



**HAL**  
open science

# FROM DOCUMENTARY FILMMAKING TO SERIOUS GAME: INTERACTIONS MODEL TO BRING THE REAL TO LEARNERS

Jacques Ibanez-Bueno, Allain Sébastien

► **To cite this version:**

Jacques Ibanez-Bueno, Allain Sébastien. FROM DOCUMENTARY FILMMAKING TO SERIOUS GAME: INTERACTIONS MODEL TO BRING THE REAL TO LEARNERS. French Journal for Media Research, 2017, 8, <http://frenchjournalformediaresearch.com/lodel/index.php?id=1363>. hal-01652995

**HAL Id: hal-01652995**

**<https://hal.science/hal-01652995>**

Submitted on 30 Nov 2017

**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.



Distributed under a Creative Commons Attribution 4.0 International License

## **FROM DOCUMENTARY FILMMAKING TO SERIOUS GAME: INTERACTIONS MODEL TO BRING THE REAL TO LEARNERS**

Sébastien ALLAIN

Docteur en sciences de l'information–communication, Docteur en sciences de l'éducation  
Chercheur associé au laboratoire LLSETI, Université Savoie Mont Blanc, France  
Chercheur associé au laboratoire TECFA, Université de Genève, Suisse  
Membre de la chaire UNESCO ITEN, France  
Membre de l'OMNSH  
sebastien.allain@univ-savoie.fr

Jacques IBANEZ-BUENO

Full Professor - Professeur des Universités  
Communication & Hypermedia Dept. UFR LLSH  
Université Savoie Mont Blanc  
G-SICA LLSETI Laboratory  
jacques.ibanez-bueno@univ-smb.fr

### **Résumé**

Cet article propose de se référer au cheminement historique et socioculturel qui a accompagné la modernité du cinéma documentaire pour mettre en lumière les différentes manières dont les serious games peuvent convoier le réel dans une expérience d'apprentissage. Après avoir précisé l'approche sémio-pragmatique qui autorise le rapprochement entre les deux champs, un modèle théorique décrira les interactions des actants du serious game en regard de la chaîne des principaux actants du documentaire. Ces transpositions permettront de critiquer la tendance actuelle du serious game consistant à vouloir donner aux apprenants un accès direct et transparent au réel. Ainsi, l'intérêt de cette recherche est de souligner la résurgence de problématiques communicationnelles afin de les ouvrir à de nouvelles perspectives. Ce faisant, les valeurs et modèles de l'approche documentaire pourraient promouvoir une interaction plus réflexive que référentielle, et pourraient s'attacher à la dimension humaniste plutôt que technologique.

**Mots-clés :** Documentaire, histoire, jeu-sérieux, sémio-pragmatique, humanisme

### **Abstract**

This article refers to the historical and socio-cultural development that has accompanied the modernity of documentary cinema in order to highlight the multiple ways for the serious games to convey the real in a learning experience. After specifying the semio-pragmatic approach that makes it possible to connect the two fields, a conceptual model is proposed that describes the interactions of serious games actants in relation to the chain of actants in the documentary. These transpositions will clarify a current trend where serious games are wanting to give learners a direct and transparent access to the real. Thus, the interest of this research comes from underlining the resurgence of well-known communicational issues, in order to adapt and open up them to new perspectives. In doing so, values and models from the documentary approach would promote a reflexive way to interact rather than a referential one, and a focus on human rather than technology.

**Key Words :** Documentary, history, serious-game, semio-pragmatic, humanism

## INTRODUCTION

“Who will be the Michael Moore of serious games?” asked Lucy Bradshaw<sup>1</sup>, general manager of Electronic Arts. At first glance, a question associating documentaries and serious games can seem surprising coming from a company that is a leader in the field of video games, particularly considering the strong ties this industry has with the world of entertainment and fiction films. However, the question is quite relevant for this manager seeking to acquire new market shares... Moreover, this question is especially relevant for the training services of major companies who want to understand how modeled situations in a serious game can be as close as possible to everyday life professional situations.

**Fig. 1. Michael Moore, in *Bowling for Columbine* (2002)**



Yet, as the designers of serious games focus on realism, authenticity, and referentiality of the contents to support the transfer of knowledge, they revive issues that are already known to the movie industry. But does realism actually makes it possible to “naturally” convey reality through images or interaction? On the contrary, doesn’t access to the real imply a necessary distance and a critical perspective? On a different level, the association of documentaries and serious games is of interest for trainers, managers, and human resources who seek to “capture” users’ skills through the traces of their activities. But does the technological tool offer the assurance of perceiving the real user? Do the capturing and transfer processes involved in serious games preserve a reference to the real? To see what answers documentary filmmaking has provided, we first analyze its closeness to serious games, by using a semiological-pragmatic approach and the concept of documentarizing reading. Engaging in such documentarizing reading is partly dependent upon the object, the modes of production for filmmaking will be reviewed, and extended to serious games. Then the actants of serious games will be transposed to the actants of “linear” documentaries. These transpositions will lead us to propose a theoretical model describing the interactions. This model will reveal a trend in current productions to belong to the naturalistic theories of documentaries. At the same time, this theoretical approach will highlight an alternative and reflexive approach, placing the emphasis back on mediation. Thus, the historical and socio-cultural path taken by documentary filmmaking will provide an insight into the path that remains ahead in order for serious games to be used for the share of the real that they are capable of conveying.

---

1 Cited by Leigh (2012), [http://www.gamasutra.com/view/news/172739/Who\\_will\\_be\\_the\\_Michael\\_Moore\\_of\\_serious\\_games.php](http://www.gamasutra.com/view/news/172739/Who_will_be_the_Michael_Moore_of_serious_games.php) [Accessed 26 May 2017].

## **PRODUCING DOCUMENTARIZING READING MATERIAL**

Nothing opposes connecting documentaries with serious games (Allain, 2013c): firstly the acceptance and borders of documentary films are constantly changing (Kilborne, 2008, p. 92), with a “succession of redefinitions of our historical relationships to and with reality” (Niney, 2002, p. 317); secondly, the definition of serious games still needs to be complemented. Indeed, either it is not yet stabilized if one considers that serious games emerged from 2002, or it is not precise enough if one considers they first appeared 40 years ago using non-digital material (Djaouti, Alvarez, Jessel, & Rampnoux, 2011; Smith, 2009). Moreover, the theory of documentary filmmaking has been updated over the past ten years with the advent of “interactive documentaries” (“i-docs”) (Almeida & Alvelos, 2010; Choi, 2010; Dankert & Wille, 2001; Galloway, McAlpine, & Harris, 2007; Gaudenzi, 2012; Gifreu Castells, 2011) and docu-games (“documentary computer game” or “documentary videogame”) (Bogost & Poremba, 2008; Fullerton, 2005; Poremba, 2011; Raessens, 2006). “At face value, the definition of interactive documentary is quite straightforward any documentary that uses interactivity as a core component of its delivery process” (Galloway et al., 2007, p. 330), endeavouring to achieve “facticity or documentarity to expose players to events and places that would remain inaccessible to them otherwise” (Raessens, 2006, p. 215). Although the ludic dimension is not necessarily addressed with “interactive documentaries” – these are largely based on real images (Ursu et al., 2009) that are different from videoludic material (computer generated images) –, it is present in docu-games. For Raessens (2006), docu-games are a sub-category of serious games: on the one hand docu-games rigorously “document” facts and recreate them in a ludic manner; on the other hand the serious goals differ from simple entertainment; a definition that is in line with that of serious games (Djaouti et al., 2011; Zyda, 2005).

The semio-pragmatic approach initially applied to filmmaking (Odin, 1983), then extended to communication spaces in general (Odin, 2011), supports the association between documentary and serious games. The approach proposes that the documentary component is produced at a crossroad of constraints (internal and external) that lead to a “documentarizing reading” (Odin, 1984, 2000). Like serious gaming that can encompass any ludic artefact and give it a serious finality (Djaouti, 2011), semio-pragmatics considers that any object can be “read” as a document. Indeed, “the more the determinations that govern the spectator’s space will be close to the determinations that govern the production space, the more likely it will be that the constructions created by the actant-spectator will be close to those created by the actant-producer” (Odin, 1983, p. 70). The external constraints are the instructions given by the institution the spectator belongs to. Thus, serious games designed for a specific group and audience can more easily match the users’ reality with psychological, historical, or emotional traits of characters and situations. The professional environment is therefore a facilitating factor for a documentarizing reading. In our opinion it represents the differentiating feature with respect to docu-games (Allain, 2013c). Internal constraints concern the textual elements (credits for a film) and style (specific to documentary reporting for instance: shake, blur, etc.). Among the typologies used to address new forms of documentaries, the taxonomy of production modes proposed by Nichols (1991) is the most referred to. We will rely on it to specify the filmmaker’s intervention through the “organization” of the filmic text. To support our discussions, we view this taxonomy as belonging to the direct realism / indirect realism dichotomy proposed by Kilborne (2008). This bipartition makes it possible to distinguish so-called neutrality from its contrary, the intervention of the filmmaker. Three of the four modes

are thus addressed, whereas the fourth will be positioned concurrently to realism. The points we will develop hereafter will then enable us to describe the actants of serious games.

## **Direct Realism**

Direct realism as proposed by Kilborne is based on the post-war work of French critic André Bazin and its analysis by Guynn (2001). The cinematographic tool is described as a technological turning point, making it possible to capture, record and broadcast “the same truth [...] indefinitely, with no distortion or loss” (Guynn, 2001, p. 34). Filming (as a captation) offers a new way for revealing the “immanent truth within the real” (idem, p. 30) and the recording preserves a natural coherence of facts with a transparency between the referents and their representation. To satisfy the perspective of a “direct access (non-symbolized) to the real” (Kilborne, 2008, p. 27), effects and special effects are excluded, as they stand between the “natural” substitution of the camera and the eyes. Although effects inherent to editing are allowed, they are codified to avoid fragmenting space-time, and justified by the necessity to downsize in Bazin’s words “a too abundant real” (Guynn, 2001, p. 35). Such transparency also entails that the technical set-up, the filmmaker’s enunciation markers, and discursive urge must be faded out. The filmmaker and the camera are “slaves” to a real that is self-sufficient (Kilborne, 2008, p. 120). Citing Guynn, “[the film] assumes its natural function in relation to its natural object” (p. 21). In a nutshell, direct realism proposes a type of communication that is flawless with no need for mediation, and considers that each spectator has “the right perspective for watching”.

Two of the modes proposed by Nichols (1991), can be compared. Firstly, the “exposition” mode, the first historically, was defined as a reaction to the implicit fictional model used in entertainment in the 1920s / 1930s. We will position it at the border between direct and indirect realism. From a general point of view, it relies on argumentative and rational logic and is presented in the form of a solution to a problem or a riddle. The content is supported by depersonalized titles and comments. The images are used for illustration or example purposes. The presence of too many arguments or too much editing draws it away from direct realism. However, the principle of immanent real is fully enforced and this mode connects with direct realism when Nichols describes a film that is offered directly to the spectators, capturing their attention thanks to the force of its arguments. In this case, although the arguments actually belong to a filmmaker, they supersede his/her presence and limit the possibility of deconstructing the film.

The second mode is “observation”. It stems from the 1960s and promotes non-intervention on behalf of the filmmaker, justifying its inscription as part of direct realism, and opposes the argumentative basis of the former mode: rather than driving an augmentation, the filmmaker is at the service of the action. The role of editing is minimalist and involves “merely” prolonging the action, ensuring continuity in terms of time and space. Voice-over, interviews, and titles are avoided so as to ensure that spectators have a “real-time” experience and to limit any sense of imposition. The characters interact as if there were no camera. The filmmakers’ presence is not suggested either, avoiding any interaction with the characters. Their absence is mentioned as a requirement to avoid impairing the social context or the intimacy of situations, conferring the impression of transparency, “as if you were there”.

The realism theories from Bazin are approaching positivist scientific theories of classical ethnographic film (Guynn, 2001). Indeed, the use of the cinema allowed to complete observation by new methods of description and conservation of social phenomena. This new form of description claims a high “faithfulness”: material is considered as raw and equipment as neutral, since any aesthetic or creative interference is avoided. This idea joins previous descriptions of Nichols when it specifies that the first two modes exposure and observation were used in ethnography.

## Indirect Realism

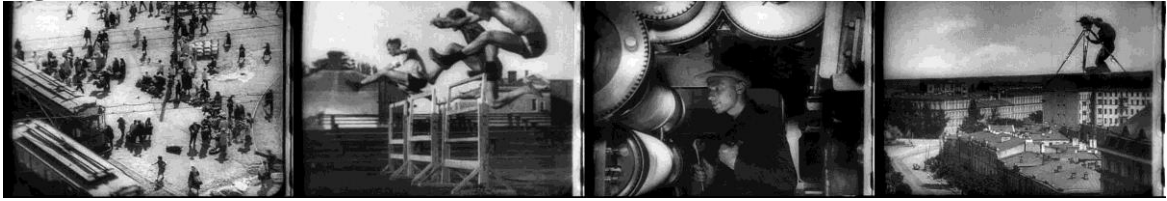
Indirect realism for its part assumes that mediation is necessary in order for the documentary to reveal its object. The project is still to present facts, but it accepts that mechanical recording is not sufficient and that the intervention of the filmmaker is required. Emblematic filmmakers who used indirect realism are Grierson and Vertov. Grierson is said to have been the first to use the term “documentary” (1926) to describe the films made by Flaherty, such as *Nanook of the North* (1922) (cf. fig.2). The documentary, according to this British approach is considered as a “creative treatment of reality”, i.e. a more or less skillful reconstruction of the world. It is no longer a simple recording, but a selective approach and a political positioning of the filmmaker with respect to the subject.

**Fig. 2. *Nanook of the North* (1922)**



With the film *Man with a movie camera* (1929), Vertov stresses the necessity to structure existing material in order to show life “as it is” (cf. fig.3). As Guynn (2001, p. 27), reports “Vertov does not view films as a transparent vector of representation offering the spectator instant access to a world that is already created. Rather, he proposes that the coherence of any discourse is the result of work [...]”. In a nutshell, “the material is seen as pre-existing” (Pierron-Moinel, 2010, p. 171), available in the environment, but the method for representing it remains to be constructed.

**Fig. 3. *The man with the movie camera* (1929)**



The characteristics of indirect realism make possible to compare it with Nichols' (1991) taxonomy. We mentioned earlier that the “exposition” mode lies on the border of this dichotomy, we will now detail the “interactive” mode – later renamed as “participative” (Nichols, 2001). The comparison is made easier as Nichols actually refers to Vertov. Whereas until now, the idea was for the filmmaker to mask the editing work and to position himself in the background, his interaction with the filmed environment now becomes an integral part of the film. The interactions consist essentially of the filmmaker’s voice, in the form of monologues or dialogues. This is not voice-over, recorded *a posteriori*, but a voice heard “on location”, occasionally embodied, in particular in face-to-face situations with the characters. This is the case in the film *Chronicle of a Summer* (1960) that Nichols gives as an example, in which the two filmmakers, Rouch and Morin, ask Parisians questions about happiness in their everyday lives (cf. fig.4). This work shares both the traits of the interactive mode via interviews and that of the reflexive mode addressed hereafter.

**Fig. 4. *Chronicle of a Summer* (1960)**



## From Realism to Reflexivity

To account for the historical development of production modes, it is necessary to address the “reflexive” mode (Nichols, 1991) that consists in questioning the knowledge we have on cinema in general, whether it be realism or any other formal approach. According to Pierron-Moinet (2010), the modernity of documentary films lies in the separation of the discourse from the representation, constructing a questioning of its limitations. Documentary filming therefore serves as a strategy to “contest pre-existing systems, to question, rupture, and subvert” (p. 33), with the notion of “undermining” the reference illusion – terms that are also used by Nichols. The filmmaker seeks to bring the spectators to question the representation, to bring them to consider the problematic relationship between the filmic text and its object. The film *Chronicle of a Summer* is described by Moinet-Pierron not only as an example of modernity, but also as its historical and socio-economic origin. The *mise en scene* was remarked at that time because the filmmakers recorded a discussion between the protagonists, after a screening of restitution (cf. fig. 5). This sequence was then mounted in the final film. Through this, the protagonists find themselves doubly filmed.

**Fig. 5. Discussion after the restitution, in *Chronicle of a Summer* (1960)**



Although realism is the style of representation that has most influenced documentary filmmaking, crossing Nichols's taxonomy with Kilborne's dichotomy has underlined a historical evolution of the filmmaker's position, from a relatively secondary role at first, to a "preminent" position (Lugon, 2006, p. 9), becoming the initiator of a "reinvented reality" (Colleyn, cité par Broudoux, 2012). The semio-pragmatic approach explains why the filmmakers' intervention – manipulation even – is not an obstacle to realism. Moreover, it spans beyond the notion of realism and supports the reflexive mode in questioning representation. Using the aforementioned dichotomy and taxonomy will enable us to position the current productions of serious games.

### **TRANSPOSING OF ACTANTS**

Focusing on the actants<sup>2</sup> is essential in filmmaking as the interactions of the latter make up the documentary set-up in itself (Niney, 2009, p. 41). In documentary films the chain of main actants is tripartite, composed of a filmed, a filmer, and a spectator. This chain focuses on the filmed/filmer relationship – as is the case with the interactive mode which different forms all have in common that they "depict social actors in a direct confrontation with the filmmaker" (Nichols, 1991, p. 47); or on the filmer/spectator relationship, as summarized previously in the reflexive mode. Here we will specify a series of transpositions of actants in serious games of the single player type following two analogies: a first straightforward analogy will essentially confirm the ability for serious games to correspond to documentary "diffusion"; a second analogy, coined as revisited, will underline new "captations" of the real. Both analogies will then be combined to offer an exhaustive model, and discussed in view of situating the current production modes of serious games, and their futures.

### **Straightforward Analogy**

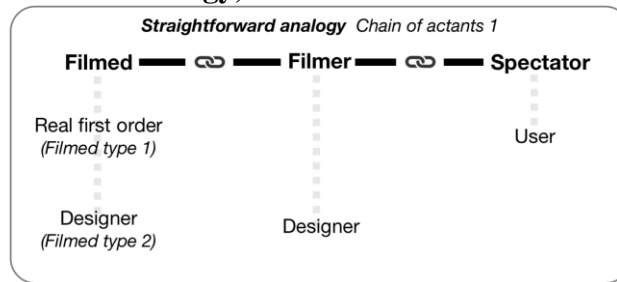
The straightforward analogy illustrates the most direct manner in which serious games become a documentary set-up, through its capacity to distribute or generate more or less interactive images, whether they are the result of captation or modeling (synthetic images). This analogy involves at least three transpositions, the third concerning the filmed, will be addressed in greater detail.

---

2 The term "actant" qualifies according to Odin (1983) an instance constructed for the analysis, "point of passage of a thread of determinations" partly conditioned by the communication space (p. 70).



**Tab. 1. The straightforward analogy, oriented toward diffusion**



## Designer-filmer and user-spectator

The first two transpositions seem obvious. Firstly, in serious games the filmmaker’s creative intervention can be compared to that of a designer – or a team of designers. We will refer to this under the generic term designer-filmer. Similarly the user adopts the posture of a spectator (user-spectator). From the point of view of serious games, the user-spectator adapts to an “initial intention” that aims to “combine serious aspects [...] with ludic levers stemming from videogames (Game)” (Alvarez, 2007, p. 35). From the point of view of documentary filmmaking and following the semio-pragmatic approach, users are subjected to the constraints of the communication space that lead them to recognize the designer-filmer’s “specific intention”, thus conferring a documentary property to the subject “which was the author’s initial intent” (Lioult, 2004, p. 153).

## Filmed-filmed and designer-filmed

The posture of the filmed is diversely adopted depending on whether or not the serious game integrates a captation of the real: if it does then the actant remains unchanged (filmed→filmed type 1), if not, the place of the filmed is occupied by the designer himself (designer→filmed type 2). We should mention beforehand that type 2 does not mean that designer is “filmed” in the actual sense, but that he is the source of the documentary object.

## Filmed Type 1

In the case of upstream captation – i.e. during the production of the artefact –, filmed type 1 represents one or several actual individuals whose main traits have been recorded so as to offer indicial cues. This is the case of serious games *Premiers combats* (2011, Graphito Multimedia)<sup>3</sup> and *I am playr* (2010, We R Interactive) which alternate video sequences and interactive scenes in a subjective view (cf. fig.6). The universe of *Premiers combats* is set in a boxing sporting context and aims to enhance awareness of young apprentices with respect to the risks associated with taking drugs and alcohol, whereas *I am playr* is set in the football environment and aims to provide the experience of being a professional football player. In both cases, the idea is to have users discover an environment. The filmed are then the teacher or coach, the new co-trainees, etc.

3 <http://www.premierscombats.com/demarche> [Accessed 14 November 2016]

**Fig. 6. *Premiers combats* (2011) [top] and *I am playr* (2010) [bottom]**



The serious game *SecretCAM handicap* (2011, Région des Pays de la Loire)<sup>4</sup> adopts a similar approach. Designed with the business world in mind, it aims to facilitate integration for handicapped employees by asking their co-workers to address their own preconceptions. In this case, the filmed are fictional colleagues whose conversations are stolen via webcams that have been pirated (cf. fig. 7). Although video has an important place in these examples, it does not cover the total duration of the games. Thus, in order for the computer graphic images to also be considered as filmed type 1, as “reproductions” of the real, they must necessarily give the illusion of being photographic images referring to the real.

**Fig. 7. *SecretCAM handicap* (2011)**



Although the use of captation – as a video capture – upstream is sometimes seen as being restrictive for docu-games (Bogost & Poremba, 2008), we can note that it still gives rise to many productions and is well acknowledged through professional rewards and prizes<sup>5</sup>. The use of indicial traces is largely used for *Will interactiv*<sup>6</sup> productions and in a lot of newsgames<sup>7</sup> such as *On the Ground Reporter: Darfour* (2010, Butch & Sundance Media), *Inside the Haiti Earthquake* (2010, PTV Productions), *Homeland Guantanamo* (2008, Free Range Studios). Finally, this format is commonly used in interactive documentaries for which Gaudenzi (2012, p. 2) gives a list including *Gaza Sderot: Life in Spite of Everything* (2008, Alma Films/Trabelsi Productions, Arte, Bo Travail!, Ramattan Studios, Upian), *Journey to the End of Coal* (2009, Honkytonk Films, Le Monde), *The Virtual Revolution* (2009, BBC Two), *Prison Valley* (2010, Arte, Upian), *Life in a Day* (2010, Ridley Scott) and *Beyond 9/11* (2011, HBO), to which we can add *Bear71* (2012)<sup>8</sup> produced by the National Film Board of Canada.

4 <http://www.seriousgamesecretcam.fr/handicap.php> [Accessed 15 April 2016]

5 The serious game *Premiers combats* received the prize for innovation at the international event Serious Game Expo 2011 and *I am playr* has been nominated several times, in particular for the BAFTA Video Game Awards and Cannes Lions Awards.

6 <http://willinteractive.com/products> [Accessed 15 November 2016]

7 [http://www.gamesforchange.org/game\\_categories/newsgames/](http://www.gamesforchange.org/game_categories/newsgames/) [Accessed 26 May 2017]

8 <http://opendoclab.mit.edu/bear-71> [Accessed 26 May 2017]

## Filmed Type 2

If there is no filming upstream, the filmed's posture then falls into an approach that relies essentially on a reflection process. We refer here to "refection documentaries" according to Gauthier and their analysis by Kilborne (2008): for such films, "there is predominance [...] of the author's demonstration or point of view over the experience of capturing reality" (p. 105). Gauthier is cited in order to highlight that "in this case the project structures the film, drawing on the material available without the film being a prerequisite [...]. Through the film-laboratory, the critical documentary filmmaker illustrates his/her subject" (Kilborne, 2008, p. 237). For serious games, this means that the available material is collected and shaped into a model in order to "reconstruct" reality. The artefact then relies on the filmmaker's point of view, his experience, and the knowledge database he will have compiled or obtained: the discourse, the characters, and the finitude of actions then correspond to the range of interpersonal interactions that he will have encountered or documented. In addition to illustrating a topic through images, as Kilborne mentions above, the perspective and ideology of the designer-filmed are deposited as "intentional interactivity" (Meunier & Peraya, 2010). We should mention that the idea is not to place the designer-filmed in the image, but rather for the filmed type 2 to derive representations that the designer has of a given situation. The *TBI-SIM* project (Traumatic Brain Injury SIMulation, 2012, University of Geneva)<sup>9</sup> illustrates this principle. It aims to simulate interpersonal relations to help children adapt psychologically to the reactions of close relatives (parent or sibling) suffering from the aftermaths of neurological injury (cf. fig. 8). In order to create situations and dialogues the authors used a series of individual interviews and focus groups with lesion-free youths and parents, service providers and regional associations. They then integrated this experience in the rules to generate the overall situation, the texts, and the narrative tension.

**Fig. 8. *TBI-SIM* (2012)**



With filmed type 2, the notion of author takes all its meaning, not as a creating entity governing fiction, but as a dialectic guiding the users in their interactions between the set-up and its relationship to the real world. Following Lioult (2004) who describes filmmakers in the reflexive mode as potentially being "both authors and characters" (p. 109), the designer can adopt here two simultaneous postures, filmer and filmed embracing the role of Flaherty, as well as that of *Nanook*. All serious games with a documentary scope that are based on computer generated images will at least recourse to this transposition. Filmed type 2 will therefore always be present, more or less visible, and will, where necessary be uses concurrently with filmed type 1.

---

9 <http://tecfa.unige.ch/tecfa/research/tbisim/> [Accessed 26 May 2017]

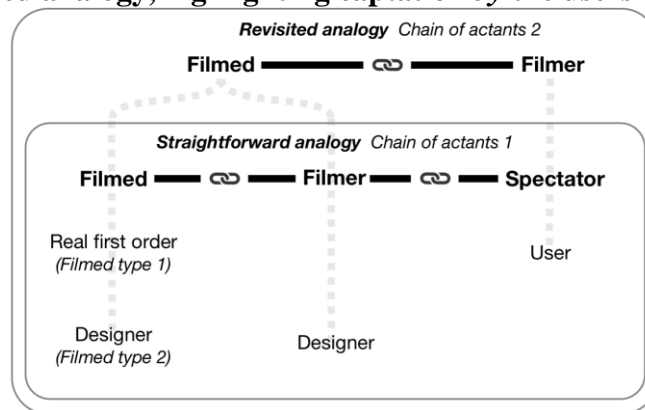
## Revisited analogy

Beside the proposition to use serious game as a means for “diffusion”, technically they also carry other communication spaces to satisfy the documentary approach. Two other transpositions appear by redefining the nature and status of the “captation”. By revisiting these correspondences with cinema, captation becomes virtual, performed by the user (user→filmer) in an exploration of the interactive content. Presenting this analogy underlines the necessity to reinterpret the literature in order to rethink the chain of actants and the “production” site. Revisiting these correspondences in a second approach, we will address the aspect of a captation of/from the user (user→filmed type 3). These two transpositions will require discussing the transparency of captation and the current resurgence of direct realism.

### User-Filmer

Referring back to filmic analyses, Niney (2009) states that “the documentary nature is not determined merely by the content (informative), but [also] by the type of camera/world interaction” (2009, p. 17). This camera/world interaction is understood here as an exploration undertaken by a user-filmer who is faced with a given world.

**Tab. 2. The revisited analogy, highlighting captation by the users**



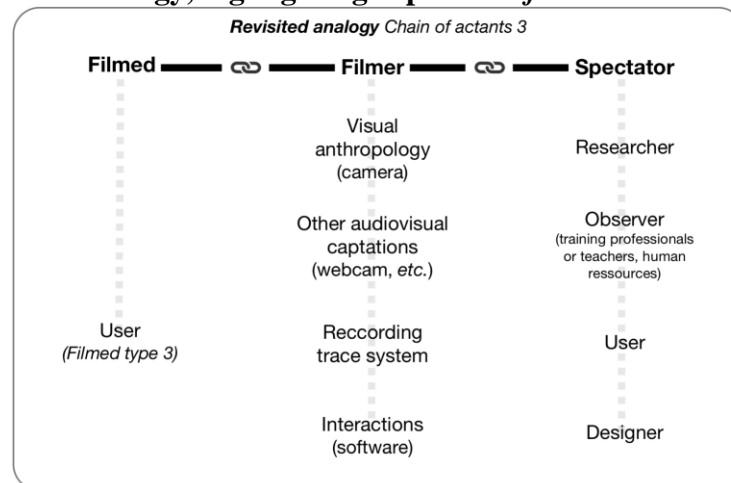
The distinction between the previous user-spectator and this user-filmer lies in a tangible interactional commitment toward the experience. This distinction has also been described by Dankert and Wille (2001), as seen “from film-like expositions to explorative simulations” (p. 27). Our user-filmer transposition draws on previous theoretical propositions mentioning, for interactive documentaries or docu-games, either an interaction coupled with an observation, or an exploration, or a captation. As a first source of inspiration, the new interactive mode, proposed by Bogost and Poremba (2008) underlines that users “can themselves become participants/observers”. A second source, the reinterpretation of Nichols’ observation mode (1991) by Dankert and Wille (2001) specifies that the “camera [...] becomes in this case an avatar for the users, invisible in the world of observation, but offering control tools that are otherwise visible or perceptible on its interface” (p. 12). Our third source stems from Fullerton (2005) and Galloway D. et al. (2007) for whom the reconstitution of historical facts and battles allows one to experience life on the combat front first hand. According to Galloway D. et al., the origins of documentary filming lies in war photo-journalism, which shows the role of users-filmer in games such as *Brothers in Arms* as the

resurgence of the first war reporters. Fourth and last source, Nichols’ (1991) interactive mode reinterpreted by Dankert and Wille (2001) adds the possibility to control one’s avatar to interact in the first person (p. 13), which the authors associate with the way one centres and frames in direct cinema. Some examples tend to “image” captation (photojournalism, direct cinema), as we were able to see during the symposium with Natkin, who presented a game of the Wesavage team, where the filmer analogy is more intelligible. But the exploration of the world in which the user-filmer is engaged – and that we underline – is first and foremost symbolic, occasionally relying on mere choices and intentions.

### User-Filmed (Type 3) and its Spectators

The user-filmed transposition places the emphasis on another captation, this time focused on the user himself (filmed type 3), following two meanings: in the literal sense, it is a camera integrated in the set-up and in the wider sense it becomes the recording of his actions (mouse movements and clicks, keyboard entries and other electronic traces of his activity are collected via a LMS or a propriety trace system (cf. tab. 3). The first sense renews the anthropologic approach to filmmaking developed previously and required additional equipment (camera). The reader can refer to the visual anthropology and hypermedia work, to the equipment used by Ibanez-Bueno and Chabert (2010) or Chabert et al. (2010), combining the filming of the users engaged in serious game, a semiological analysis of the images of the game and post-game interviews. In this case, the user-filmed transposition is logically accompanied by a researcher-spectator. Other configurations may concern the use of webcams or Kinect type systems; i.e. work by Poremba (2011).

**Tab. 3. The revisited analogy, highlighting captation of the users**



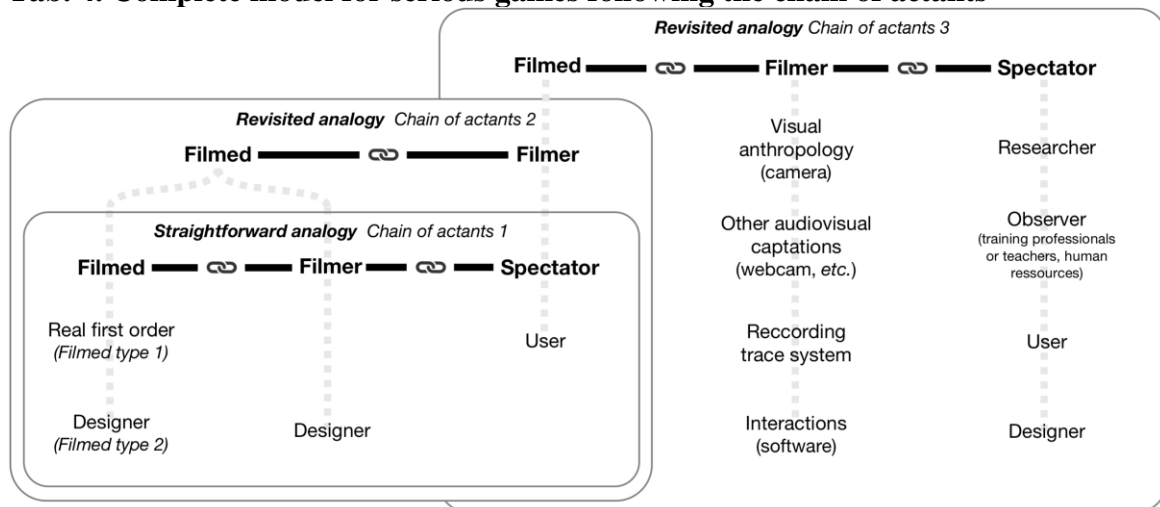
Concerning the second type of captation, “integrated” in the set-up, it allows for new spectators that we will mention briefly. In addition to the designer and the researcher, training professionals or teachers and human resources managers will find an interest in the recording of the traces. They all become spectators. Thanks to such traces, the designer can consider detecting functional anomalies or adapting the sequence to the users’ results; researchers can consider correlating the visual anthropology approach with metric data in order to qualify practices (Allain, 2013b); training professionals or teachers can consider the preparation of training presentations based on a predictive assessment carried out via serious games or

measuring the knowledge retained following the training session using this means (summative assessment); finally, human resources managers may consider using the traces in order to identify the users' profile and competences required to complete human resources tools or recruitment tools. Lastly, one final spectator should be mentioned, as although the user's interactions can be communicated to a third party, they can also be used as feedback information. In this case, we have a user-spectator, but who is a witness to his own performance. This user-spectator can result from short interaction loops composed of the system feedback (real time interaction) or longer loops such as deferred pedagogical comments (such as debriefing); one can also associate the "replay" mode mentioned by Fullerton (2005) for *JFK Reloaded* (2004, Traffic Management) that enables one to view under different angles the options considered for the assassination of the president of the United States.

## Complete Model

As our two analogies and their transpositions call upon the same actants, we propose to articulate them into a complete model, summarized in Tab. 4.

**Tab. 4. Complete model for serious games following the chain of actants**



The transposition of the user within the straightforward analogy is framed by two transpositions of said user within the revisited analogy. Thus, transpositions of actants in serious games will span over not one documentary chain, but over three. The user can therefore adopt – and potentially cumulate – the statuses of spectator, filmer and filmed. Moreover, the user can be spectator in two ways: within the straightforward analogy as the addressee of diffused content and within the revisited analogy as spectator to his own actions or choices (replay, debriefing, meta-cognitive analysis, etc.). Concerning the designer, the illustration specifies that he can adopt the status of filmer in two instances: first within the straightforward analogy, to make available cues of reality or his own experience; secondly within the revisited analogy, to observe the user's interaction. Finally, he adopts the status of filmed, object of his own setup and object of the user-filmer exploration. In brief, the set of

transpositions makes it possible to consider the place of the user and that of the designer in a nested manner (piling of chains) potentially recursive (differed viewing and retroactive loops). These two dimensions mirror the set-up proposed by Rouch and Morin where the restitution of the film being made –*Chronicle of a Summer*– is integrated in the final film. This possibility for cumulating is essential, as the modes presented until now in the literature are not interconnected. For our part, the model illustrates visually, through descriptions and examples, that combinations are possible within a same set-up. This echoes the modes defined by Nichols, their possible overlapping and combination in a within a same film.

## DISCUSSION

The historical development of documentary filmmaking and the model composed of the straightforward and revisited analogies now make it possible to discuss a huge limitation of serious games production when they ambition to convey reality: the resurgence of direct realism. In a first step, the description of the straightforward analogy underlined the necessary creative intervention of the designer-filmer to build the serious game artefact, which facilitates its link to indirect realism. Moreover, the use of computer-generated images should logically have consolidated this intervention, drawing away from the direct realism approach. But, with the revisited analogy we will see that this approach finds a new expression in serious games, returning to the impression of a direct access to real for the user-filmer and on the reactivation of naturalist or positivist theories for the user-filmed. Concurrently, our model will make it possible to engage a reflexive alternative to consider the interactions between actants of serious games from a different perspective.

### Return on the User-Filmer

According to Poremba (2011), “the desire for transparency is present in both documentary and videogames” (p. 128). The user-filmer transposition in particular highlights the confrontation of two perspectives that remind of the direct/indirect realism dichotomy. In some cases, the experience is described via a “first hand” incarnation or exploration (Galloway D. et al., 2007, p. 333; Fullerton, 2005, p. 9). Users then take fully part in the world via their actions and feedback. The posture is accompanied by a deep immersion that allows them to access the world directly, which is the mark of direct realism. The most advanced theoretical form identified in this respect is “mutual discourse” (Galloway D. et al., 2007, p. 333), i.e. exchanges that are transparent, continuous and bidirectional between the agents of the system and the users. But this first vision rapidly leads to another one, sometimes by the same authors who specify that this “first hand” access occurs through the intermediary of a “depicted” world (idem, p. 333). In other terms, they agree half-heartedly that the virtual world is necessarily the result of an elaboration and a creative act, which contradicts any direct access. In 2001, Dankert and Wille already noted that exploration by a user and his avatar implies “a world created by the author or director of the work” (p.19) who also creates the “characters, props and settings, the rules governing their behavior, and the tools that allow the user to interact with the world – and to interact with the characters (agents) encountered as part of the exploration” (idem). Although the users actually explore an environment, they are essentially faced with a reality that is made available to them by a designer. In this sense, indirect realism should be predominant: far from offering direct access

to the real, the exploration is limited to the world that is provided. Any exploration that takes place, whether passive or performative, is then necessarily relative and bounded. Broudoux (2012) emits the same criticism regarding webdocs in which users only engage in pseudo actions in the first person. Concerning serious games, strictly speaking although *Premiers combats*, *I am playr* and *SecretCAM* do not explicitly claim any documentary scope, they do support a high level of realism<sup>10</sup>. Moreover, with *SecretCAM*, although the game proposes to “reflect” upon one’s preconceived opinions, which is a reflexive and introspective undertaking, the interaction delegated to a user-filmer remains within the field of direct realism and within the observation mode. Indeed, the questioning that is elicited mainly concerns the users’ social representations and not the image representations of the material, which would in that case be part of the reflexive production mode.

### **Focus on the User-Filmed**

To reformulate the user-filmed transposition within the revisited analogy, the causal or physical chain of the cue has its source in the users’ captation and ends with a spectator. The postulate is simple, but it is not without consequences for the different spectators that we have previously identified. Concerning the researcher first, we can note that depending on his epistemological posture (positivist or research-action for example) and the purpose (exploratory or confirmatory in particular), the captation will engage more or less significantly the mechanical capacity of the medium and implicitly a direct realism. This is even more relevant for any observer such as assessor or human resources manager who, in good faith, will consider the recorded traces as the user’s “past actions”. If this was not the case then of what use would be the information feedback from serious games? However, the code is essentially the designer’s vector, encapsulated within the rules and algorithm. It cannot be changed by the user and communication is only possible by following the channel opened by the designer. In other terms, one must admit that the user-filmed resulting from a captation relying on a trace system is conveyed through the code. Thus, considering that users are restituted through the code therefore entails adopting a form of direct realism where the serious game tool is a “natural” vector. Although this approach may be obsolete for the film industry, it is this trend that can be identified today: in docu-games, Poremba (2011) has considered the possibility that the referential dimension is related to the users themselves, through captors that lead to “natively referential calculations” (p. 30). Galloway D. et al. (2007) has also described, in addition to their “mutual discourse” model, a system that “constantly monitors the user and uses its own artificial intelligence to encourage participants’ interaction” (p. 333) or “adapts” the sequence to their more or less “conscious” expectations. Concerning serious games more broadly, although they do not all aim to be “documentaries”, those that feedback data (traces) implicitly claim to “document” their users. The temptation will then be for any spectator to consider the user-filmed recorded in this manner as the real rather than a mere part of a reality.

---

10 Experience feed-back from users of *SecretCAM handicap* particularly develops this point (Calvez, 2012)



## Reflexive Alternative

In order to distinguish serious games from direct realism and from realism in general, we will introduce to conclude a reflexive alternative that concerns both the user-spectator and the user-filmed. First, what is described above with the production modes now applies also to the user, who has become both the filmer and a spectator of a given world. Depending on how the representation and the interactions are made available by the designer, the users will more or less have the choice of exploring a reality in a critical manner, questioning their exploration approach and their own reflection of it. To make it easier, the designer can induce a reflexive mode by introducing counter-immersive elements throughout the game so as to maintain a distance between the user and the character-user for example (Allain & Szilas, 2012). Consequently, freedom of action is no longer an illusion; it stems from the space offered to the user to explore and think the object that is given to him (Copans, 2010). Although there is still an illusion that is due to realism, it is simultaneously perceived as such, with an appropriate distance.

Turning to the user-filmed issues now, the reflexive mode can be developed in two directions: learning or assessment. Concerning learning, it is related to the awareness of the spectator, a reduction in distance between the spectator space and the filmed space, what Pierron-Moinel (2010) refers to as “become-filmed”. *Chronicle of a Summer* illustrates well this reduction, and even goes so far as to superimpose spectator and filmed. With video games and serious games, the fact that user-spectators become aware of being the object of the captation is a major stake: although the retroactive loops described above are of interest as “transparent” processes to enable users to act within the game, they would be more “modern” if they enabled one to be one’s own spectator, to see oneself perform the actions and perceive the mediation. Thus, in between the short feedback loop and the longer postponed viewing loop, or debriefing, we propose to introduce an intermediate loop. Its function is no longer to merely translate transparently the users’ actions in the game, but to select these, to interpret them, to propose a “differed” analysis so that users may view themselves as a disruption and an external contribution. It is *via* this gap between played and played back (restituted) that users may in our opinion avoid the risk of self-referentiality and the illusion of realism. It is also thanks to the discrepancy introduced by the external source that learning will become possible, resulting in cognitive conflicts (Allain & Szilas, 2012). Kilborne (2010) noted that “documentaries offer spectators a space in which they can become involved, question themselves, become for themselves their own questions” (p. 4). To express this in the words used by Jacquinet-Delaunay (1984, p. 195) for documentary filmmaking, serious games must propose “a new way of thinking the world and of thinking oneself within it” (p. 195). Under these conditions, the users may become their own spectators, reflexive.

Concerning the second direction of the reflexive mode, we will focus on those serious games which objective is to assess their users, whether in the sense of assistance with decision-making for professional orientation with the CNAM<sup>11</sup> project *Jeu Serai* (2011, Wizarbox and Seaside Agency), or an aid to recruitment with *MISIVIAS* (2011, Dæsign, SBT and Arnava)<sup>12</sup>. Two strategies can then be adopted. The first considers that the actions carried out by the character-user are the user’s total reflection and that they can therefore be inferred in this manner – this is the principle of enunciative *mise en abyme* (Allain, 2013a). However,

---

11 S. Natkin, E. Guardiola, P. Vrignaud, D. Soriano, E. Loarer (2012), Du jeu utile au jeu sérieux: un exemple le projet JEU SERAI, Journal Hemes, La revue, vol. 62, pp. 85-92.

12 <http://www.gameclassification.com/FR/games/43510-MISIVIAS/index.html> [Accessed 126 May 2017]

as total reflexion is a fantasy where communication theories are concerned, this strategy requires knowledge of the deformations introduced by the set-up between the user and his partial reflection within the game, which represents a major challenge. The second strategy, initiated with *MISIVIAS* project, considers that it is not only the actions in the game that should be interpreted, but also their doubling with the users *via* the principle of an *acted mise en abyme* (Allain, 2013a). Concretely, assessing the managerial skills of a user-filmed will involve not only assessing the actions performed by the manager character with his virtual team, but also the managerial relationship that the user has with this character and the intentions that govern it. Thus, the documentary approach we promote must remind all actants in the serious game that mediation is at play, with its limitations and the perspectives that it opens up in terms of *mise en abyme* of the real, rather than a reproduction of it.

## CONCLUSION

The comparison of serious games and documentary filmmaking was facilitated by the semio-pragmatic approach, stressing the opportunity that the professional context offers to initiate documentarizing reading. We described a series of transpositions concerning not one but three chains of interaction, each composed of the traditional actants inherited from documentary filmmaking (filmed/filmer/spectator). A first straightforward analogy highlighted the principle of documentary diffusion, whereas the revisited analogy placed the emphasis on two senses of the captation (*by* and *of* the user). The model resulting from the articulation of these two analogies made it possible to clarify the sometimes multiple and recursive postures of actants in serious games. The distinction direct/indirect realism, stemming from filmmaking then allowed to situate current productions of serious games according to the intervention, claimed or not, of the designer and according to the attitude adopted by the users to explore a given world. Yet, whereas filmmakers have historically tended to control the technical aspects, to propose less and less “naïve” interactions with the world, to make the relationship to images mature and finally sign the modernity of cinema, current serious games globally propose direct and natural access to the real that places them in the category of obsolete production modes. Indeed, although straightforward analogy tends toward indirect realism, the first-hand experience has been underlined by the revisited analogy. As a counterpoint to realist production modes, a reflexive alternative has been proposed: although realism engages in a given world, reflexivity reminds that mediation is at work. Thus, looking to the historical and socio-cultural development of documentary filmmaking, our transpositions measure the path that remains ahead for serious games to acquire the characteristics of their own modernity. The techniques alone will not explain its emergence. As Pierron-Moinel (2010) explains for the cinema, “it will have taken the encounter between Rouch and Morin for this new conception of the cinema as a communication tool between men to arise” (p. 203). Finally, in response to Bradshaw, it remains to be known who will find again the humanistic art of the *griot français*<sup>13</sup>, unless the solution involves using a figure, an interactive one this time.

---

13 Nickname given to Rouch, according to Pénel (2007), which means in West Africa poet and communicator, considered as depositary of the oral tradition.

## REFERENCES

- Allain, S. (2013a). La mise en abyme actée, nouveau fer de lance du serious game. *Revue d'Interaction Homme-Machine*, 14(1). Retrieved from <http://europia.org/RIHM/V14N1.htm>
- Allain, S. (2013b). Questionnaires en série, interactions et potentiel narratif pour l'évaluation des pratiques. In *18e Congrès SFSIC "La contribution des SIC aux débats publics"*, May 30-31 and 1<sup>st</sup> June. Rennes: L'Harmattan.
- Allain, S. (2013c). *Serious game et perception du réel – Lecture documentarisante et potentiel cognitif*. Thesis, Universities of Geneva and Grenoble. Retrieved from <https://archive-ouverte.unige.ch/unige:30964>
- Allain, S., & Szilas, N. (2012). Exploration de la métalepse dans les "serious games" narratifs. *Revue Sticef*, 19. Retrieved from [http://sticef.univ-lemans.fr/num/vol2012/07-allain/sticef\\_2012\\_allain\\_07.htm](http://sticef.univ-lemans.fr/num/vol2012/07-allain/sticef_2012_allain_07.htm)
- Almeida, A., & Alvelos, H. (2010). An interactive documentary manifesto. In *Interactive Storytelling: third joint conference on interactive digital storytelling, ICIDS 2010, Edinburgh, UK, November 1-3, 2010, Proceedings*. Deutschland: Springer.
- Alvarez, J. (2007). *Du jeu vidéo au serious game, approches culturelle, pragmatique et formelle*. Thesis, University of Toulouse II et III.
- Bogost, I., & Poremba, C. (2008). Can games get real? A closer look at "documentary" digital games. In A. Jahn-Sudmann & R. Stockmann (Eds.), *Computer games as a sociocultural phenomenon: games without frontiers, wars without tears*. Palgrave Macmillan.
- Broudoux, E. (2012). Le documentaire élargi au web. *Les Enjeux de L'information et de La Communication*, 1–18.
- Calvez, F. (2012). Serious game "SecretCAM handicap". Billet 1 à 15. Retrieved December 15, 2016, from <http://cnam-numerique-pdl.typepad.fr/numerique/2012/11/serious-game-secretcam-handicap-pr%C3%A9ambule-au-retour-dexp%C3%A9rience.html>
- Chabert, G., Ibanez-Bueno, J., & Allain, S. (2010). Un partenariat Entreprise-Université-Hôpital autour des usages d'un "serious game." In L. Vieira, C. Lishou, & N. Akam (Eds.). Presented at the International Symposium EUTIC, november 25-26 2010, Dakar: Presses universitaires de Dakar.
- Choi, I. (2010). From tradition to emerging practice: A hybrid computational production model for Interactive Documentary. *Entertainment Computing*, 1(3-4), 105–117. <https://doi.org/10.1016/j.entcom.2010.03.001>
- Copans, R. (2010, November). *Le format comme outil professionnel. Peut-on créer un format ? Exemple avec la collection Architectures (Arte)*. Study day "Ce que le documentaire fait au format", Sorbonne Nouvelle, Paris.
- Dankert, H., & Wille, N. E. (2001). Constructing the concept of the "interactive 3D documentary" - Film, drama, narrative or simulation? *Virtual Interaction: Interaction in Virtual Inhabited 3D Worlds*, 345–370.
- Djaouti, D. (2011). *Serious game design: considérations théoriques et techniques sur la création de jeux vidéo à vocation utilitaire*. University Paul Sabatier (Toulouse). Retrieved from <http://www.sudoc.fr/162094507>
- Djaouti, D., Alvarez, J., Jessel, J. P., & Rampnoux, O. (2011). Origins of Serious Games. In *Serious games and edutainment applications* (pp. 25–43). Springer. Retrieved from [http://www.ludoscience.com/files/ressources/origins\\_of\\_serious\\_games.pdf](http://www.ludoscience.com/files/ressources/origins_of_serious_games.pdf)
- Fullerton, T. (2005). Documentary games: Putting the player in the path of history. In *Playing the Past Conference*. University of Florida, Gainesville. Retrieved from [http://tracyfullerton.com/assets/DocumentaryGames\\_fullerton.pdf](http://tracyfullerton.com/assets/DocumentaryGames_fullerton.pdf)

Galloway, D., McAlpine, K. B., & Harris, P. (2007). From Michael Moore to JFK reloaded: towards a working model of interactive documentary. *Journal of Media Practice*, 8(3), 325–339.

Gaudenzi, S. (2012). *Interactive Documentary: towards an aesthetic of the multiple*. Goldsmiths, Londres. Retrieved from <http://www.interactivedocumentary.net/about/me/>

Gifreu Castells, A. (2011). The Interactive Documentary. Definition Proposal and Basic Features of the New Emerging Genre. Spain: McLuhan Galaxy - Universitat Pompeu Fabra – Universitat Oberta de Catalunya. Retrieved from [http://www.academia.edu/1491044/The\\_Interactive\\_Documentary.\\_Definition\\_Proposal\\_and\\_Basic\\_Features\\_of\\_the\\_New\\_Emerging\\_Genre](http://www.academia.edu/1491044/The_Interactive_Documentary._Definition_Proposal_and_Basic_Features_of_the_New_Emerging_Genre)

Guynn, W. (2001). *Un cinéma de non-fiction : le documentaire classique à l'épreuve de la théorie*. (J.-L. Lioult, Trans.). Aix-en-Provence: Publications de l'Université de Provence.

Ibanez-Bueno, J., & Chabert, G. (2010). Serious game à l'hôpital : jeu et avatars pour la communication des cadres. Presented at the 17th Congress of the SFSIC, June 23-25 2010, Dijon.

Jacquinet-Delaunay, G. (1984). Le documentaire pédagogique ? In *Cinémas et réalités* (pp. 191–197). Saint-Étienne: University, CIEREC.

Kilborne, Y. (2008). *L'expérience documentaire. Approche communicationnelle du cinéma de réalité*. Paris 8.

Kilborne, Y. (2010). A la lisière du réel et au cœur des SIC. Presented at the 17th Congress of the SFSIC, June 23-25 2010, Dijon: SFSIC.

Leigh, A. (2012). Who will be the Michael Moore of serious games? Retrieved from [http://www.gamasutra.com/view/news/172739/Who\\_will\\_be\\_the\\_Michael\\_Moore\\_of\\_serious\\_games\\_.php](http://www.gamasutra.com/view/news/172739/Who_will_be_the_Michael_Moore_of_serious_games_.php)

Lioult, J.-L. (2004). *A l'enseigne du réel, penser le documentaire*. Aix-en-Provence: Publications de l'université de Provence.

Lugon, O. (2006). L'anonymat de l'auteur. In *Le statut de l'auteur dans l'image documentaire : signature du neutre* (pp. 6–14). Paris: Ed. du Jeu de Paume.

Meunier, J.-P., & Peraya, D. (2010). *Introduction aux théories de la communication* (3rd ed.). Bruxelles: De Boeck.

Nichols, B. (1991). *Representing reality: issues and concepts in documentary*. Indiana University Press.

Nichols, B. (2001). *Introduction to documentary*. Indiana University Press.

Niney, F. (2002). *L'Épreuve du réel à l'écran : essai sur le principe de réalité documentaire* (2nd ed.). Bruxelles: De Boeck Université.

Niney, F. (2009). *Le documentaire et ses faux-semblants*. Klincksieck.

Odin, R. (1983). Pour une sémio-pragmatique du cinéma. *Iris*, 1(1), 67–82.

Odin, R. (1984). Film documentaire, lecture documentaristante. In *Cinémas et réalités* (pp. 263–278). Saint-Étienne: CIEREC.

Odin, R. (2000). La question du public. Approche sémio-pragmatique. *Réseaux*, 18(99), 49–72.

Odin, R. (2011). *Les Espaces de communication : introduction à la sémio-pragmatique*. PUG.

Pierron-Moinel, M.-J. (2010). *Modernité et documentaires : une mise en cause de la représentation*. Paris: l'Harmattan.

Poremba, C. K. (2011). *Real, unreal: crafting actuality in the documentary videogame*. Concordia University. Retrieved from <http://spectrum.library.concordia.ca/15136/>

Raessens, J. (2006). Reality play: documentary computer games beyond fact and fiction. *Popular Communication*, 4(3), 213–224.

- Smith, R. (2009). *A history of Serious Games*. Presented at the I/ITSEC09, Orlando. Retrieved from <http://www.slideshare.net/roger.smith/a-history-of-serious-games>
- Ursu, M. F., Zsombori, V., Wyver, J., Conrad, L., Kegel, I., & Williams, D. (2009). Interactive documentaries: a golden age. *Computers in Entertainment (CIE)*, 7(3), 41.
- Zyda, M. (2005). From visual simulation to virtual reality to games. *Computer*, 38(9), 25–32.