we adopt the fieldwork note-taking method which captures spatial, temporal, and contextual aspects. This gives us the qualitative Dataset 1.

Example: In the case of Looxcie camera, the test users will take notes of their daily use of Looxcie from the beginning of the study until the end of it. We ask the users to note experiences of their use of Looxcie: how often, what purpose, how was the device used and new metaphors of presence that might emerge (if any).

## 3.2. Step 2 & 3: Quantitative questionnaires

The PQ [3] and the copresence and social presence questionnaire [6] are used for getting quantitative data. Users will answer the questionnaires twice, first in the middle and second at the end of the pilot use period. This is to ensure we capture any changes in the level of presence felt by the users over time and make this method comparable to the

pre-test and post-test survey practice in control experiment method. Datasets 2 and 3 produced in this way are quantitative.

Example: Looxcie users fill the questionnaire after 2 and 4 weeks of the study and they can compare their first answers to the latest.

## 3.3. Step 4: Content analysis of usage logs

Content analysis [13:171-173] is done on the usage logs of the system or service (Dataset 4) to identify what users do to control the system or service and what kind of usage patterns emerge.

Example: Looxcie system's usage logs are the list of actions performed by the users such as pressing on-off button, zooming in, taking still photos and videos, etc. These are analyzed to see if the users e.g. take photos at all and about how often they record video.

## 3.4. Step 5: Correlation & pattern analysis

If there are any discrepancies or patterns between the level of mobility aspect (Dataset 1) and presence (Datasets 2 and 3), the correlation between these two factors can lead us to develop new features to the system or service. Likewise, some patterns of usage from Dataset 4 might correlate with a difference in the level of reported presence in Dataset 2 and 3.

Example: If Looxcie users who used the zooming function report higher presence more than users who did not zoom, Looxcie's zooming capabilities should be made easier to find and use.

## 3.5. Step 6: Structured interview

If there are any gaps in Datasets 1, 2 and 3 that are prone to interpretation of the researcher, structured interviews [13:156-161] are developed to answer questions open to developers. The interview transcripts act as Dataset 6 and they can be grouped according to themes of the open questions.

Example: One Looxcie user seemed not to take video clips, but her notes in Dataset 1 do not reveal why. The interview will poll her and other users for the reason which turns out to be their habitual use of their camera-phone. The system design needs no change.

## 3.6. Step 7: Reiteration (optional)

In the case of new uses or phenomena in the mobile context observed, steps 1 to 6 can be

repeated over an equivalent period of time. This is done to reveal the nature and evaluate benefits of new functions and usage.

<u>Example</u>: A specific user reports using Looxcie camera for traffic safety while riding his motorbike. This use was not expected when designing the system. If this is seen as an important phenomenon, it is possible to suggest all the other users to try to use Looxcie in this way. Steps 1 to 6 can be repeated on all of the users and functionality of the camera improved.

## 4. Conclusion & Discussion

We presented a methodology to evaluate social presence in mobile context. Not only it bridges the gap in presence measures, but also provides guidelines for capturing the contextual, temporal and spatial factors of presence which subsequently might lead developers to innovations to enhance the system or service. The amount of data collected will be considerably a lot to analyze. Many times, when using mixed methods, there is a risk to fall into the trap of "true integration" by putting the data derived through different methods alongside each other and discussing findings separately [11]. Due to this and the ethnographic studies in general, researchers have to be trained to collect and analyze the qualitative data.

We are testing this methodology for its validity in several studies. After the tests we hope to find ways to simplify some of the steps to enhance its applicability in presence research and development of real mobile system and services.

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