

Presence in the environment: theories, methodologies and applications to video games

Xavier Retaux*

Paris8 University
France Telecom R&D

ABSTRACT

Many authors maintain in their work that the presence feeling in the virtual universe only survives if the player is unaware of the technical interference. The technical system is a mediation between the subject body and the virtual environment. There are many ways to theorise this mediation and therefore many types of explanations given to explain the fact that the user is no longer aware of the technical system. The more common is the "immersion theory". This is a technical theory. We propose a more psychological theory based on activity theories. We think that the transparency of the mediation appears with the subject practise and the increase of it.

We propose a new methodology to assess the feeling of presence to show that this feeling varies during the activity.

We don't find that the more a subject is experienced the more he feels present. We discuss this result and conclude that there's a complex relation between the feeling of presence and the transparency of the mediation.

We find that the feeling of presence varies according to the activity. This second result can't be explained by the theory of immersion. This result support our proposition but we need more results to conclude.

Keywords: *presence, immersion, activity theories, videogames.*

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1. Introduction

Many authors maintain in their work that the presence feeling in the virtual universe only survives if the player is unaware of the technical interference. For example, if a player is not aware of the fact that the virtual universe is displayed on the screen, he will be able to be present in this universe.

You will notice straight away that we have chosen to use the expression "to be aware of the technical system" rather than "to react", "pay attention" or "perceive." To be aware consists of "having a full and clear knowledge of what one does or feels, of the existence or the reality of something" ("Grand Larousse en 5 volumes" dictionary). This expression does not require a particular explanation: reflex, attentional, or perceptive

* Corresponding Author:
Xavier Retaux
Email: xretaux@netcourrier.com

mechanisms. Therefore, we can tackle the explanations of this state of awareness or not from the technical system without a presupposed explanation.

Why is the user no longer aware of this technical system? And what should we do to favour the fact that the user is no longer aware of the technical system? We are going to propose some answers to these questions. For this, we will see the different explanations of the fact that the user is no longer aware of this technical system.

2. Explanations of this feeling 'of being elsewhere.'

The technical system is a mediation between the subject body and the virtual environment. There are many ways to theorise this mediation and therefore many types of explanations given to explain the fact that the user is no longer aware of the technical system. We will see these different explanations.

2.1 Technical explanations: the immersion theory

This theory aims to make the technical system invisible by allowing the user to behave as if he is used to it. This theory aims to create an ideal interface between the user and the technical system. This interface is ideal in the sense that it would not require any teaching (Rheingold, 1995).

This theory is founded on a distinction between reality and virtuality. For the researchers defending this point of view, there is a reality measurable that it is sufficient to reproduce in order to allow the user to behave 'naturally'.

The synthesis of this universe is realised by means of a technical system that simulates it. The interface works via the peripherals called 'immersive.' The immersion connects the human perceptive and motor 'channels' with entries and exits from the technical system. For example, in the case of office computers, the line of sight is coupled with the screen and the hands to the combination of keyboard and mouse. Nevertheless, our example is a system that is not very immersive. A highly immersive system will consist of a heading in a "Head Mounted Display" (HMD) format and datagloves. So, the visual channel and the hands are totally immersed in the technical system. This allows the user to behave naturally, without any teaching. In order to take an object into the virtual universe, the user seizes with his actual hand, the datagloves are in charge of transmitting the gesture to the technical system that then modifies the attachment on the HMD.

The more the user is immersed by the peripherals that allow him to behave naturally, the less he is aware of the technical system and the more he feels a part of the virtual world (see Coiffet, 1995 for the development that is the most characteristic of this theory).

The limits of this technical theory (for example Cadoz, 1996; Ryan 1994 or Kalawsky 1999) are partly technical. This immersive and invisible technical system does not exist today. It will without a doubt never exist because it implies the disappearance of tools by perfectly copying reality when these tools are not present in reality.

Many questions naturally stem from this technical theory. What classifies as an exact copy of reality? How does perception work? How does action work? What are the links between perception and action? What is natural behaviour for the user? What are your objectives when you use a virtual reality system? What is a feeling of being in a virtual environment?

The study of a person interacting with immersive systems is therefore pertinent and this is what we are going to see next.

1.2 Psychological explanations

From the point of view of the person, many mechanisms are suggested to explain the reason why he is unaware of the technical system and therefore the feeling of being in a world created by the technical system. The field of study of this feeling is that of 'presence'. There is a thin line between this field of study and the immersion theories. If the scientists in this field often reproduce the immersion theory, it distinguishes itself by an approach centred round the person, rather than the conception of the system.

The peripherals as interface between the person and the virtual universe

In this perspective, the person is in the real world and acts in the virtual and distant world. There are different theories to explain the functioning of the person, his interactions with the technical system and the reasons why he places himself in reality or virtuality. These theories lead you to believe that the feeling of presence is like a feeling of being more or less in a virtual world (or acting in a virtual way), a present world (where you are physically) or distant place (where you are acting psychologically).

The people who have written about this perspective agree that the concept of presence has many explanations and that the level of study chosen does not assume that the others are not valid.

This presence approach is based on a separation between environments. It is therefore geographical. We will quote only a few of the most cited authors referring to this approach: Sheridan (1992a), Slater & Usoh (1994), Kim & Biocca (1997), Witmer and Singer (1998), Lombard & Ditton (1997) or Schubert, Friedman & Regenbrecht (1998, 1999).

Whatever the level of study chosen, these authors have their approach of a person as physically present in the real environment and more or less psychologically present in another environment, in common. As a person cannot be geographically present in two places at the same time, you must see to it that he believes that he is physically in an environment that in actual fact he isn't present in.

This approach leads to treat the feeling of presence from a physical point of view, by integrating the perception, the motor capacities, memories and attention of the person and by copying the real world to create an illusion of place in the virtual world. It is important but not sufficient. Nevertheless, few studies look into the activity of the person. What does the person do to define his goals, choose and realise his actions? Does this have an influence on the feeling of presence?

The peripherals as continuity of the body of the person

In this perspective, the person is in his "action world". You don't care about knowing whether it is virtual or real. The real and virtual separation is not pertinent psychologically speaking since undefined in terms of action but uniquely defined in technical terms.

There are also different theories to explain how the person works, his interactions with the technical system and the reasons that place him in a world of action rather than any another. All of them define the world of action according to the person's goals. These theories believe this feeling of presence is like a feeling of being more or less in the world of action.

Flach & Holden (1998) propose using the ecologic theory of Gibson. This approach measures objects and events relative to an actor. In this approach it is the coupling of action and perception that will determine the loyalty of virtual reality. Thus, these are functionalities more than the appearance that determines the reality of the experience. The analysis level of this approach is the perception and action too. But the person is functionally 'linked' to his environment in the approach proposed by Flach & Holden.

Zahoric & Jenison (1998) and Marsh, Wright & Smith (2001) base their theories on the work of Winograd and Flores who bases his on that of Heidegger. For them, the

relation to the world is built. No distinction between the real world and the virtually world is psychologically valid. Zahoric & Jenison (1998) choose to look into a construction in terms of perception and action following Gibson's theory. An individual will feel present if his actions and perceptions are supported with success, in other words if they are the same effects than in the real world. Marsh states that the user must be kept in the flow of his activity in order to increase the presence feeling. This flow is broken if the activity does not happen as expected, there is therefore a breakdown. For Marsh, Wright & Smith (2001) as the attention is not worn in the real world, there is presence in the virtual world even if there is a breakdown in interaction. The transparency limits itself for him to a perceptive and mechanism of attention.

These authors tackle the question of the person interacting with the world in terms of actions. However, they introduce each in their own way a distinction between real and virtual place that is not strongly pertinent from the point of view of the action. We think that the analysis levels used by these authors are not the same. They think that the media is integrated so strongly with the activity that it becomes invisible. This activity is orientated towards a goal. This goal cannot reduce itself to motor and perceptive mechanisms (Zahoric & Jenison) or perceptive and attentionnal mechanisms (Marsh, Wright & Smith 2001). The subject builds this goal actively, consciously and socially. We believe that one must adopt this analysis level in order to be able to free oneself from questions of virtuality or reality what a physical approach stretches to always to bring back. Spagnolli & Gamberini (2002) study the mediation with an activity point of view and show that the feeling of presence is not determined by the perceptibility of the technical medium per se. They based their work on the concept of "breakdown" (Spagnolli, Gamberini & Gasparini, 2002).

McGreevy (1992) studies a precise interaction situation: the work of geologists. It is difficult to say how he thinks the link between the person and his environment. He is interested in the work of geologists in a real situation, with or without the mediation of a camera system coupled with HMD. The environment is therefore the same and is analyse by geologist with and without a technical mediation. It shows that geologists need to have a continue representation from the environment of their work and that this continuity is a condition of presence. McGreevy therefore conditions the presence of the geologist to his goals and to a way he can successfully realise them. The technical mediation does not have to reduce the static continuity and the dynamics of the environment for the geologist. For example the weak field of vision prevents the geologist from having a large view of the environment necessary for his job. The

problem is not that the technology does not reproduce exactly the real environment but that the technology prevents the geologist from working in a way that he is used to. McGreevy shows well that the level of analysis other than the perception and the action is pertinent in the presence study: that of activity.

Jacobson (2001) shows that the users of MUDS are more present in technical activities if they have a technical knowledge and in social activities if they have a social knowledge. Their sensation of presence vary according to their knowledge and their activities. Jacobson (2001) uses interviews to obtain these results.

Reeve (2001) shows that the users of virtual reality system feel more present when they are familiar with the interface. He studies the feeling of presence of actors that use virtual reality to rehearse a play. He found also that the actor feel more present when they are more experienced in acting.

Mantovani and Riva (1999; 2001) think that every experience is culturally and socially mediated. Thus, the reality of the person environment is no longer specific in the case of virtual reality or teleoperation than in other cases. There is always mediation between the person and his environment. For these writers the presence factor is an ecological action via a cultural and social mediation. There is only an environment for the person, that of his possible action via an obligatory social or cultural mediation.

These authors are very close to the perspective presented by Rabardel (1995). For Rabardel, the subject uses an artefact to realise the object of his activity. The subject constructs a mixed psychological entity: the instrument. This entity is constructed at the same time as the artefact and the participants' schemes. It is built according to the object of the participants' activity. It carries out mediation between the subject and the object of the activity. The artefact can become transparent if it enables the subject to build instruments. It is the notion of operative transparency. Once an instrument is built, the artefact psychologically becomes the continuity of the body of the person. It is no longer accessible to the conscience. The transparency is therefore built in the reaching of a goal and no longer an illusion passively received by the subject. Beguin & Rabardel (1997) show in a study on CAD (Computer Assisted Design) that the materiality of the activity's objects is transposed on the file. The file becomes the headquarters of the participants' activity. The authors conclude that in terms of activity, the dematerialization is 'neither really just nor even operating.' This leaves you to strongly believe that the real and virtual distinction is not pertinent from the activity's point of view.

To conclude, we think that this distinction sets out to conceive the presence feeling from a physical point of view, based on an perceptual illusion of non-mediation mechanism (Lombard & Ditton 1997). We propose to consider that the person is also present in his world of action, that integrates but passes the real and virtual distinction and that this world is the fruit of the construction of an instrument.

Thus, we propose to take into consideration the activities' role in the development of the presence feeling of a subject that has built its relationship to the world via mediation of an artefact in order to realise his goals in the given situation.

3. Hypothesis

Basing ones judgement on the literature and on the Rabardel's model, we therefore assume that the presence feeling is dependant on the construction of the mediation by the expert players according to the object of their activity.

We believe that it is pertinent to have a historic approach on the participants' activity in order to understand the presence feeling in a real usage situation.

We try to show what influenced the construction of the operative transparency according to the object of the activity. We believe that the less experienced the user, the more the presence feeling increases with practice. We will see what the users' objects of the activity are and we will check if there are differences in the presence feeling assessments between these. We will compare the assessments of the presence feeling for different parts according to the object of the activity they are not equivalent.

We believe that the persons' presence feeling can vary according to the object of the activity. A number of parameters vary according to the activity's object. If it is completely relevant to study the parameters more precisely, this does not imply for as much as it is not relevant to study the variations of the presence feeling according to the activity's object. It is in fact because the person changes his object of activity that the other parameters change. The change in he object of the activity means that the person will also modify his behaviour and therefore his relationship with the technical system. The mediation construction is in fact linked to the object of the activity.

We will study a real usage situation: games playing. We have therefore created an experimental situation where the players are going to recreate as best they can their game habits on one machine and the will play many rounds in the same conditions. We believe that we will see an increase in the feeling of presence of players as soon as they construct or reconstruct their instruments in the world.

We have developed an original method of assessing the presence feeling in order to conduct our observations. We will firstly present it and then we will develop the experiment properly speaking. Because all construction is steered towards a goal, we will carry out an autoconfrontation with the players in order to distinguish what the objects of the activity are and to compare the presence feeling according to these objects.

4. Methodologies and experimentations

For this research we needed a continuous and subjective method of presence evaluation that is compatible with the games activity. In fact, we needed to obtain the presence feeling of participants at different moments of their activity in order to link the pursued goal and the route that they take to achieve their feeling of presence. We have not found a satisfying method in the literature and have chosen to develop this method ourselves.

We will first present our methodology without results. This is composed of two parts: research into the question of presence and the autoconfrontation of presence.

We will then present the progress and results of the experiment.

4.1 Define the question of presence

Welch, Blackman, Liu, Mellers & Stark, L.W. (1996), Kim & Biocca (1997), Lombard & Ditton (1997), Freeman & Avons (2000) and Jelfs & Whitelock (2001) think that the feeling of presence is strongly subjective and that it is necessary to define it with the participants in order for it to agree on what will be asked.

Theories

We want to determine which questions to ask the participants in order to directly measure their feeling of presence. As Truitt and Ahlstrom (2000) suggested, the assessment of a feeling or an impression goes through a work in real usage situation in order to be as close as possible to the operators. We will try to analyse the feeling of presence of individuals in their activity. We there hypothesise that this feeling will vary from one activity to another by its nature and that it is difficult to qualify it without appealing to the operators.

The works on the sensorial evaluation (especially the taste assessment) inspires us. In order to obtain reliable and accurate results regarding the gustative evaluation of a

product, Urdapilleta, Ton Nu, Saint Denis, Huon de Kermadec, (2001) propose the elaboration of taste descriptors and their group definition. For the taste, there are many descriptors to be evaluated. For the feeling of presence, we want only a single evaluation that represents them all. Our goal is not to evaluate each dimension of the participants feeling of presence but to define a single, common and comprehensible question to all the players.

Interviews with the users in real situation

Leplat and Hoc (1981) note that it is important to know the activity before the signing and analysing of all the methods of verbalization in order to avoid only accessing a formal knowledge. The interviews allow you to therefore familiarise yourself with the activity and to try to 'get closer' to the participants feeling of presence by making it possible to adapt your views and to skip over the general processes towards a more specific knowledge.

Firstly we carried out interviews with the users of virtual game environments in order to determine which terms would best define their presence feeling. There are three objectives; to understand straightaway what creates the presence feeling, what is this feeling of presence and what terms define it the best.

4.2 The game activity

3D video games

We have chosen the computer games playing activity in order to realise our observations. This activity is very standard and the users can be an advanced user. It is therefore possible to observe a real situation of users who have constructed their mediation. What interests us in this paper is a particular category of videogames: the 'First Person Shooter' (FPS).

We have chosen this type of game because it is, as far as we know, the most immersive type of games in the technical sense. Videogames are less immersive than a complete virtual reality system. These games supply a minimum degree of immersion.

- A subjective view for the player (1st person)
- A 3D world with textured surfaces and different lighting and graphical effects (fog, smoke...)
- A sound generally spatialized onto 2 speakers
- Realism research into the interactions

The game that interests us the most is Quake 3

Quake 3

This is a fighting game in a 3D environment displayed in a subjective view. Equipment is laid down: weapons, armour and ammunition. They are always in the same place and reappear a bit after having been taken. You need these pieces of equipment in order to win. They give an advantage to resist and eliminate the others players.

We have chosen Quake 3 for these specific reasons:

- The Quake situations are not real. The places, weapons and characters of Quake are not real. But it is set up to be from the actions and representations point of view. It supplies immersive characteristics in FPS style and other extras:
- A stereoscopic vision.
- A joystick (more intuitive than the keyboard or mouse).
- A 3D sound.

The presence of these immersive technologies allows us to know their real effects. You will notice that the movement are simulated by swinging views when walking or running in order to realise the slight modifications of the position of the head when walking.

- The game is very quick: the action is very rhythmical. The places are generally reduced and players come across them quickly. Also they move a lot quicker than in a lot of similar games. Quake therefore imposes strong temporal constraints: players must act and perceive as quick as possible.
- It is very demanding in terms of processing power. At its release Quake was asking an enormous amount from the machine to such an extent that it became, in many material tests, a point of reference to measure the display abilities of the system.
- It is very adaptable to the players and machines abilities. This game has many configuration layers. The first is at the menu while the last allows you to modify the game via the C++ language. The most interesting is that the user has the possibility to modify the realism and the immersive abilities of this program.

We have seen that Quake imposes temporal constraints and processing constraints. These constraints will force the player to make choices between different characteristics of the technical mediation, and the games adaptation ability will allow him to carry out these choices.

4.3 A first approach of the game activity

Interviews took place during Lan-Party in 2000 and 2001 at Rennes and at Paris (Rétaux forthcoming). There were 11 players interviewed (10 men and 1 woman). Game level was varied. All liking FPS, certain players were passionate for Quake while the others just played it methodically (often preferring Counter-Stricke). We asked them about their playing in a large sense rather than asking the questions that we are particularly preoccupied with.

The players attempt to get the clearest and most fluid display as possible. They try to make the fastest and most precise gestures. They manipulate the graphic parameters of the program; touch associations and buttons to the games function and the sensitivity of the mouse. The sensitivity of the mouse is a criterion that determines the amplitude of the link between a real movement of the mouse and the 'subjective view' movement on the screen. The bigger it is, the more important the view movements for the same real movement of the mouse.

There are many physical laws in the world managing accelerations and speed in movements. The players seek to profit from the many faults in these laws by combining many movements simultaneously in order to profit from multiple accelerations. Amongst these laws there is, for example, gravity. This allows them to move quicker. Nevertheless, so that the gestures have an effect and therefore there is a fault, it is necessary to have more than 24 images per second.

This study of player verbalisations on the transparency of the interface, in a real situation, brought about 3 conclusions concerning the relationship of the player with the technical system:

- The game activity is the object of a construction steered towards a goal
- This construction can provoke a technical system transparency and contribute to the presence
- Players do not feel physically present in the game but rather feel involved in it.

From the interviews carried out, the players teach us that the game is a constructed activity. Historically, players are firstly seduced by the immersive qualities of the game. Little by little, the games ability to adapt the activity and the game to their goals will be more important. Video games are built in order to be known then controlled by the players. The games artefacts must become an extension of the participants' body that

links him to an action space that develops in the rules space. Games each have their own rules, tricks and ways to win. Each game is a free space in which the player can express himself. The game is a world apart created by a game contract (Duflo 1997). The physical illusion of non-mediation only has a fleeting life. The subject will construct the transparency from his activity. It seems to be the construction that straightaway constitutes the game and allows you to feel present within. Whether these artefacts are real or virtual, as long as they are integrated by the subject in a operative way, in other words as long as they allow him to carry out the object of his activity.

4.4 Presence expression

The interviews were analysed. The analysis picks up all the presence-feeling expression in the game used by the users. The expression that occurred the most is used to formalize our question of presence submitted to the definition group. In our situation, the expression 'to be in the game' (or not) appeared often in the verbalizations of one player or another. The term 'presence' did not occur.

4.5 Definition group

Next we carried out a definition group about our question of presence: "to be in the game." A professional must in principle head this group. Not having either the means or the skills to realise this, we opted for an online consultation. We were counting also on attracting a maximum amount of people, more than in the group, and making up for the lack of a professional host. The forum was introduced as:

"Hello! I have a bit of a strange question. I am doing a thesis on ergonomics (which I have already posted onto the forum) and I am interested in Quake.

If I was to ask you if 'do you feel like you are in the game?' What would you understand from that question? What does this feeling depend on? More clearly what are the reasons if you do or do not feel in the game?

Xavier

PS: I specify that I am not interested in violence in games or in the fact that the players would be outside reality... it is not my goal. My goal is to know what characteristics does a game have in order for one to be 'in' it?"

This message allows to be specific straightaway, to arouse interest, to respect the codes and the tone of the forum and finally to take some precautions on the sensitive participants of the community (violence in games).

Sometime, we must to precise our questions:

"Do you think you could give more details? It's not in a one or zero all that is it? You are more or less there, no? Does that depend on what happens outside and in the game? On the machine? On the configuration of the game?"

"Two other little questions:

- *How can these feeling evolve from experience, from installing it for the first time to playing it perfectly a few months later?*
- *Is the first time the same as the umpteenth time? For the same reasons?*

"To come back to Quake and my question, I suppose there are other things that make you feel a part of Quake like 3D or the quality textures? Is there an evolution of the feeling of being in the game? Is it stronger as soon as the game is mastered? Why?"

The group leader carried out the analysis of the verbalizations and the large presence dimensions were subjectively brought together.

For example: *"In order to immerge yourself in whatever it is, an exotic environment is needed, making the work imaginary."* Has been classed "removed somebody from his usual surrounding".

The descriptions of being in the game have been regrouped into a theme in order to be usable in a definition. It was difficult to separate the state of "being in the game" and the causes and effects of this state. For example: *"think of nothing else"* does this allow him to be in the game or does it describe a state of being? We therefore next proposed our definition to the discussion group in order to validate it.

4.6 Results

There have been 45 messages, of which 4 were from me, and 16 contributors during our discussion group set up on the "QuakeFR forum". The choice of forum was lead by the need to test the question of presence with a population of players already aware of this game. This forum brings together the best French players.

If the interpretations that created this feeling of being in the game, were varying from player to another, the term has been immediately understood and interpreted as 'being at the game to nothing else' by most of the players. To be at the game signifies: to be performing, concentrated, involved, disorientated and moved by the game. This stage is indispensable so that the participants all evaluate the same thing and so that this evaluation is as near as possible to their real feeling.

Two players defined this feeling as negative:

State	Occurrence	Category
The opposite of being there is of not being there	1	Conscious of being there
No longer ask if one is there	1	Conscious of being there
Not to be in the reality	2	Conscious of being there

We have not kept this definition because it introduces nothing if it is not to take the opposite. Here are the other definitions given by the players from the fact of 'being in the game.'

State	Occurrence	Category
Not thinking of anything else	4	Concentrated
To be concentrated		Concentrated
To think of the game		Concentrated
To feel removed from our usual surrounding	2	Removed somebody from his usual surrounding / Changing of scenery
To feel emotions	3	Touched
To have taken in the rules of the world or know the universe		Performing
To feel able to do what you want		Performing
Winning	1	Performing
To want to play	2	Implicated
To be interesting in the game	1	Implicated

The created categories are typical of my own subjectivity. A lot of other elements have been collected during this work of definition: These last elements have not been taken into account because they were not describing a state but a factor or an effect of

a feeling of being in the game. The player will evaluate his feeling of being in the game. This feeling is defined as 'performing, concentrating, being implicated, being touched and changing of scenery.'

We next proposed this definition to the discussion group in order to validate it. It has sometimes been judged too large but never (for any player) to restricting. It described the state of the players while they were in the game well. We had therefore a definition of the players feeling of presence in Quake 3 that should be suitable for all the Quake 3 players.

4.7 Conclusion

In terms of these processes, we have a question that the majority of participants understand, precise and exhaustive in the dimensions of the presence evaluated. We demand to evaluate 'the extent to which do you feel to be in the game' and precise that 'feeling to be in the game' is 'performing, concentrating, being implicated, being touched and changing of scenery. 'What remains now is for us to establish a continuous quantitative assessment method of the feeling of presence.

5. Autoconfrontation methodology

It is impossible for the players to continuously and simultaneously assess their feeling of presence. They are too occupied by the game and cannot carry out other actions during certain moments of the game. In the case of simultaneous verbalisation, a double continuous verbal task would unavoidably change the fulfilment of the explained task. It is therefore better to resort to consecutive verbalisations.

We will try to evaluate the presence feeling of participants by using the consecutive explanation and especially the autoconfrontation method. Researchers (Clos, Faïta, Fernandez and Scheller 2000, Bisseret, Sébilotte & Falzon 1999, Rabardel, Carlin, Chesnais, Lang, Lejoliff & Pascal 1998, Hoc 1984, Leplat and Hoc 1981, Theureau 2000) validate the consecutive explanation. The length of the situation that the subject has verbalised and the time that separates the activity from the activity from the verbalisation must not be too long. The nature of the activity is also important: an automatic process will be more difficult to verbalise than a process that is not and will strongly require a reconstruction. It is also necessary to know the activity in order to get the verbalisations on the activity really carried out. They also recommend to use video documents so that the researcher avoid too much of a reconstruction from the subject

and always from the 'general data' to go towards the specific data so that you do not limit the subject.. This is the autoconfrontation methodology. The autoconfrontation is an examination of the dynamics of the structural coupling of the participant and of the situation (including the other participants). This exam is jointly assisted by behaviour reproduction techniques (video) and by the researcher as observer and interlocutor. It allows you to document the immediate comprehension of the participants' real-life experience' at any moment of his activity.

The evaluation can be a reconstruction by the subject because his feeling isn't conscious. The presence feeling model created by the subject must be as near to the truth as possible.

Therefore some precautions are needed:

- The experimenter must familiarise himself with the activity and with the presence feeling of the participants in the studies situation in order to reproduce the most ecological situation as possible. This will allow him to understand what the subject says and to carry out the instructions and an adequate evaluation situation. It is advisable to insure that the participants act naturally during the information collection. The players will face alone the same adversary: a high level 'bot' (computer opponent). The players' goal is to get as many points as possible. This game situation corresponds to a practice that exists already but is not standard. It allows you nevertheless to make the tests easier to compare. The best player will get the prize. We try to favour the optimisation of the player's performance. The players must use their own mouse and are invited to use their own mouse mat. They carry out 6 complete games before starting the proper test in order to retrieve their game habits. Finally, the players will be able to set out the parameters of the game to their liking.
- It is necessary that there are good relations with the participants and that they have good dispositions. The participants that do the task without motivation do not produce good evaluations. It is important that the test develops well and that the task does not put the participants off. To this effect, it is advisable to establish a convivial climate and to not carry out more than one evaluation per session.
- The length of the activity, during which the subject evaluates his feeling of presence, and the time limit between the carrying out of the activity and the evaluation must be short. It will be saved as a video. This recording must last 5

minutes at the most. In our situation, 5 minutes of recording requires 40 to 50 minutes of decoding with the subject.

- The analyst must be independent: he must not talk with the subject. It is necessary to stick to the instructions, explain them if necessary. You must avoid giving these expectations. The recording instructions of the activity must not enable the subject to gather expectations from the researcher. If the subject expresses none or little variation in his feeling of presence, it is advised to stop the recording and to raise the question of presence in terms of variation on a period that comes before. For example, for our situation, we will ask the subject if his feeling of presence increased or decreased since the previous stop? The moment where this question takes place must be fixed in advance (at the end of 30 seconds for example). The autoconfrontation instructions must not enable the subject to gather the expectations of the researcher.

The evaluation of the presence feeling is straightaway quantitative and qualitative. The quantitative evaluation is accompanied by explanatory verbalisations. From the quantitative side, we have opted for a scale in 9 points: from 0 to 8. This scale enables the subject to respond to the question of presence. In the case of video games, the question was to evaluate 'the extent to which do you feel to be in the game'. From the qualitative point of view, we asked the subject to explain the variation causes of the presence feeling.

The use of autoconfrontation supported by a video document seems therefore to be the most adequate methodology for our situation as it respects the usage precautions.

5.1 The presence autoconfrontation

5.1.1 Objectives

We aim to understand the variations of the player's presence feeling according to the object of their activity and their experience.

We want to show that players feel more present when they are more experienced. We want to show that their presence feeling vary according to the object of their activity, especially that this feeling is less important when they are searching for equipment than when they are fighting their enemy because we think that the equipment activity is more automatic and transparent than the fighting activity. In this second activity, a player can't totally anticipated the enemy behaviour. In contrary, the position of the equipment is always the same.

5.1.2 Experimental situation

The test is developed in the laboratory.

It carries out 6 complete games before the actual test-game in order to retrieve their game habits. They came two times and so played two test-games.

5.1.3 The participants

Fifteen males participated to this experience. They will neither speak nor practice with each other. Their game levels are checked by questionnaire and by their performance. Five out of fifteen players have a lot of knowledge of the virtual world. These five players are the most experienced. The "gameplay" concerns the length of the gameplay of Quake and of similar games. The configuration concerns the scale of the configuration tool usage. Finally, the 'map' concerns the knowledge of the virtual environment of the test. This knowledge is important in order to know where the equipment is placed and where the best place to be is and which weapon to use.

Players	Gameplay	Configuration	Map	TOTAL
Player 1	-1	-1	0	-2
Player 2	-1	0	0	-1
Player 3	0	-1	0	-1
Player 4	1	0	0	1
Player 5	1	-1	0	0
Player 6	1	0	0	1
Player 7	1	1	0	2
Player 8	1	1	0	2
Player 9	2	1	0	3
Player 10	1	1	1	3
Player 11	2	1	1	4
Player 12	2	1	1	4
Player 13	2	1	1	4
Player 14	2	1	1	4
Player 15	3	1	1	5

Tab.1: Player experience according to responses to the questionnaire.

The control of the player's experiences will check if there is a link between the initial experience of the players and the increase of their presence feeling.

5.1.4 Materials

A PC Pentium 500 MHz equipped with a TNT graphic card. It is a configuration exactly sufficient for Quake. It makes the most demanding of players carry out adjustments in order to keep fluidity. We use a camera, a video recorder and a screen.

5.1.5 Steps of the test

There are two test sessions that are imperative to be carried out on two distinct days in order to avoid boring. We take a certain number of precautions declared before the tests. In terms of the first session the participants' parameters (in the file config.cfg) is saved and is used in the next one. The test happens in the laboratory.

Steps

The total duration was 2,5 hours.

The players start by configuring the game during the first session. In the two sessions, they play 6 sets of training and one test game. During each training games, the researcher asked to the player if he learned something during this game.

	1	2	3	4	5
Step	Configuration of the game	6 training games	1 testing game	Autocofrontation of presence on the testing game	Autocofrontation of activity on the testing game
Duration	15 min	6 x 5 min	5 min	50 min	30 min

Tab.2 – Steps and duration of the steps of the experiment

To configure the game

We ask the player to firstly optimise the configuration in order to retrieve their habits. Then it asks them to play to win, knowing that only the last game will count towards the competition. The player takes as much time as he wants to regulate the game according to his needs. He can test his configuration, as he likes. It is impossible to adjust Quake from the exterior (for example, on Windows or on the screen) because these adjustments can't be saved. This step is very important and his duration lasts

sometime more than 15 minutes. The configuration continues during the next step: subject training.

Subject training

The training happens in the same environment (Q3Tourney4 card) lasting for 6 parts of 5 minutes. We proceed to the demo recording between each part. All modifications are allowed to take place between the parts. Between each part we ask the subject if he knows the environment, the enemy and where the equipments are being placed after they have been taken, better.

The testing game

The subject will be told that this part is determined by the competition. This is a 5-minutes game. The subject must make the best score possible. We remind the subject that his score will make the difference between his "frags" (the points in this game) and those of the bots.

The autoconfrontations

Half of the players carry out the presence autoconfrontation before the activity autoconfrontation. The other half does the opposite.

Presence autoconfrontation

The player evaluates 'the extent to which do you feel to be in the game and the variation of this feeling'. This feeling is defined at 'performing, concentrating, being implicated, being touched and changing of scenery'. The experimenter who notes the time and the evaluations of presence makes the presence chronogram. The experimenter asks the player to tell him if he remembers the feeling of being in the game increased or decreased during the video viewing. If the player does not signal any variation during thirty seconds, the experimenter asks him if his feeling of being in the game has increased or decreased during the proceeding period and the passage is viewed as new. If the player describes variation cause of his feeling of being in the game, the experimenter will ask the subject if his feeling of being in the game varies each time that this cause will appear during the activity on the screen.

Autoconfrontation on the activity

The experimenter asks the subject to describe what he is doing and what his goals are as the video takes place. The experimenter sometimes pause the video to ask the player if his goals have changed at any point in the game.

5.1.6 Data recording

This methodology enables you to evaluate 2 dimensions of presence:

- Quantitative: a scale of 0 to 8 points to estimate presence
- Qualitative: the participants verbalisations on this presence and in particular the effects and determiners. We will not go back into detail of this data in this article.

The players explain too the object of their activity (their goals).

We record this others data:

- The changes in the game configuration.
- The knowledge of the player on the game environment and enemy between each game.
- The movie of the games.
- The presence chronogram that contains the period in seconds, the level of feeling of being in the game for this particular period and the causes of this variation of feeling being in the game.
- The activity chronogram that contains the period in seconds and the object of the activity in progress.

At the end of a session, the player is reminded not to talk to the other players and to not practice this kind of game. The experimenter makes no commentary concerning the level players in order to avoid a variation in the player's motivations. At best, he will tell the players that he is 'nothing is played yet.'

6. Results

We have kept back two objects from the activity: to fight and equip oneself. There are others but they cannot be used because either they are too rare or we do not have enough data, or that they given by a few players.

When the game crashes, the presence assessment is always 0. In the other situation, the players feel more or less present in the game.

6.1 The difference between the two parties according to the experience

There is no significant difference between presence assessments in the two test parts. The experience of the player has only a significant effect on the variation of the score (ANOVA $p < .05$) according to the player level. The score do not significantly correlate with the presence feeling.

There is however a certain evolution of player knowledge from one session to another except in the cases of JBB and YAV who already knew the places perfectly. Their knowledge of the game environment and enemy increased.

6.2 Variation of presence according to the object of the activity

We have therefore compared the presence feeling evaluations when the participants say that the finding of equipment is their activity's object to the presence feeling evaluations of when they give battle against the enemy as their activity's object during the second autoconfrontation. We choose this two activity object because they were common.

	Average	Ec-Type	N	Diff.	Ec-Type	t	DII	p
BATTLE	5.970106	.674636						
EQUIPEMENT	5.173587	.782785	15	.796519	.328833	9.38139	14	.000000

Tab.3 - Matched between the presence estimations when the activity object is the battle or the search for equipment (*Significant differences marked as $p < .05000$).

The presence feeling evaluations of participants during the equipment or combat phase are significantly different.

7. Discussion and conclusion

Our first result is the design of a new methodology to understand and measure presence. This is a continue methodology to asses presence.

We expect to find an increase of the feeling of presence between the two games test because of the building of a transparent mediation. We therefore do not find any links between the setting up, the acquisition of experience and, we suppose, the building up of the games transparency and the feeling of presence. This experiment only verbally verifies the construction of the relationship of the subject with the object. Reeve (2001) finds a relation between acting ability and the feeling of presence. Our results are not compatible. The transparency of the mediation is perhaps a false cause of feeling of presence. Fontaine (1992, 1995) defines presence as a state of awareness where we

are present in the direct task. Fontaine's approach is interesting because it no longer treats presence in terms of 'real' or 'virtual' but in terms of a task usual or not. The familiarity, attention and automatic reflexes are thus three factors of presence. A lot of activities are unconscious because automatic movements and attention is focussed on a reduced part of the environment. We think that the more a task is familiar, the more it is transparent and the less one feels present. This approach goes against our hypothesis because it would postulates precisely that the mediation awareness is a factor of presence. Perhaps there's a more complex relation between presence, attention, transparency and familiarity.

Perhaps, our experimental procedure was not efficient. It would be advisable to check the activity via the data, in order to see if effectively takes shape. Furthermore, it is very risky to base it solely on the two games. It only needs the first game to go well or the second to go bad so that the statistics no longer speak. Few elements can lead to a part developing well or badly: annoyance, bad luck, errors...

Finally, according to the verbalisations, a lot of players won on efficiency in equipping themselves but without managing to compete with an extremely precise and quick bot. The bot turned out to be too weak for certain players and too strong for a lot of the others. This level of opponent has not enabled many players to finally be efficient against this bot. It seems that it is necessary to leave longer for the players to be able to be truly competitive against the enemy.

We are going to have to create a new faster methodology in order to multiply the comparison games. In fact the autoconfrontation methodology requires 10 times more time than the activity length (a 5 minute part is analysed from the presence point of view in 50 minutes). It is therefore impossible to analyse more games with this methodology.

We find a difference in the players' presence feeling estimation according to goals that they reach in the game. Jacobson (2001) finds a variation in the feeling of presence of MUDS users in their verbalisation. Our measures confirm this result. When players search for equipment, the players are less in the game than when they are fighting the enemy in order to reduce their level of life to zero. The change of the objects of the activity shows that the player is going to change his behaviour and therefore his relationship to the technical system. As the mediation construction is orientated towards the object of the activity, this result shows that the presence feeling analysis from the mediation construction point of view makes you identify the object of

the activity. If this methodological result is important, it is also from the explicative point of view. This result also shows that the feeling of presence varies according to the goals that a person reaches in the virtual world or according to the object of the activity (in the Rabardel's model). We know that the mediation and the construction of the mediation depend on the object of activity too. This result is a first step in explaining presence in terms of presence in an activity built by the subject to achieve his goal rather than spatial or perceptive presence. The immersion theory can't explain this result. There is no technical difference during the game. The players have always used the same technical system. Then, a psychological approach in term of the realism of perception and motor capacity can't explain this result too.. We can say that the player needs more attention during the "fighting activity" than during the "equipment activity". But the attentionnal cost of the activity is only a part of the difference between "fighting" and "equipment". The attention mechanism can explain this results but it's perhaps insufficient to understand the effect of the conscious subjects' activity in context.

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