

Subjective-Situational Study of Presence

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Abstract. The paper is devoted to the description of the interview approach to reveal presence state and its types such as environmental, social and personal presence. The questions of the interview is described and analyzed in detail. The questions were formulated in view of the subject's behavior and the reactions during tests. Also the answers of the test subjects are analyzed from a perspective of sense of presence revealing. The interview method proved its efficiency. This method allowed to identify in practice types of presence being under researching. In addition, it has enabled a better understanding of the dynamics of the perception changes in the case of presence. The flexibility of this method allows to adjust it under specific virtual environment, and to clarify all key aspects to understand presence.

Keywords: sense of presence, interview approach, types of presence.

1 Introduction

Virtual reality is widely used in educational, medical and scientific applications in the last two decades. Also the phenomenon of virtual reality is the object of scientific research. This paper is devoted to the research of the sense of presence.

The sense of presence (feeling of “being there”) is a factor which defines virtual reality. The sense of presence distinguishes virtual reality from “traditional” 3D Computer Graphics. [2]—[4], [7]. There is a number of publications devoted to the problems of specific states occurring in connection with virtual reality. The important conceptions of virtual reality such as presence, absorption, immersion, involvement, and cybersickness are described and discussed. Also the methods and techniques of the measurement and the study of sense of presence are described. Its contributing factors are analyzed. But the finding of effective methods for the presence measurement remains a challenging open problem.

Behavioral, physiological, and subjective approaches to the measurement and to the study of sense of presence are offered traditionally.

Presence in any case reduces to definition “sense of being there”. In our opinion this is the only true criterion of the presence condition. Therefore it seems correct to use in the first instance the subjective method since no one but the person cannot say where she/he felt her/him self. Thus objective methods are subsidiary, confirming introspections of subjects.

Thus, our approach is based on the subjective opinion of an user. It's about her/his sensing that she/he was "there", was in the virtual reality. An user can say "no, I was not able to control events, I was uncomfortable, I was not able to survey or search the virtual environment, I had not lost track of time, but I was there." And we may make a conclusion, that an user experienced the state of presence.

Presence is defined as a sensing of immediate interaction with the environment or the object of the environment. International Society for Presence Research said presence is the state arising in interaction with the special technology in which part or all of the individual's perception fails to accurately acknowledge function the role of the technology in the experience.

The question of how to determine whether the presence of? "Being there" is too broad term. Presence can be of different types, can exist in varying degrees, can be experienced at any one instant of interaction with the technology and the lost to the next instant.

We propose to expand presence and include in criteria not only user actions or her/his feelings about the event happened already, but the user's expectations and expectancy. The technology may not always make the sense of touch or other interaction; the imagination does not help relive a nonexistent touch. But an user believes that a touch is possible.

When the user says "I was afraid of being hit by clashes", "I wanted to touch", "I waited for sensation of wind on my face" experimenter says "there is a sense of spatial (environmental) presence."

When the conditions of the experiment or technology does not allow another person to be in the environment, but the subject says "you were near to me", the experimenter said "there was a Social presence or Co-presence".

In this paper some results of our previous researches are used [1]. In those researches we have considered the problem of influence the presence effects on the performance of the intellectual task. As such Kohs Block design test was selected. The study involved two groups. The subjects in one of them decided the task in stereo glasses. The members of the second (control) group performed exactly the same task, but on the desktop. To motivate the subjects of both groups they after experiment may see demos with nature views. A sense of presence after the Kohs Block design test was measured using the Presence Questionnaire of Witmer and Singer [8]. That is mentioned most often in literature. Questions in that questionnaire are constructed taking into account factors which cause the sense of presence. We received the results coinciding with described in literature. Despite of it we were not completely satisfied with the results of research. The main defect of a questionnaire as the method is preset strictly fixed questions. Questions in any way concern neither the concrete virtual environment, nor concrete activity of the subject of the experiment in frameworks of this environment. Therefore the elaboration more flexible technique is seemed to be useful.

In this regard, we propose our version of a technique for the presence research. It's not a questionnaire, which would have to be modified "toties quoties" (each time). It is an interview where in advance the only the general direction of questions is specified. The questions of our interview depend on many factors. Among them the

type of the virtual environment, the behavior of the test subject, a task that she/he performed in the environment. Besides, the questions depend on the subject's messages during operating in the virtual environment, as well as during the interview.

We analyzed the different data, such as the records of the subjects after the test run in stereo-glasses, the reports about the virtual reality demos viewing by both main and control groups, as well as the subject's stories about viewing of 3D movies. The analysis was supplemented by our own impressions of the CAVE-system and 3D movies.

As a result we drew a conclusion that it is appropriate to conduct not quantitative but qualitative studies of presence state. Such approach relieves of the need to connect this low-studied phenomenon with others often too low-studied states. Similarly it isn't necessary to look for quantitative indices of actually unknown objects and concepts.

Types (levels) of presence were described in detail in [6]. We think that it is suitable to base a survey-interview on these types. However, the preliminary results of our analysis induced us to redefine the descriptions of these types.

For example, **environmental** (or spatial) presence within frameworks of our study assumes the interaction with the environment, the reaction environment on the subject, and the expectation of interaction. The determining factor is the expectations of the subject. As we said above, when the user says "I was afraid of being hit by clashes, I wanted to touch", "I waited for sensation of wind on my face", the experimenter may say "there is a sense of spatial (environmental) presence".

Social presence is considered if the subject believes that she/he interacts with others human beings within virtual reality. Moreover technologies may allow being present into an environment really and may not allow. But if the subject says during the interview "you were near to me", then the experimenter may say "there is a Social presence or Co-presence".

Personal presence is the most profound presence. Subject remembers how she/he appears in the initial state of virtual reality. She/he knows the background and previous experience into this environment.

Below we consider a set of interview questions which correspond to the selected types of presence.

The first, **environmental**, set of questions in turn may be divided onto following subtypes:

- questions about *impressions*, formed into virtual environment;
- questions about *expectations* (for example *did you want to touch objects, did you afraid of crash with wall, or tree, or another object of environment, etc.*),
- questions about *self-sentiments* (for example *where have you been - in the virtual environment or in the real world?*).

The second set of questions is the **social** set. In this part of the interview it should be asked about other subjects of the virtual environment, about the experimenters and the technical staff if they were in the room. The aim of the social set of questions is to find out whether other people intensify the sense of fidelity of a virtual environment

or they hinder sense of “being there”. Possible such co-presence is ignored as unnecessary for the interaction with the environment.

The third set consists of questions about **personal** presence. The task of these questions to reveal exactly whom the subject feels in virtual reality. Presumably she/he can identify with the character, proposed a specific system or come up with something else, or may be her/himself. In the latter case it is necessary to ask if she/he remembers how and why was in this virtual environment.

In addition, at the beginning of the interview the general questions about impressions have to offer.

2 Methods

The virtual environment containing various objects and allowing to move inside, helps to reveal the factors influencing experience of presence. We have chosen the environment to involve the maximum number factors which may influence the experience of presence. We paid special attention to ease of the interface, the reality of the imagery, the user control of the events occurring in the environment and realistic feeling of movement through the environment. The popular computer game *Grand Theft Auto: San-Andreas* was chosen. The game world in this case is rather rich. There is the possibility to navigate a helicopter demonstrating the reasonably realistic “behavior”. *Multi Theft Auto* is the modification of *Grand Theft Auto*. It makes possible to create various scenarios basing on the game.

The eighteen subjects were selected. They were acquainted earlier with virtual reality based on the stereo glasses. They had the opportunity to fly over a town, a forest, and a lake. The flight took place in the low cloud. The timescale was 1 hour = 1 minute. Flights began with since midday and finished ten o'clock P.M. The total time spent in the virtual reality should not exceed ten minutes. There was the “first-person” flight, that is subjects obtained an overview from a helicopter cockpit. The helicopter itself and its cockpit panel weren't shown to the subjects. USB-joystick ThrustMaster Top Gun Fox 2 Pro was used as the controller. Two series with a small break were offered to the subjects. The subjects independently controlled flight in one series. The operator controlled helicopter in another series. In some cases subjects initiate voice commands according to which the operator directed the helicopter.

The questions of interview were formulated taking into account the virtual environment. These questions are:

1. Describe your feelings and impressions.
2. What is your mood after the “flight”?
3. Did you feel the flight? As far as this feeling was realistic?
4. Did you wait for the crash?
5. Are you afraid of the crash?
6. Did you wish to examine the environment?
7. Had you another wishes and expectations connected with the virtual environment?
8. Where did you feel you self: a) airborne; b) in the helicopter, c) in the room (where test was carried out), d) at the same time in the room and in the helicopter?

9. Who, in your opinion, did control the helicopter (in cases when the test operator have controlled the helicopter)?
Options: a) a test operator, b) a character from the virtual environment, c) the helicopter was controlled by itself.
10. How did you perceive the flight operator?
Options: a) as a character from the virtual environment, b) a person from other world (i.e. from real world), controlling the helicopter, c) some tool, d) without a thought.
11. Where, in your opinion, have the experimenter (or the experimenter together with the operator) been in the case of the independent flight? a) Near you in the helicopter? b) Near you in the room? c) You didn't think of them? d) They were absent at all.
12. Whom did you feel yourself? a) a game character, b) other person (describe), c) your old self?
13. Do you remember how you have became airborne?
14. Had you sense of presence? In what series this sense was more – in passive where you watched the flight, or in active where you controlled flight?

Note, that in each case the questions were formulated in view of the subject's behavior and the reactions during "flight".

The purpose of the first two questions is to bring the opportunity for the subjects to share impressions, to state what is most excited them at present and only then to return to the topic, that is interesting the experimenter.

The third question related to the realism and fidelity of virtual environment. This question allowed to correlate the impressions emerged from virtual environment, to the impressions emerged usually from the real world.

Points concerning presence directly begin with the fourth question. The questions from the fourth to the eighth were the environmental questions. The questions from the fourth to the seventh were about the impressions received from the virtual environment and the interaction with the environment. The eighth question was about the subjective localization. These questions were made more exact on the basis of direct observation over subjects: "What emotions the expected collision did trigger?", "When you almost collided with the wall what did you feel: fear of trauma, misgiving of penalties for failure, etc."

The questions from the ninth to the eleventh were about social presence. As we said above in our investigation other participants of virtual environment did not present visual, but they presented in environment functionally (for example the operator who controlled the helicopter in half of series).

Twelfth and thirteenth questions were about personal presence.

The last question was proposed as the final, and its main goal is to summarize the interview. Also, we tried to verify how important for presence experience is an own subject activity in the virtual environment.

3 Results

Usually answers to the first two questions had rather emotional nature. They were reduced to exclamations such as “Cool”, “Fablonic”, “I like it”, “I also want a helicopter!”, etc. Less enthusiastic answers also took place. Subjects complained of the fatigue, the difficulty with control, inability to look around the corner, the discrepancy between the visual and vestibular sensitivity. However generally one may say that flying in a virtual environment has attracted interest.

3.1 Answers to the Third Question

The part of the subjects had no real flight experience. They could compare their virtual experience to flights in a dream. One subject considered the virtual flight as more similar to swimming. However the majority (10 of 18) specified that the flight was seemed to them like a flight in the real world. There were also such subjects who reported that flight in the virtual environment is even more realistic than in the real plane since a view from a window of the passenger plane doesn't provide such visibility.

3.2 Answers to Environmental Questions

The answers to the questions from the fourth to the eighth are ranged from the belief that there is a “picture” or “Game World” to the confidence that one can be knocked on the trees and swim in the lake. The subjects were exposed to the dangers of the virtual collision with buildings, trees or the ground. It is interesting that they responded differently to these dangers. For example, one of the subjects described its presence in virtual reality as an extremely high. Her description largely corresponds to an altered state of consciousness. For her the collision was a way to explore the world, “to touch the world by helicopter if you can not feel it by own hands”. Others said that they felt themselves rather in a room where the test was conducted, than in the air over the city or inside the helicopter. But at the sight of the approaching wall they shuddered and tried to dodge.

3.3 Answers to the Social Questions

Despite the fact that our subjects were well aware of the operator being in the room and some of them even gave him commands, part of the subjects claimed that in a passive series the helicopter flew by itself, operated by “the roundabout mechanism”. Others considered her/his own voice giving commands as the instrument of control and ignored the person to whom they were addressed. There were subjects who included the operator in the virtual environment, identifying him with the pilot. In some cases we received the answer “you were beside me, but you were in the room, but I was in a helicopter over the city”.

3.4 Answers to the Personal Questions

In our study we observed some situations. In some cases the subjects felt “as themselves, together with whole their memory” (i.e. they didn’t experience personal presence). In others they felt “as themselves, but without the burden of habitual experiences”. In third they felt themselves even as the character of the virtual environment with the biography that is different from the biography of the subject. In only two cases we observed personal presence. The subjects were built in themselves on virtual environment on the level of reminiscences, imagining the background to their appearance in the virtual world, and even a “virtual biography”. Once the identification of her and the virtual character was full. The subject could tell us “her” (virtual) biography, the flight purpose, the duty station, and even a grade title of character. The second case was rather intermediate. The subject thought up a character backstory, but did not convince herself in the authenticity up to the end. In our opinion, there were elements of the game to another person here.

Only two subjects answered negatively on the generalizing question, and three subjects pointed that the experience of presence was higher during passive rather than active series.

4 Conclusion

The main advantage of the interview approach is a lack of prearranged constraints on the set of questions. Thus this method is applicable for the different environments and the experimental conditions. Certainly, under other conditions questions will be formulated differently. The environment set of questions may be strengthened, the social or personal set may be weakened. Other expectations and fears may appear in other experiments.

Besides, the free form of the interview allows subjects to describe intermediate forms of presence which they tested. It allows to reveal nuances of the phenomenon.

We have to remind, the term presence, especially spatial presence dubbed as the sense of “being there.” Spatial presence is a product of an unconscious effort to correctly register oneself into the virtual environment in a consistent manner. this process is perceptual, and bottomup in nature, and rooted in the reflexive and adaptive behavior to react and resolve the mismatch in the spatial cues between the physical space where the user is and the virtual space where the user looks at, hears from and interacts with [5].

Our method helps to notice when this mismatch is resolved not completely. In our research subjects in most cases ignored a contradiction. For example, the subjects claimed that they were in the helicopter, and spoke about experimenters “you was near me, in the room”. They noticed a paradoxicality of the words only after speaking. Thus, one may consider that our method revealed partial spatial presence.

Then the interview method proved its efficiency. This method allowed to identify in practice types of presence being under researching. In addition, it has enabled a better understanding of the dynamics of the perception changes in the case of presence. Finally, the flexibility of this method allows to adjust it under specific virtual environment, and to clarify all key aspects to understand presence.

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