HAL
open science

An Early Evaluation Method For Social Presence In Serious Games

Ines Di Loreto, Abdelkader Gouaich

To cite this version:

Ines Di Loreto, Abdelkader Gouaich. An Early Evaluation Method For Social Presence In Serious Games. CSEDU'10: 2nd International Conference on Computer Supported Education, Apr 2010, Valencia, Spain. pp.94-101. lirmm-00446893

HAL Id: lirmm-00446893

https://hal-lirmm.ccsd.cnrs.fr/lirmm-00446893

Submitted on 13 Jan 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

AN EARLY EVALUATION METHOD FOR SOCIAL PRESENCE IN SERIOUS GAMES

Di Loreto Ines
LIC, Università degli Studi di Milano, Italy
ines.diloreto@unimi.it

Gouaich Abdelkader
LIRMM, Université Montpellier 2, France
gouaich@lirmm.fr

Keywords: Evaluation Methods, Serious Games, Social Presence.

Abstract: In recent years, there has been increasing interest, both in the potential of computer games as learning and teaching tools, and in research into their use. However, most frameworks for serious games evaluation do not explicitly consider social aspects. On the contrary, we believe that social aspects have to be considered as an essential component of the 'virtual' life of most current users. For this reason, in this paper we propose a framework able to analyze serious games social aspects and give an early evaluation of the designed application. The evaluation framework is based on four elements: identity, space, persistence and actions. These elements (and the behaviors they let to emerge) can be used as markers in order to evaluate if or not our systems is able to facilitate the feeling of social presence and then social learning. The result of such an evaluation can be useful to designers in order to understand if the systems lack of functionalities before starting the implementation and thus return on the phase of design to add missing elements.

1 Introduction

In recent years, there has been increasing interest, both in the potential of computer games as learning and teaching tools, and in research into their use (Nicola, 2007). However, most evaluation frameworks for serious games do not explicitly consider social aspects. On the contrary, we believe that social aspects have to be considered as an essential component of the 'virtual' life of most current users. Current digital cultures - such as blogging and gaming - take for granted social web features and expect them to be available into any application. An application that fails in presenting at least familiar social web features would be considered as a regression and may be rejected. The above mentioned considerations emphasize the need to understand social dynamics when designing any application in our era. This is also true for serious games, and in particular for serious games where the social aspect impacts over the learning aspect.

Besides, serious games evaluation are performed a posteriori. On the contrary, we claim that an a priori evaluation of serious games can be useful. In fact, while users are able to evaluate the quality of their experience, for the most part they are not able to understand which feature/characteristic generates a poor performance. This doesn't mean that an user centered design approach (see e.g.,Vredenburg et al., 2001) is not useful when designing a serious game with social aspects. On the contrary, a deep analysis of users' needs is at the basis of any application development. However, between user centered design, and user satisfaction measurement we want to add an intermediate layer. In fact, an additional level for an early evaluation approach can be useful at different levels for the serious game creators. Firstly, the early evaluation of the game design is performed when multiple experts (experts on learning, computer scientists and so on) still works together, thus fostering communication between them if some problem arises. Secondly, an early evaluation of the designed application can help *designers* to anticipate several problems that can arise *before* starting the implementation and thus return on the phase of game design to add missing elements, restraining in this way development cost.

For the above mentioned reasons, in this paper we propose an early evaluation framework able to ana-

lyze social aspects of serious games and give an early evaluation of the designed application. The evaluation framework is based on four elements: identity, space, persistence and actions. These elements (and the behaviors they let emerge) can be used as 'markers' (or 'indicators') in order to evaluate if or not our systems is able to facilitate the feeling of social presence.

Following sections of this paper will be devoted to (i) show the importance of social presence and social learning in serious games, (ii) present the framework and a method for early evaluation based on the framework (iii) show the results of an experiment where the early evaluation method helped the designers to detect design weaknesses.

2 Motivation

From an historical point of view, the serious games movement started with the U.S. Army's release of the video game America's Army in 2002 (American's Army, 2002; Gudmundsen, 2006). The same year the Woodrow Wilson Center for International Scholar in Washington, D.C. founded the Serious Games Initiative, and the term "serious games" became widespread (Serious Games Initiative, 2002). The term itself is nowadays established, but there is no current single definition of the concept. Serious games usually refers to games used for training, advertising, simulation, or education, which are designed to run on personal computers or video game consoles.

It is important to note that there is no clear evidence that the serious game approach is better that classical approaches, such as e-learning, for knowledge transmission and acquisition. However, for some domains such as health and reeducation some works have established the benefit of serious games to make reeducation sessions more motivating and less exhausting (Burke et al., 2009)[1].

In addition, it has been demonstrated that social presence is one of the most significant factors to examine in distance education. Many studies dealing with social presence on CMC (computer-mediated communication) have been done in standard educational settings and organizational settings. For example Tu (Tu, 2000) analyzed the relationship between social presence and the social learning theory. For the author, social presence is required to enhance and foster on-line social interaction, which is the major vehicle of social learning. Also for Wenger (Wenger, 2000) learning can be defined as an interplay between social competence and personal experience: our belonging to social learning systems can take various forms at various levels between local interactions and global participation. This is also true from the serious game point of view. For Kiili (Kiili, 2005) social games consist of both, individual and social events. In fact, in online multiplayer games players can collaboratively solve and explore problems in a shared game world, but ultimately critical reflection and knowledge construction occurs in a private world. It seems relevant, then, to evaluate serious games with social aspects from both points of views, personal and social.

As a consequence of the above mentioned reasons we claim that because social activities are important for learning we need an evaluation framework able to take into account social aspects. In particular, in this paper we will propose an early evaluation framework and a method, able to evaluate social presence 'potential'. The evaluation framework endorses Witmer's ideas (Witmer and Singer, 1998) stating that the effectiveness of serious games, and more generally virtual environments, is linked to the sense of presence reported by users. As an example, in synthetics worlds (such as Second Life) an active exploitation of our senses can create a psychological sense of presence, or, in other worlds, the illusion that "I'm in the virtual world and not in my house" and, as a consequence, that "I'm there with other people" (Biocca, 1997).

In the rest of this section we will define the concept of presence (and its importance for social environments). Next section will be devoted to present the framework and the method for the early evaluation.

2.1 Presence and social presence in social environments

In his paper 'Measuring Presence in Virtual Environments: A Presence Questionnaire', Witmer (Witmer and Singer, 1998) says that the effectiveness of virtual environments (VEs) has often been linked to the sense of presence reported by users of those VEs. For the author, presence is defined as the subjective experience of being in one place or environment, even when one is physically situated in another. In addition, presence is a normal awareness phenomenon that requires directed attention and is based in the interaction between sensory stimulation, environmental factors that encourage involvement and enable immersion, and internal tendencies to become involved.

What is interesting for our purpose is that we can extend the concept of presence to the concept of *social* presence. Social presence is, in fact, defined as

[1] This is the context of our research project MoJOS (http://www.mojos.fr/) which main objective is to build serious games for upper lamb reeducation after strokes.

the "degree of salience of the other person in the interaction and the consequent salience (and perceived intimacy and immediacy) of the interpersonal relationships" (Short et al., 1976, p. 65). As we have already said, social presence has been proved to be necessary for both, interface design of social applications (Xu et al., 2006), and learning purposes (Kasvi, 2000).

In addition, we claim that social presence is also important in serious games. We also state that we can identify several 'indicators' in order to measure the potential presence awareness of our application. In other words: the absence of these indicators in our virtual environment (in our case a serious game) is a signal of a not well designed system, not able to support social interactions and social learning. As we have said, being able to do such an evaluation at early stage (i.e., before starting implementation) has major advantages: it can simplify the work of designers (that can return on their design before development) and help to build better applications while reducing development costs.

3 Defining 'indicators' for social presence

This section presents core elements of the framework that can be used to evaluate social presence 'potential' in an application at early stage. The framework is based on four elements: identity, space, persistence and actions. These elements are motivated by an empirical analysis of current social software and supported by major findings from psychology and sociology. In fact, these elements represent core features of any Social Interactive Systems (SIS) targeted towards young generations (and thus also serious games with social capabilities). Consequently, they represent an interesting evaluation criteria in order to capture at early stage the *potential* presence awareness of the application being designed. Hereafter, the semantics of each element of the framework is described more in details.

3.1 Identity

Our point of view about Identity is the same as social psychology's later approaches, which consider individual and social identity not as stable characteristics, but rather as a dynamic phenomenon (Harré and Langenhove, 1991). In these approaches, the choice about what possible self to show is driven by *strategic moves* (e.g., what features are more relevant and effective for self presentation) *which participants can make within a particular situation*.

In describing everyday interactions, Goffman (Goffman, 1959) distinguished between two ways of expressing information: information that is given and information that is given off. Information that is given is the conscious content of communication, the voluntary, symbolic actions that are mutually understood, for example, a person who describes their anger is giving information about their emotional state. In talking about their anger, however, the person also gives off information, through para-verbal characteristics such as tone, volume, and rate of speech, the choice of words, their accent, and non-verbal cues. While information that is given is considered to be within the actor's control, information that is given off is perceived by the audience to be unintentionally communicated (Kendon, 1988).

This means that in everyday life identity is socially constructed though interactions. The construction of an identity is a public process that involves both the 'identity announcement' (given information) made by the individual claiming an identity, and the 'identity placement' made by others who endorse the claimed identity (based on both given and given off information).

For instance a classical example of 'identity announcement' is avatar personalization. While we will not enter in detail here on its implications, the avatar is a visual claim for personal expression that is constantly worked on. This continuous work reinforces the *concept of presence* and thus *social* presence. The explicit specification of a social network of acquaintance can be seen as collateral information. If it's true that social networks are built via a series of invitations, usually members also have some control over the visibility of their network for others. This means that, for impression management, a user will show only networks he/she wants to show. For instance some members can decide to make their social networks visible only to their direct acquaintances. In this case, there is a 'given' information (the user chooses what to show about his/her identity), but also a 'given off' information (derived e.g., from the kind of groups a user showed/joined).

From a design point of view we can say that, allowing both the kinds of identity representation becomes the starting point for a social, evolving identity.

3.2 Space

If we look carefully, the language we use to describe our experience of the virtual environment is a reflection of an underlying conceptual metaphor: 'Cyberspace as Place' (Lakoff and Turner, 1988). This

means that we are transferring certain spatial characteristics from our real world experience over the virtual environment. The metaphor 'Cyberspace as Place' leads to a series of other metaphorical inferences: cyberspace is like the physical world, it can be 'zoned', trespassed upon, interfered with, and divided up into a series of small landholdings that are just like real world property holdings.

As you noticed, we joined together the terms space and place. In reality, for the good functioning of a SIS it is important to distinguish between them. Actually, the literature about space and place is fairly massive and diverse. A converging definition of the difference between space and place does not exist, however we can list some interesting definitions adapted from (Carmona et al., 2003) that try to capture differentiation aspects between space and place:

> Space is alienation; place is identification (according to Norberg-Schulz).
>
> Spaces are the basic divisions of our surroundings; place is our history and adaptation of them (landscape historian JB Jackson).
>
> Space is the scene of being; place is a site where human modes of being are well provided for (Heidegger).
>
> Places are essentially centers of meaning constructed out of living experience. By imbuing them with meaning, individuals, groups or societies change 'spaces' into 'places' (urban designer Edward Relph)

Besides, in his book (Carmona et al., 2003), about urban spaces and places, Carmona distinguishes among dimensions of an urban space. While space is divisible, place is not. Place is complex, inextricably multi-dimensional, lived, experienced, meaningful (with of course multi - meanings). This means that while space is a well-defined topographical entity, place is the result of human inhabitation, (social) interaction, and the like. We are located in spaces, but we act and develop individual and social experiences in places.

We claim that in order to design a social serious game, it is essential to allow by design the creation of public (at different levels) places for aggregation but also the creation of private places (Wenger et al., 2002). Besides, the level of personalization can be used in order to allow the shift from spaces to places. Only taking possession of the space, and manipulating it to turn it in something we like, we can transform it in a place.

3.3 Persistence

As we have seen, in order to create a social identity in an online environment several elements are required. The first of these is persistence (of personal identity in the system). In a non-persistent world it is not possible to have an history of actions and thus allow, for example, the creation of a reputation like in real life.

Moreover, Danet (Danet et al., 1997) , argued that synchronicity is associated with 'flow experiences', a state of total absorption and a lack of awareness of time passing. This idea of synchronicity is linked to the idea of *temporality*, a linear procession of past, present, future. This particular nuance (synchronicity as process) is very interesting if we think that interaction with media and media perception is changed. In fact, advances in technology and the speed of network connections are blurring distinctions between synchronous and asynchronous communications (Joinson, 2003). Synchronous and asynchronous communications are thus processes that happens during time. The idea of communication as a process is totally consistent with the idea of persistence and is another element supporting social awareness.

3.4 Action

In this part, we discuss physical and psychological mechanisms that regulate human actions in order to understand why the action element have to be considered as a pillar in the design of social serious game.

The first theory we want to describe is the so-called: *thinking through doing*. This theory describes how thought (mind) and action (body) are deeply integrated and how they co-produce learning and reasoning (Klemmer and Hartmann, 2006). Jean Piaget (Piaget, 1952) postulated that cognitive structuring requires both physical and mental activity. Particularly for infants in the sensorimotor stage of development, physical interaction in the world facilitates cognitive development. For example, locomotor experience increases spatial cognitive abilities in infants, such as understanding the concept of object permanence (i.e., that objects continue to exist even when they are not visible) (Kermoian and Campos, 1988). In this very basic sense, humans learn about the world and its properties by interacting within it.

As a second support we can cite *embodied cognition*. Unlike theories of information processing and human cognition that focus primarily on thought as something that only happens in the head, theories and research of embodied cognition regard bodily activity as being essential to understanding human cognition (Pecher and Zwaan, 2005). While these theories

address cognition through action in physical environments, they also have important implications for designing interactive systems.

In fact, body engagement with virtual environments constitutes an important aspect of cognitive work. For example, one might expect that the predominant task in Tetris is piece movement with the pragmatic effect of aligning the piece with the optimal available space. However, contrary to intuitions, the proportion of shape rotations later undone by backtracking increases (not decreases) with increasing Tetris-playing skill level. In fact, players manipulate pieces to understand how different options would work (Maglio and Kirsh, 1996). These epistemic actions are one of many helpful ways in which a user's environment may be appropriated to facilitate mental work (Hollan et al., 2000; Norman, 1994). This kind of reasoning also implies that an action is always an action-over-something. As our example on Tetris shows, the kind of interaction spaces and objects we create in a Social System will influence which cognitive work the user will do over the system.

3.5 The overall framework

We can think about each of the above described element as a line (an axis) that starts from the lack of presence of the element to the fulfillment of its presence for a social serious game (see Fig.1). For example, for the concept of identity when totally missing represents anonymity while when fulfilled represents a social presence (with intermediate points such as personal identity construction). For the concept of space when missing represents a topographical space while when fulfilled represents social places (with intermediate points such as third places and personal places). For the concept of time its totally lack is system 'amnesia' while its fulfillment is memory (with intermediate points linked more or less to the concept of persistence). Finally, for the concept of action its totally lack is the obstruction of action (i.e., my user can only look at my application) while its fulfillment is social actions (with intermediate points such as public personal actions and the like). However, the total framework is not simply a list of elements (i.e., its application doesn't mean to put one after the other the four elements in your system) but it's created through the delicate balancing between them. This means that it is up to the designer to choose which element of the framework stress or not during the creation of a dynamic experience such as a serious game with social integrated features.

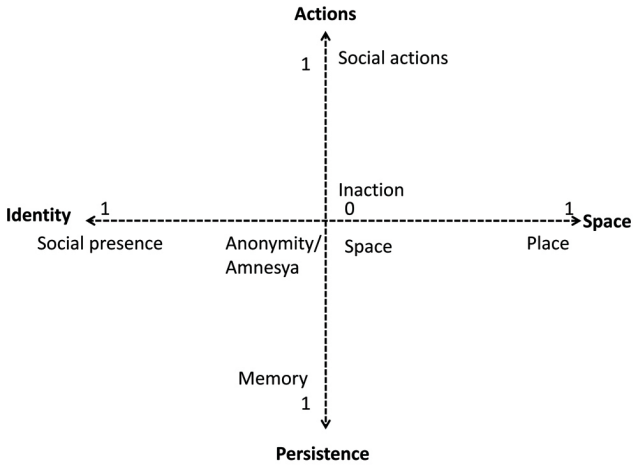

Figure 1: Framework axis

4 A method for evaluating an existing game design

While the above described framework can also be used in the phase of design of a social serious games, for this paper we will focus on its application to the phase of evaluation of the designed application.

In fact, usually a software development starts with a requirement document that captures a set of requirements and features of the future application. This initial requirement document is written by stakeholders using natural language to express their needs. So, during the design phase always arose the problem of translating natural language requirements into software requirements. In order to overcome this difficulty, we suggest a methodology, already used in game developments, based on the concept of *stripes*. Flynt defines a stripe as 'a set of functionality embodied in a single component of the system.'(Flynt, 2004). More specifically, a stripe embodies a subset of functionalities described in the requirements document as a coherent succession of actions. The process producing stripes is a top-down process starting from the most general system features. For instance, one can find the login stripe that describes a set of actions allowing the user to open a session. The level of detail and complexity grows with each stripe, but because the detail and complexity are layered, at no point does complexity become overwhelming thanks to the hierarchical organization of stripes. This hierarchical organization of stripes does not mean that all stripes are independent. In fact, stripes can overlap when they concern similar functionalities. For example, both login and personalization stripes can involve a stripe that loads the user's avatar and profile.

However, extracting stripes from natural language description is quite difficult due to inherent ambiguity and complexity of natural language. To overcome this difficulty we inserted a phase of pre-design between concept development and classical design phase. The idea behind this insertion is to use the phase to translate the design into requirements following the path illustrated in Fig. 4.

As first step the 'translator' makes a very simple task: he takes the design and he highlights *actions* (i.e., verbs) in natural language. He next defines for each action the elements that impact over the framework filling a structured table. For example he uses a field named 'Interaction space' (that answer the question 'the action impact over?') to identify space/place, and answers to the 'who' and 'when' questions ('who' is doing this action? Is a persistent action? and the like) to identify identity and persistence. The application of this method is linear (in fact you analyze the document paragraph after paragraph). Fig. 2 shows some example of stripes that were created during the experiment described in section 5. As you can see the result of this first analysis is a set of very detailed stripes that still have to be worked on in order to derive features and components. However, this phase is also the most interesting for early evaluation. In fact, as we have said in classical design cycles, the evaluation of the system (in order to decide if or not it is coherent with your expectation) can be done only after the development phase (in reality, after the use of the application). In our case we can evaluate the system *before* starting the implementation.

In order to make such an evaluation we provide weights, ranging from 0 to 1, for each stripe (i.e, we analyze the above mentioned table for each stripe). Next we 'fill' another table like in Fig. 3 with weights. In our example, the modification of the avatar impacts over the identity but is also a persistent action. On the contrary, it does not impact on the space of the application.

This kind of evaluation has two main advantages. Firstly, it will show you if the resulting evaluation is exactly what you expect from the application (the profile you have wished for) *before* you start the implementation. It may happen, for example, that you want to create a design that is balanced over all the four elements but the result of your evaluation shows that you lack e.g., in identity features. Secondly, it allows you to re-define your stripes in this phase in order to avoid the problems highlighted by the evaluation (or, on the contrary, to re-think your first design).

In next section we will describe an experiment we held during the creation of a social serious game

Sub-Stripe (n°)	Text & Description	Formal	Interaction Space	Non Functional
2	*"**he** can go to school [...] , going to the* **pub** *[...] , visit a* **friend at his house**, *going to* **shopping**, *and the like."* the resident can move around various places	**Who:** the resident **When:** anytime **What(on what):** various places	The resident, his canoe and various places	Sound and graphic design for the canoe animation. **Sound**: the sound of the resident navigating **Graphic**: the resident leaving a place with his canoe

Sub-Stripe (n°)	Text & Description	Formal	Interaction Space	Non Functional
9	*"An **action menu** with buttons that open:* **journal**, **minimap**, **'go to list'**, **chat**, **buddy list, settings, notes**" The player can click on a menu to access various features.	**Who:** the player **When:** when the player clicks a button **What(on what):** a new window displaying the feature	The player mouse pointer, the menu, the various windows representing the features.	A graphical representation of the menu and the buttons. This representation is integrated in the main window.

Sub-Stripe (n°)	Text & Description	Formal	Interaction Space	Non Functional
70	*"Each **Resident** can personalize the* **avatar** *he choose when he enter the world whenever he wants."* The avatar editor existence	**Who:** the resident **When:** anytime **What(on what):** the avatar	Resident, avatar, objects (chest or inventory).	A graphical representation of the « naked » avatar.

Figure 2: Some example of stripes

	Identity	Space/Place	Persistency
Action: Modify avatar	1	0	1

Figure 3: An example of evaluated stripe

where we asked our designers to apply the above described method and to evaluate it.

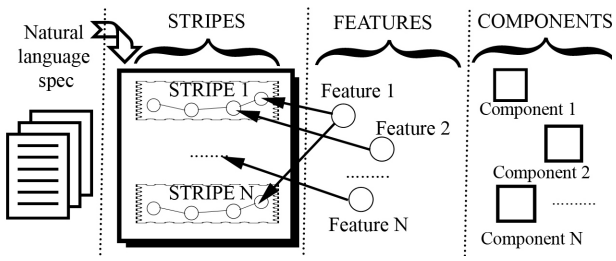

Figure 4: The processus from natural language specifications to features

5 An experimentation of the method: School Society

5.1 Method

The objective of the study reported in this section is twofold: (i) to check practicality of the proposed framework when building an actual complex social serious game; (ii) and to evaluate qualitatively the benefits of such methodology.

A textual description of a social serious game named School Society has been prepared by a team of researchers composed mainly by pedagogues (2 persons) and game designers (2 persons). Computer scientists have been allowed to participate but were not authorized to address technical issues. These meetings have produced a game design document that describes, to some extent, the "culture" (Salen and Zimmerman, 2003) and rules of the social serious game.

To summarize, the game can be described as follow:

- every student has an avatar within the system and lives in a house situated in a private island
- the student can use a canoe to reach one of the following destinations:school, market place, pub, friend's island
- the student takes quizzes in the school in order to have a certain amount of virtual money and experience
- the student buy items to decorate his/her house in the market place and these items are visible to friends visiting the house
- finally, the pub is used to chat with other players and make new friends

It is worth noting that this is a simple description of the game and the actual game design document is about 20 pages (4000 words and 15 figures)

A computer science engineer, with an experience of 3 years, has been specifically hired to produce the serious game specifications starting from the game design document. The methodology was introduced to the engineer during a half-day training session conducted by the authors. The engineer was not allowed to question the methodology. However, he was allowed to ask questions on the game design document by explicitly raising issues using a standard issue tracking system[2]. Authors of the game design document were able to answer explicitly these issues by providing more explanations or making choices to clear ambiguities. The identities of the engineer and game design authors were not revealed to prevent indirect interactions and all interactions have occurred explicitly through the issue tracking system.

[2]The issue management system Redmine has been used.

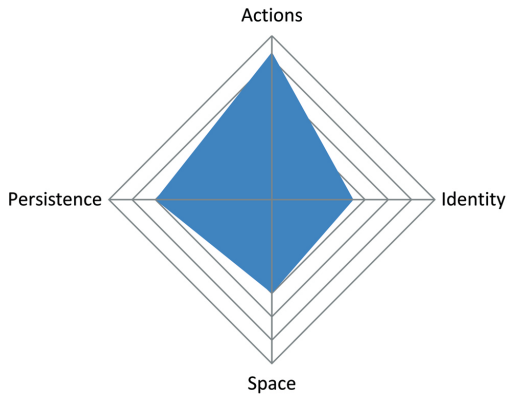

Figure 5: The first evaluated profile

The production of the final serious game specification was performed in two phases:

- phase 1: the engineer produced all stripes and derived automatically the application profile. The result of this phase was then transmitted to game design authors that provide feedbacks in order to correct what is missing and guide the next phase. At this stage, they were allowed to make changes to the original game design document. Fig.5 shows the first evaluated profile for the application.
- phase 2: the engineer takes into account phase 1 feedbacks and makes revisions to produce a new set of stripes and a new application profile. Again these results were presented to game design authors. Fig.6 shows the final evaluated profile for the application. As you can see the second profile is more balanced over the four axis. It is worth to note that this balancing among all dimensions was decided by game designers for this particular application. Within other contexts, designers may decide to emphasis on particular dimensions and deliberately neglect some others. For instance, in learning casual games, the persistence dimension can be deliberately diminished.

The study was limited to two phases but one can notice that this is an iterative process that can be iterated more than twice.

Table 1 presents duration of each phase. One can notice that phase 1 is three times longer that phase 2. This is due mainly to the learning curve of the methodology and also by the fact that most of stripes have been produced during phase 1 and only few have been modified and added from phase 1 and 2.

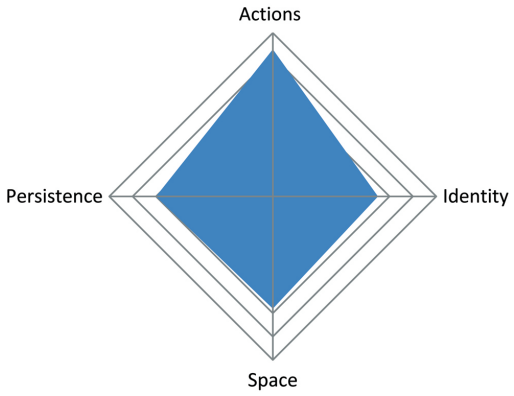

Figure 6: The final evaluated profile

Phases	Time	N. of Stripes	N. of modified Stripes
Phase 1	3 weeks	75	n-a
Phase 2	1 week	81	18

Table 1: Duration and number of stripes produced in each phase

5.2 Results

The final evaluation was conducted using interviews with the engineer and game design authors.

5.2.1 Engineer's feedback:

At the end of the study an interview was conducted with the engineer. During the interview the engineer has addressed several points about his experience with the presented methodology. Hereafter a summary of the main points that have been discussed:

- The engineer has found the methodology very useful in identifying non-functional aspects of the serious game. In fact, the culture of classical software engineering does not highlight the importance of non-functional aspects of a software system that creates a specific atmosphere for an application. In serious game non-functional aspects are crucial to capture game culture and atmosphere. Thanks to the methodology, all non-functional aspects have been recorded as non-functional stripes.
- The engineer has already some experience in developing large software systems. So, he was aware of the cost of implementation and revision of software systems. Consequently, he pointed out that the early evaluation performed between phase 1 and phase 2 has helped to revise some fundamental decisions without having to conduct costly implementations.
- The engineer has also pointed out that having extracted all stripes and grouping them into clusters makes it very easy to build a detailed storyboard of the serious game and facilitates the implementation phase. In fact, during the implementation all stripes are translated to features that are implemented by developers. This decomposition can also help to adopt an iterative approach by deciding what features to implement for each release.

5.2.2 Game designers' feedback

Surprisingly, the application profile has been considered by game designers as an interesting communication medium to communicate with the engineer. In fact, they were given a feedback that represents, to some extent, the interpretation of the engineer. For instance after phase 1, game designers have noticed that several points concerning social interactions have been missed by the engineer. In fact, phase 1 game design mentioned, but succinctly, chat between players. Since this description was not that significant the engineer did not create a specific stripe. When analyzing the early evaluation of phase 1, game designers discovered this omission and have decided to add into the game design a description of a pub to allow players socializing. This has generated specific stripes in phase 2.

6 Conclusions and Future works

In this paper we started from the assumption that social learning and social features enabling social presence are essential when building a serious game. For this reason we described a framework and an early evaluation method that can be useful in order to anticipate 'lacks' in the design. The framework and the early evaluation approach can be useful at different levels. Firstly, the early evaluation of the game design is performed when multiple experts (experts on learning, computer scientists and the like) have to work together by fostering communication between them. Secondly, an early evaluation of the designed application can help designers to anticipate several problems that can arise when developing a serious game with social aspects before starting the implementation (thus returning on the game design phase to add missing elements and restraining development cost). In order to support these two last statements we described an experiment we held where a computer scientists and pedagogues worked together in order to build a

virtual world for learning purposes. Results of this experiment were in line with the idea that adding a layer between user centered design, and user satisfaction measurement can really help designers to build serious games in a better way. Moreover, it's our intention to reproduce the experimentation of the method over different serious games design, in order to better support our findings. Besides, we also believe that trough users' feed-backs we could show empirical evidence that the method and the framework can help to build *better* serious games from the social point of view. For this reason we are conducting a real world experiment to relate designer's impressions with the a posteriori evaluation of end users.

Results of this experiment will be subject of future publications to enrich serious game literature with experimental works to demonstrate advantages and limitations of this approach.

REFERENCES

American's Army (2002). The american's army game website. http://www.americasarmy.com.

Biocca, F. (1997). The cyborg's dilemma: Progressive embodiment in virtual environments [1]. *Journal of Computer-Mediated Communication*, 3(2).

Burke, J., McNeill, M., Charles, D., Morrow, P., Crosbie, J., and McDonough, S. (2009). Optimising engagement for stroke rehabilitation using serious games. *The Visual Computer*.

Carmona, M., Heath, T., and Tiesdell, S. (2003). *Public Places, Urban Spaces: The Dimensions of Urban Design*. Architectural Press, Burlington, MA.

Danet, B., Ruedenberg-Wright, L., and Rosenbaum-Tamari, Y. (1997). Hmmm... where's that smoke coming from? writing, play and performance on internet relay chat. In *Journal of Computer-Mediated Communication*, volume 2.

Flynt, J. P. (2004). *Software Engineering for Game Developers*. Software Engineering Series. Thomson.

Goffman, E. (1959). *The presentation of self in everyday life*. Doubleday.

Gudmundsen, J. (2006). Movement aims to get serious about games. USA Today, 5/19/2006.

Harré, R. and Langenhove, L. V. (1991). Varieties of positioning. *Journal for the Theory of Social Behaviour*, 21(4):393–407.

Hollan, J., Hutchins, E., and Kirsh, D. (2000). Distributed cognition: toward a new foundation for human-computer interaction research. *ACM Trans. Computer-Human Interaction*, 7(2):174–196.

Joinson, A. N. (2003). *Understanding the Psychology of Internet Behaviour: Virtual Worlds, Real Lives*. Palgrave Macmillan.

Kasvi, J. (2000). Not just fun and games – internet games as a training medium. In *Cosiga – learning with computerised simulation games*, pages 23–34. P Kymäläinen and L Seppänen.

Kendon, A. (1988). Parallels and divergences between warlpiri sign language and spoken warlpiri - analyses of signed and spoken discourses. *Oceania*, 58(4):239–254.

Kermoian, R. and Campos, J. J. (1988). Locomotor experience: a facilitator of spatial cognitive development. *Child development*, 59(4):908–917.

Kiili, K. (2005). Educational game design: Experiential gaming model revised. Technical Report Research report 4, Tampere University of Technology.

Klemmer, S. R. and Hartmann, B. (2006). How bodies matter: Five themes for interaction design. In *In Proceedings of Design of Interactive Systems*, volume 74, pages 140–149.

Lakoff, G. and Turner, M. (1988). *Categories and Analogies*, volume 3. University Of Chicago Press.

Maglio, P. and Kirsh, D. (1996). Epistemic action increases with skill. In LEA, editor, *Proceedings of Cognitive Science Society*.

Nicola, W. (2007). Motivation and computer game based learning. Proceedings ascilite Singapore 2007.

Norman, D. (1994). *Things that make us smart: Defending human attributes in the age of the machine*. Addison Wesley, New York.

Pecher, D. and Zwaan, R. A. (2005). *Grounding Cognition: The Role of Perception and Action in Memory, Language, and Thinking*. Cambridge University Press.

Piaget, J. (1952). *The origins of intelligence in children*. International University Press.

Salen, K. and Zimmerman, E. (2003). *Rules of Play: Game Design Fundamentals*. The MIT Press.

Serious Games Initiative (2002). The serious games initiative websites. http://www.seriousgames.org/index2.html.

Short, J., Williams, E., and Christie, B. (1976). *The Social Psychology of Telecommunications*. John Wiley and Sons Ltd.

Tu, C. H. (2000). On-line learning migration: from social learning theory to social presence theory in a cmc environment.

Vredenburg, K., Isensee, S., and Righi, C. (2001). *User-Centered Design: An Integrated Approach*. Prentice Hall PTR.

Wenger, E. (2000). Communities of practice and social learning systems. *Organization*, 7(2):225–246.

Wenger, E., Mcdermott, R., and Snyder, W. M. (2002). *Cultivating Communities of Practice*. Harvard Business School Press, Boston.

Witmer, B. G. and Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. *Presence*, 7:225–240.

Xu, Z., John, D., and Boucouvalas, A. C. (2006). Social factors and interface design guidelines. In Ghaoui, C., editor, *Encyclopedia of Human Computer Interaction*, pages 523–532. Idea Group, London.