Bridging the Gap between Game Designers and Cultural Institutions: a Typology to Analyse and Classify Cultural Pervasive Games

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Abstract

In the last fifteen years, pervasive games, i.e. games that blend a gameworld and reality were created most notably to promote movies, series or videogames. Chosen for their combination of assets, they prompted a deeper engagement in players especially in the institutional cultural sector. We aim to create conceptual and methodological tools to bridge the gap between designers and cultural institutions and help them reach mutual understanding. In this paper, we will describe our adaptation of an open-ended typology of games to the specific case of CPGs.

Keywords: pervasive games, cultural heritage, alternate reality games, typology of pervasive games, design of pervasive games

Résumé en français à la fin du texte

Introduction

Since 2008, each visitor of the Tower of London can play and help three characters and a polar bear in peculiar missions: evading the dreadful tower! To do so, (s)he needs to visit the tower with (her)his mobile phone and listen to old famous prisoners. Some of them, such as Anne Boleyn, could only give information about themselves, whereas others could ask the player to help them evade by repeating the events that led to their evasion.

These players experienced *Prisoner Escape From the Tower*, a pervasive game offering a cultural message, which actively engages participants, and enable them to discover and learn about English cultural heritage. Pervasive Games are sociotechnical apparatus that cultural institutions (e.g. museums, theatres, etc.) created following a *multimediatization* process, which means that multimedia technologies are employed to prompt new leisure and informal learning activities, in order to reach new audiences. In fact, due to the development of information technologies and to the *media convergence* process, cultural institutions have to take into account audience's expectations. Designing Cultural Pervasive Games expects to align visitors' expectations and cultural institutions' goals. This process raises several methodological questions, at the intersection of both Information and Communication Sciences and Sciences of Design fields.

This paper presents a methodological thinking to formally describe Cultural Pervasive Games. In the first part, we discuss the usage of multimedia technologies in cultural heritage sites and its objectives. Subsequently, we discuss the pervasiveness and other main features of pervasive game, in order to define the concept of Cultural Pervasive Games (CPG). In the third part, we put forward the typology of CPG we built over a large corpus. Finally, we discuss how our typology could be an intermediary and necessary step towards an ontology, which would help multimedia designers and cultural institutions to create CPG in heritage sites.

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Culture & IT in heritage sites

Cultural institutions have a most relevant mission for the education of citizens in the post-industrial society, in particular for the education of youth population (Pronovost, 2005). In fact, culture is not an individual creation but a system of representations, which are specific to a human community and shared among its members (Cuche, 1996; Moles, 1967). For this reason, several countries, especially in Europe, are used to deploy important financial and human means to prompt young people to learn and discover different forms of culture, especially those they are unfamiliar with (Hindmarsh *et al.*, 2001). For instance, in France the mission of national cultural institutions is to enable citizens to nurture their talent and creativity, to be trained in any kind of artistic discipline and to preserve cultural heritage.

To accomplish its mission, cultural institutions often commit artists and curators to create exhibits that stimulate any social interaction about, around and sometimes with artworks (Bannon & Bowers, 2001; Ciolfi & Bannon, 2002; Filippini-Fantoni, 2004; Heath, Luff, Lehn, Hindmarsh, & Cleverly, 2002; Hindmarsh *et al.*, 2001). In fact, social interaction is a key component of an audience's learning experience (Falk & Dierking, 2000; Heath, Lehn, Hindmarsh, Luff, & Cleverly, 2001; Laurillau & Paternò, 2004).

In this context, information and communication technologies have been employed to actively engage the members of the audience cooperating with each other, towards the media convergence process (Jenkins, 2006; Lambert, 2003). New forms of cultural learning experiences emerged (Kiefer, Matyas, & Schlieder, 2006; Michael *et al.*, 2010) aiming to present cultural heritage in a more appealing way while taking into account the social side of visiting.

Games have long been used in the cultural institutional sector. Indeed, many cultural institutions seek to exploit the commonly claimed potentialities of games such as flow or immersion (Brockmyer et al. 2009; Csikszentmihalyi & Csikszentmihalyi, 1992). Games with a purpose are broadly referred to as serious games. Clark Abt (1970) defined serious games as games mixing educational learning and informal learning and used as a complement to other pedagogical methods without limiting them to a specific medium/material. However, the expression "serious game" is commonly and broadly used to refer to video/computer-

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enhanced games which include a serious dimension: informational, persuasion, educational, advertisement, etc. At the same time, this modern definition "limits" these games to video games and extends the types of "serious" purposes (Alvarez & Djaouti, 2010 ; Alvarez *et al.*, 2007 ; Anderson *et al.*, 2010 ; Bellotti *et al.*, 2013 ; Mortara *et al.*, 2014 ; Zyda, 2005).

The serious purpose is conveyed in the content of the games. However, considering all serious games efficient only based on the content they include would be making an overly generalizing claim. An efficient serious game has not only to be a good pedagogical tool but also a good game (Mortara *et al.*, 2014 ; Suttie *et al.*, 2012 ; Zyda, 2005). Additionally, Bogost highlights that the potentiality of games to achieve a "serious" purpose not only relies on their content but also on their expressive persuasive power. In that context, persuasive games are games that exploit procedural rhetoric, persuasion through interactions and representations, in order to make a claim (Bogost, 2007, 2011). These approaches are not incompatible but complementary.

Nonetheless, if the serious/persuasive games expressions cover games created for a wide variety of media and platforms, including mixed-reality games or mobile games, they still set the focus on computers along their related technologies and functioning (Bogost, 2007 ; Anderson et al, 2010).

This paper addresses games with educational/informational purposes played in a cultural institutional context. Though computer-enhanced, these games focus on reality to the point that some seek to make these technologies transparent to the player. These games are also referred to as "pervasive cultural heritage serious games" (Coenen *et al.*, 2013). They are a part of what we call Cultural Pervasive Games.

Pervasive games: definition

To describe the pervasiveness of games instead of drawing a clear separation between pervasive and non-pervasive, Montola (2005, 2007) suggests that a game is pervasive if it corresponds with at least one of the following criteria: a) it is not played in a dedicated space (e.g. game board, field) but rather in the physical spaces of the player's ordinary life, such as

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streets or museums; b) its game sessions are blended in ordinary life; c) there is ambiguity between the identity of participants, both players and actors of the game, and non-participants.

According this position, pervasive games blend a gameworld into the ordinary life of the player, blurring the magic circle of a game (Montola 2005, 2007, 2011; Montola, Stenros, and Waern 2009). The expression magic circle refers to the playground, the social, spatial and temporal boundaries in which the game takes place (Huizinga, 1980; Salen and Zimmerman, 2003). In other words, a pervasive game represents the rupture or dissolution of the traditional boundaries of games, when its gameplay exploits pervasive computing technologies and blends virtual and reality (Hinske, Lampe, Magerkurth, & Röcker, 2007; Lankoski *et al.*, 2004; Montola, 2011; Nieuwdorp, 2007). McGonigal (2006) posits that "pervasive" implies breaking, blurring and moving the boundaries. In other words, a pervasive game would provide a more mobile and intermittent experience. In our view, we adopted Montola's perspective and we consider pervasive games can exploit various technologies including localization technologies such as GPS (Benford et al, 2006) and Infrared (Reid et al., 2008); client/server infrastructure and services counting networking technologies such as WIFI (Chalmers et al, 2004; Ballagas, Kuntze & Walz, 2007 ; Björk, Falk, Hansson & Ljungstranden, 2001);   web technologies (Benford *et al.*, 2006); mobile or augmented reality technologies (Schneider & Kortuem, 2001 ; Stenros, Montola, Waern, Jonsson, 2007), etc.

Pervasive games: main features

Pervasive Games have a main relevant feature: the ambiguity between reality and the gameworld due to the absence of firm delimitation between the "two" worlds. Ambiguity can be thrill-inducing and thus a source of interest, curiosity and amusement (Benford *et al.*, 2006; Dansey, 2008; Gaver, Beaver & Benford, 2003; McGonigal, 2003 ; Montola, 2007), and it can be exploited as a resource to generate social interaction, thoughts, questions and confusing the player involved in the game.

According to Gaver, Beaver and Benford (2003), there are three main types of ambiguity:

i)   ambiguity of information: it occurs when imprecise information is received, provoking speculations and requiring interpretations. For example, in *Uncle Roy*

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All Around You, players were asked to follow a person qualified only with vague information (e.g. color of a shirt or hair)

ii)   ambiguity of context : it occurs when an object or an element of the game is presented in a way that breaks its usage conventions. A non-game example of ambiguity of context are the *Modified Social Benches* of Danish artist Jeppe Hein. These benches generate confusion between the expected usage of a bench and the fact that they were designed specifically to be unusable this way. It stimulates interaction.

iii)   ambiguity of relationship : it exploits the player's relationship with an object or an element of the game. Gaver, Beaver and Benford mentioned the Telegotchi, "an electronic pet with no buttons" (Gaver, Beaver, and Benford 2003) supposed to be controlled with the user's psychic powers.

The interaction between these three types could impact significantly the efficiency of pervasive games in activities related to cultural heritage, and it could make some emergent features, such as apophenia and coincidence.

A. Apophenia and pareidolia

Ambiguity of information stimulates a natural optical phenomenon: pareidolia (McGonigal 2004). Pareidolia is a sort of perceptive illusion, a tendency to perceive as significant a meaningless stimulus. A typical example of pareidolia would be seeing the shape of a T-Rex playing saxophone in a cloud.

Dansey (2008) describes pareidolia as a visual form of apophenia without attributing to the latter term its common clinic connotation (as a development stage of schizophrenia). Apophenia therefore covers a wider area than the simple pareidolia. Indeed, it would qualify any tendency, in an individual, to attribute an incorrect meaning to a coincidental event. In other words, apophenia is the phenomenon in which "a sense is given to nonsense" (Dansey 2008). In pervasive games, apophenia would inspire a player to interpret a coincidental event as a game event (McGonigal, 2004; Dansey, 2008).

McGonigal (2006) describes a case of apophenia in a *Go Game* session. One of the team found, during their game, a pile of materials (e.g. pieces of metal or old furniture) next to a

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sign stating "Assembly required". Thinking that this was part of the game, the team members spent 20 minutes to build a chair with these materials. A few minutes after, one the game plants approached the group (McGonigal, 2006).

Not only these players interpreted as a game event something that was totally unrelated (apophenia) but the coincidental approach of the game plant at this very moment (he was actually patrolling in the area) highlights another phenomenon: coincidence.

B. Coincidence

The "happy coincidence" (Reid, 2008) is a 'magic' moment when the overall context is favourable and fills the gap between the real world and the game world. According to Reid (2008), three types of coincidence can occur:

 i) natural coincidence, when natural events and game events are linked in some way, as when, for example, a thunder resonates in the real world while a player is getting described a tragic event happening during a thunderstorm ;

 ii) social coincidence, which occurs when a player shares a game event with another while considering it is fortuitous ;

 iii) feigned coincidence, when actors or game elements are exploited to bring events that are interpreted as coincidences .

Coincidences make the place where the game is orchestrated more meaningful to the players, thus generating a sensation of connection to the place or historical site (Reid 2008). Coincidences could be also interpreted as a message to the players, inviting them to look beyond appearances and to search for potential game hints in the real world (McGonigal 2003; McGonigal 2006), in particular in games created to make heritage sites more appealing, engaging and thrilling (Bellotti, Ferretti, and De Gloria 2005; Reid 2008), like the Cultural Pervasive Games.

Cultural Pervasive Games (CPGs): definition and features

In our view, CPGs are created in a specific purpose: forming an educational interface between the public and the artworks most notably to support a cultural event, provide some alternative tours and enhanced visits, promote the historical cultural heritage or change the image of a cultural institution. Cultural pervasive games, in the same way than videogames or

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traditional games, require a precise vocabulary to describe their structure and mechanisms, such as time, space and social interactions between players.

Gentes *et al.* (2010) point out that, for a CPG located in an urban setting, it is insufficient to consider the space as the geometrical organization (Gentes, Guyot-Mbodji, and Demeure 2010). They expand this concept to four anthropological dimensions: the real-world physical organization, the narrative world as well as the service and the events within the city.

Zagal and Mateas (2007) studied the temporality in video games and identified four temporal frames: the fictive time, the coordination time, the real-world time and the gameworld time. Several temporal frames could interact with each other in a particular game (Zagal and Mateas 2007).

We analyzed 12 CPGs orchestrated or launched between 2007 and 2012 in Europe or North America. We only retained CPGs that met 2 criteria: a) created by cultural institutions or to valorize a heritage site b) with enough information accessible to feed the analysis. These CPGs were created for various purposes we could group in 3 categories (table 1).

The first category concerns CPGs aimed at promoting a cultural event (e.g. festival, conference). The game is commonly played before or during the related event. Their narrative is also related to the theme of the event. For example, in 2011, the game [In]visible Belfast was created to prompt publics to participate to the Belfast Book Festival. The story was revolved around a famous Irish writer: Ciaran Carson.

The second category concerns CPGs aiming to offer new ways to visit cultural heritage sites for example to reach new publics. The narrative aspect of these games is not always History compliant but seek to stimulate a longer, more attentive or participative visit.

In the third category, we grouped CPGs aimed at giving publics, especially the youth, a more modern, friendly image of cultural institutions and their related practices.

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	Category	Cultural Pervasive Game	Year
1	Promote an event	Eduque le Troll, Centre Georges Pompidou, (France)	2012
2		Cherche Tom dans la Nuit, European Night of Museums, (France)	2011
3		[In]visible Belfast, Belfast Book Festival, (Ireland)	2011
4	Offer new ways to visit a	Prisoner Escape From the Tower, Tower of London, (UK)	2008
5	cultural site or museum	The Giskin Anomaly, Balboa Park, (USA)	2007
6		« RExplorer », Regensburg (Germany)	2007
7		PLUG, Musée des Arts et des Métiers, (France)	2009
8		The Miracle Mile Paradox, Miracle Mile area, (USA)	2012
9		Ghosts of a Chance, Smithsonian American Art Museum, (USA)	2008
10	Change the image of a	The Mystery Guest, Bibliothèque Finksburg du comté Carroll, (USA)	2010
11	cultural institution before	Find Chesia, Finksburg Library of Carroll County, (USA)	2009
12	public's eyes	Blood on the stacks, Bibliothèque Coates, (USA)	2007

Table 1 - Corpus of CPGs

The analysis of the games suggests that players cooperate and sometimes form teams instead of competing against each other. This is also the case in games that were not requiring collaboration or cooperation to be finished such as *Cherche Tom dans la Nuit* in which players helped beginners to solve puzzles. In other games, such as *Eduque le troll*, a form of competition or emulation was present due to the limited amount of prizes given to the first players to finish the game. Social interaction patterns set by the game designers stimulated these behaviors (Dena, 2008).

When games support these activities, players most gladly engage themselves in activities of active discovery with strong motivation (Bellotti *et al.*, 2005; Reid, 2008). For example in *Vanished*, children explored topics with scientific method and experiences. It lead players to be active and satisfied in relation to their underlying longing of activity (Davallon, Gottesdiener, & Le Marec, 1999; Fourmentraux, 2006 , Lambert, 2003), most notably concerning creation and co-creation of cultural objects such as in *Ghosts of a Chance* or *Pheon*.

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Relevance of a typology of games

Starting from earlier works (Aarseth, Smedstad Solveig & Sunnanå, 2003), Elverdam and Aarseth (2007) make their proposal about an open-ended multi-dimensional game classification model, which contains 17 dimensions grouped in 8 meta-categories: Virtual Space, Physical Space, External Time, Internal Time, Player Composition, Player Relation, Struggle and Game State. By open-ended, the authors meant that "individual dimensions can be modified, added, or rejected without compromising the integrity of the model as a whole" (Elverdam and Aarseth 2007). This typology is not limited to videogames but describes games as varied as Chess, Volleyball or World of Warcraft.

Zagal *et al.* proposed the "Game Ontology Project" (GOP) to describe, analyze and study games. Their purpose was to create a hierarchically structured evolutive framework adapted to a wide range of games (Zagal *et al.*, 2005). All the entities of the ontology ensue from one of the five main elements: interface, rules, goals, entities, and entity manipulation. Zagal and Bruckmann (2008) used this ontology as a learning tool for game design students. On one hand, their purpose was to invite students to engage themselves in activities linked to the research in their field thus "allowing students to meaningfully participate in authentic practices that contribute to a larger body of knowledge" (Zagal & Bruckmann, 2008). Students were then asked to enrich the existing ontology with examples of games. On the other hand, the authors wanted to "help students learn and develop a critical vocabulary for talking about games" (Zagal and Bruckman 2008) thus using the ontology as a learning tool.

In the field of game studies, many authors reflected upon the lack of unified, critical and precise vocabulary to describe games and their structure (Church, 1999; Elverdam & Aarseth, 2007; Zagal & Bruckman, 2008; Zagal, Mateas, Fernández-vara, Hochhalter, & Lichti, 2005). They also mention the need to develop design tools such as typologies or taxonomies (Bailey, 1994) in order to help cultural actors and designers to create CPGs (Elverdam & Aarseth, 2007; Zagal *et al.*, 2005).

This lack of tools doesn't only have theoretical effects but also professional effects. For example Zagal and Bruckman (2008) asked college students taking game classes to participate in an exercise of formal description of video games to complete an ontology of

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games. Future professionals of the field, familiar with games, yet faced difficulties to describe games and lack vocabulary to do so. Participating in the ontology development and thus working with a tool composed of strict semantic categories had positive learning outcomes in terms of vocabulary (Zagal & Bruckman, 2008). In a transdisciplinary professional context, it is highly likely that the same difficulties will be met or be heightened between groups of different specialties.

Our typology of cultural pervasive games

We adapted Elverdam and Aarseth's work (2007) to the particular case of the CPGs and we created our typology (fig.1). Its open-ended nature, completeness and precision were undeniable assets. Due to the pervasive nature of CPGs and their blending with reality, we have rejected some categories in Elverdam and Aarseth's work (2007), such as the "Game State" meta-category, we added some other categories (green colour in Fig.1) and we modified some existing dimensions (orange colour in Fig. 1). In this section, we describe our proposal.
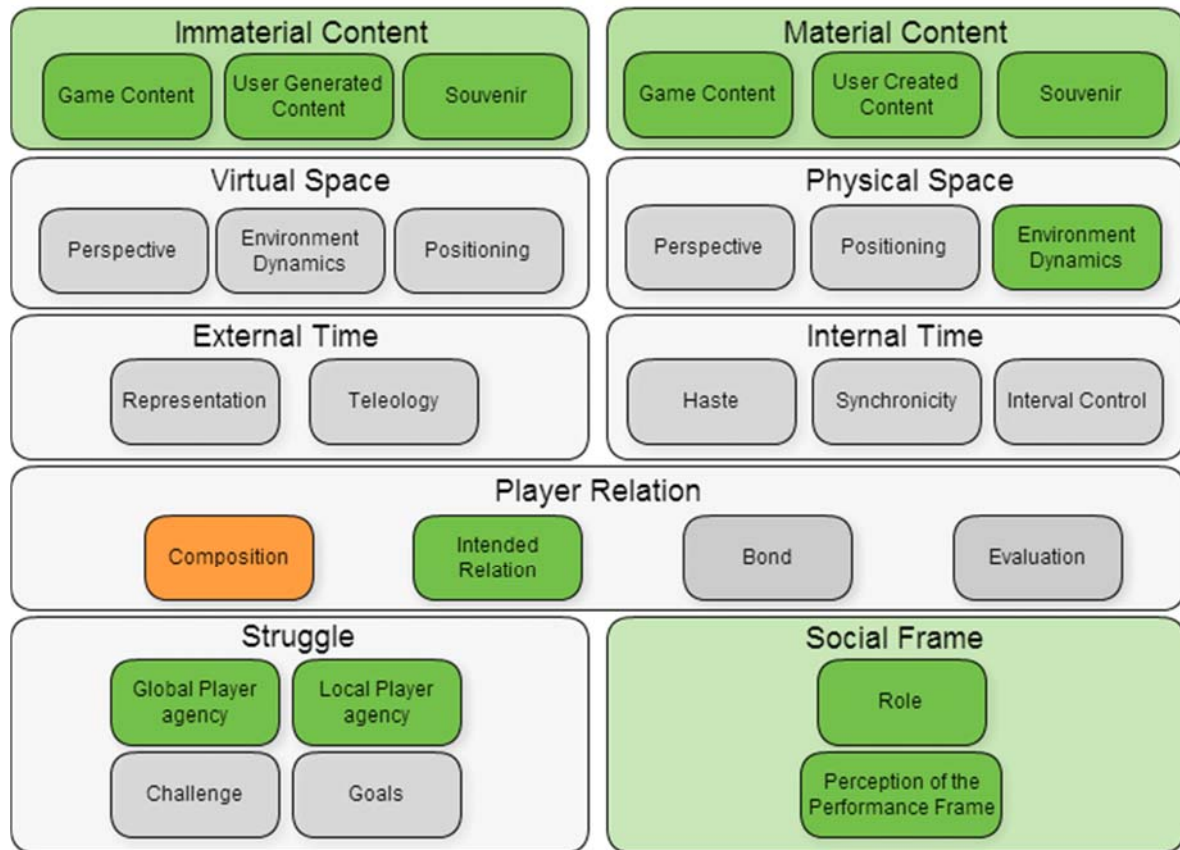
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Figure 1 - Our typology of Cultural Pervasive Games

Added meta-category: Immaterial/Material Contents

Two new meta-categories have been created to describe the narrative content of the game. As pervasive games occur both in reality and in a gameworld, we called the new meta-categories "Immaterial Content" and "Material Content". They both contain three dimensions, each dimension of a meta-category mirroring a dimension in the "twin" category.

The dimension "Game Content" describes the kind of material/physical or immaterial/virtual content included in the game. It contains 4 values:

    i)   existing (when the game exploits pre-existing content),

    ii)   specific (when the content of the game was created specifically for the game),

    iii)   both (when the game exploits both pre-existing and specifically made content) and

    iv)   none (when the game exploits no content of this type).

For instance, the immaterial content of *Prisoner Escape from the Tower* or *RExplorer* were created specifically for the game (Reid *et al.*, 2008) while *Cherche Tom dans la Nuit* exploited both pre-existing and specific immaterial content.

The dimension "User Content" describes the type of immaterial or physical content that was allowed/encouraged from the players. It contains 4 values:

    i)   game requirements (players are required to send/create content as part of the game such as a photo or a sculpture),

    ii)   player's initiative (players generate content on their own volition such as a game wiki created to help other players to follow the plot of the game),

    iii)   both and

    iv)   none (the players are not allowed/encouraged to create content either physical or virtual).

Added meta-category: Social Frame

We added the "Social Frame" meta-category to represent the social extension of the magic circle of play. It includes two dimensions: "Perception of the Performance Frame" and "Role". The "role" describes the kind of role the player performs, according to Van Ments' works (1999). Its values can be:

    i)   none (the player acts as himself/herself),

    ii)   existing/historical role (the player acts as a real person),

    iii)   player-created role (the player acts as an imaginary person and creates this imaginary person).

The "Perception of the Performance Frame" dimension describes how the magic circle of play is socially extended. Benford *et al.* (2006) describe two different strategies. The first strategy makes the apparent frame of the performance, the gameworld appear wider than it actually is. The aim is to give players the illusion of a game in which bystanders are involved (Benford *et al.*, 2006). Thus, individuals who stand totally outside the social frame are perceived as implied performers. The second strategy makes the social frame perceived as narrower than it actually is. Dissimilar to the first case, it makes performers be perceived as implied bystanders. These two strategies also include objects or spaces (Benford *et al.*, 2006).

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We added a third value for this dimension: "Identical". This value describes a game in which the perceived social limits and the actual limits are the same. In this kind of games, there is no social ambiguity about players, performers and bystanders. Games like PLUG fall in this category. PLUG was staged at the "Musée des Arts et des Métiers" and was a card-collecting game in which each card represented an artwork.

Added dimensions: Environment Dynamics in the Physical Space

In pervasive games, both the physical space and virtual space are exploited and the player has the ability to do things "for real" (Montola, 2007) meaning that she can actually produces changes in her environment. To describe this ability, we chose to add a new dimension in the "Physical Space" meta-category named "Environment Dynamics". It mirrors the "Environment Dynamics" dimension within the "Virtual Space" meta-category.

Given that the potential changes made in the player's environment can't be totally free, this dimension can only take two values: None and Fixed. Games such as *RExplorer* and *Prisoner Escape from the Tower* have no environment dynamics. Indeed, the game designers did not allow the players to make any change to the town of Regensburg or the Tower of London. In *Ghosts of a Chance*, players collectively created the artworks displayed in a temporary exhibition of the Smithsonian Museum of American Art.

Added dimensions: Player Agency in Struggle

In the "Struggle" meta-category, we added two dimensions in the "Player Agency": "Global Player Agency" and "Local Player Agency". Both contain two values: Absent and Present. We consider that Local Player Agency is present when players' actions have immediate results on the sequence of events of the game. Global Player Agency is present when players' actions have consequences in the long-term period (Mateas & Stern, 2005).

Discussion

Our extended typology enables designers to describe three possible extensions of the boundaries of the game: social expansion, spatial expansion and temporal expansion. It contains 27 dimensions (for a total of 84 values) grouped in 9 meta-categories.

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Zagal and Mateas (2007) distinguish the gameworld time (i.e. time spent in the gameworld) and the fictive time (i.e. players' expectations about the representation of time in the game). This distinction is particularly relevant in the case of historical CPGs. However, their "Gameworld time" roughly corresponds to Elverdam & Aarseth's "Internal Time". Moreover, the time representation of "Fictive Time" is actually addressed in the "Representation Dimension" in "External Time". Though, we preferred keeping Elversam and Aarseth's terminology because it would seem more appropriate to describe the "real-world History" in the "External Time" meta-category.

Elverdam and Aarseth (2007) observed that one perspective of their typology model was to enable researchers to determine the game design patterns responsible of the success of those games played by a specific group of players. In the same way, it could be used for the reverse approach to ask the question: which patterns could a designer implement in order to reach a particular objective among the aforementioned group of players? The answer to this question requires that both a wide-ranging list of patterns as well as a list of classified games exist and are maintained. Björk and Holopainen (2005) worked on the first aforementioned list.

Elverdam and Aarseth also made an analogy between their work and language. They compared their typology to a grammar of the language of games while game design patterns are the language itself. Following this analogy, an ontology could serve as a grammar in this language. We therefore aim to develop, in further works, an ontology of pervasive games, especially CPGs. Gruber (1993) defines the concept as a "specification of a conceptualization" (Gruber, 1993). Borst (1997) highlights several key characteristics of such a project. For this author, an ontology is a "formal, explicit specification of a shared conceptualization" (Borst, 1997). An ontology is a vocabulary about a specific domain, hierarchically structured and including a set of relationships, constraints and rules defining this vocabulary (Breslin, Passant, and Decker 2009; Szilagyi 2014). An ontology must fulfil three different commitments: "a semantic commitment which sets the linguistic meaning of the concepts described in the ontology, a ontological commitment which sets their formal meaning and a computational commitment which determines their actual exploitation" (Bachimont, 2000). Various technologies and standards exist to represent information and knowledge such as

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KL-ONE, DOGMA or OWL (Web Ontology Language). Our ontology of Cultural Pervasive Games will exploit the latter.

The next step will be to integrate works conducted on ontologies and culture (Blanchard, Mizoguchi, & Lajoie, 2010) to include knowledge about the cultural context of these games. Finally, this will enable us to build a knowledge base we will exploit in a web-based application for the conception of Cultural Pervasive Games.

Conclusion

Information and Communication technologies offer a constant challenge to cultural institutions and designers who work with these. Technology literate publics have important expectations related to contents or interactivity offered while institutions have mostly educational and informational objectives. In that context, the concept of Cultural Pervasive Game, influenced by the pervasive computing paradigm and by the media convergence process, would seem to be a suitable answer to both of them.

Our contribution aimed to define Cultural Pervasive Games both on the intentional and extensional plans. To support our work, we analysed a selection of Cultural Pervasive Games. It enabled us to adapt a typology to the specific case of CPGs. The typology has both a descriptive and taxonomic value. As such, it represents a necessary step to identify and classify characteristics of Cultural Pervasive Games. The next step will be to create a methodological tool to support the conception of CPGs which requires cooperation between game designers and cultural institutions in order to balance efficiently the gaming and pedagogical aspects of these games.   In the game studies domain, many authors noticed the lack of such tools (Bailey, 1994 ; Church, 1999; Elverdam & Aarseth, 2007; Zagal, Mateas, Fernández-vara, Hochhalter, & Lichti, 2005), and highlighted the necessity to develop methodological tools for the conception of games (Elverdam *et al.*, 2007; Zagal *et al.*, 2005). Others showed the repercussions of this lack, including on future professionals of the field (Zagal & Bruckman, 2008).

Our next step will concern the validation of the predictive level of our typology. It will enable us to create an ontology and a knowledge base of Cultural Pervasive Games exploited in an

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application aimed to help both designers and cultural institutions in the process of conception of these games.

Works cited

AARSETH, E., SMEDSTAD SOLVEIG, M., & SSUNNANA, L. (2003). "A multidimensional typology of games", In *Level Up Conference Proceedings*. University of Utrecht. Retrieved from http://www.digra.org/wp-content/uploads/digital-library/05163.52481.pdf

ABT, C. C. (1970). *Serious games*. Viking Press New York.

ALVAREZ, J., & DJAOUTI, D. (2010). *Introduction au Serious Game* (Questions Théoriques). Retrieved from http://www.questions-theoriques.com/produit/2/9782917131084/Introduction%20au%20Serious%20game

ALVAREZ, J., RAMPNOUX, O., JESSEL, J.-P., & METHEL, G. (2007). "Serious Game: just a question of posture?" In *Artificial and Ambient Intelligence convention (Artificial Societies for Ambient Intelligence) (AISB (ASAMi)), Newcastle upon Tyne, UK, 02/04/2007-04/04/2007* (pp. 420–426).

ANDERSON, E., McLOUGHLIN, L., LIAROKAPIS, F., PETERS, C., PETRIDIS, P., & de FREITAS, S. (2010). "Developing serious games for cultural heritage: a state-of-the-art review". *Virtual Reality*, *14*(4), 255–275. http://doi.org/10.1007/s10055-010-0177-3

BACHIMONT, B. (2000). Engagement sémantique et engagement ontologique : conception et réalisation d'ontologies en Ingénierie des connaissances. In *Ingénierie des connaissances, évolutions récentes et nouveaux défis* (Eyrolles). Paris: J. Charlet, M. Zacklad, G. Kassel & D. Bourigault.

BAILEY, K. D. (1994). *Typologies and Taxonomies: An Introduction to Classification Techniques*. SAGE Publications. Retrieved from http://books.google.fr/books?id=1TaYulGjhLYC

BALLAGAS, R. A., KRATZ, S. G., BORCHERS, J., YU, E., WALZ, S. P., FUHR, C. O., TANN, M. (2007). "REXplorer: A Mobile, Pervasive Spell-casting Game for Tourists". In *CHI '07 Extended Abstracts on Human Factors in Computing Systems* (pp. 1929–1934). New York, NY, USA: ACM. http://doi.org/10.1145/1240866.1240927

_____ 145
Kinephanos, ISSN 1916-985X
Exploring the Frontiers of Digital Gaming: Traditional Games, Expressive Games, Pervasive Games, special issue, April 2016
www.kinephanos.ca

BANNON, L., & BOWERS, J. (2001). *Report On Start- up Workshop for "SAFE" Project. Introduction* (Rapport de Workshop No. CID-183, SHAPE IST 2000-26069 Workpackage 4 Deliverable D 4.1). Retrieved from http://cid.nada.kth.se/pdf/CID-183.pdf

BELLOTTI, F., BERTA, R., De GLORIA, A., D'URSI, A., & FIORE, V. (2013). A Serious Game Model for Cultural Heritage. *J. Comput. Cult. Herit.*, *5*(4), 17:1–17:27. http://doi.org/10.1145/2399180.2399185

BELLOTTI, F., FERRETTI, E., & De GLORIA, A. (2005). Discovering the european heritage through the chikho educational web game. In *Proceedings of the First international conference on Intelligent Technologies for Interactive Entertainment* (pp. 13–22). Berlin, Heidelberg: Springer-Verlag. http://doi.org/10.1007/11590323_2

BENFORD, S., CRABTREE, A., REEVES, S., SHERIDAN, J., DIX, A., FLINTHAM, M., & DROZD, A. (2006). "The Frame of the Game: Blurring the Boundary between Fiction and Reality in Mobile Experiences". In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 427–436). Montréal, Québec, Canada: ACM. http://doi.org/10.1145/1124772.1124836

BENFORD, S., MAGERKURTH, C., & LJUNGSTRAND, P. (2005). "Bridging the physical and digital in pervasive gaming". *Commun. ACM*, *48*(3), 54–57. http://doi.org/10.1145/1047671.1047704

BJÖRK, S., FALK, J., HANSSON, R., & LJUNGSTRAND, P. (2001). "Pirates! Using the physical world as a game board". In *IN PROCEEDINGS OF INTERACT 2001* (pp. 9–13). Japon: IOS Press.

BJÖRK, S., & HOLOPAINEN, J. (2005). *Patterns in Game Design*. Charles River Media. Retrieved from http://books.google.fr/books?id=IFQfyODK4wAC

BJÖRK, S., & HOLOPAINEN, J. (2009). *Gameplay design patterns collection*. Retrieved from http://129.16.157.67:1337/mediawiki-1.22.0/index.php/Main_Page

BLANCHARD, E. G., MIZOGUCHI, R., & LAJOIE, S. P. (2010). "Structuring the Cultural Domain with an Upper Ontology of Culture". In *Handbook of Research on Culturally Aware Information Technology: Perspectives and Models* (Information Science Publishing). E.G. Blanchard and D. Allard. Retrieved from http://dx.doi.org/10.1007/978-3-642-02580-8_63

BOGOST, I. (2007). *Persuasive Games: The Expressive Power of Videogames*. The MIT Press. Retrieved from http://www.worldcat.org/isbn/0262026147

BOGOST, I. (2011). *How to do things with videogames*. Minneapolis: University of Minnesota Press.

BORST, W. N. (1997, September). *Construction of Engineering Ontologies for Knowledge Sharing and Reuse*. Universiteit Twente, Enschede. Retrieved from http://doc.utwente.nl/17864/

BRESLIN, J. G., PASSANT, A., & DECKER, S. (2009). *The Social Semantic Web* (1st ed.). Springer Publishing Company, Incorporated.

BROCKMYER, J. H., FOX, C. M., CURTISS, K. A., McBROOM, E., BURKHART, K. M., & PIDRUZNY, J. N. (2009). "The development of the Game Engagement Questionnaire : A measure of engagement in video game-playing". *Journal of Experimental Social Psychology*, *45*(4), 624–634. http://doi.org/10.1016/j.jesp.2009.02.016

CAILLOIS, R. (1958). *Les jeux et les hommes*. Gallimard. Retrieved from http://books.google.fr/books?id=bQhmAAAAMAAJ

CHALMERS, M., BELL, M., BROWN, B., HALL, M., SHERWOOD, S., & TENNENT, P. (2005). "Gaming on the edge: using seams in ubicomp games". In *Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology* (pp. 306–309). New York, NY, USA: ACM. http://doi.org/10.1145/1178477.1178533

CHURCH, D. (1999). "Formal Abstract Design Tools". *Game Developer*, *3*, 28.

CIOLFI, L., & BANNON, L. (2002). "Designing Interactive Museum Exhibits : Enhancing visitor curiosity through augmented artefacts". In *Proceedings of ECCE11*. Catania (Italy).

COENEN, T., MOSTMANS, L., & NAESSENS, K. (2013). MuseUs: Case Study of a Pervasive Cultural Heritage Serious Game. *J. Comput. Cult. Herit.*, *6*(2), 8:1–8:19. http://doi.org/10.1145/2460376.2460379

CSIKSZENTMIHAKYI, M., & CSIKSZENTMIHAKYI, I. S. (1992). *Optimal Experience: Psychological Studies of Flow in Consciousness*. Cambridge University Press. Retrieved from http://books.google.fr/books?id=lNt6bdfoyxQC

CUCHE, D. (1996). *La notion de culture dans les sciences sociales* (3ème ed.). La Découverte.

DANSEY, N. (2008). "Facilitating apophenia to augment the experience of pervasive LARPs". In *Breaking the Magic Circle Seminar*. Finlande. Retrieved from http://eprints.port.ac.uk/4724/

_____ 147

Kinephanos, ISSN 1916-985X

Exploring the Frontiers of Digital Gaming: Traditional Games, Expressive Games, Pervasive Games, special issue, April 2016

www.kinephanos.ca

DAVALLON, J., GOTTESDIENER, H., & Le MAREC, J. (1999). "Les cédéroms de musées, vers de nouveaux rapports du public aux œuvres ?". In *Arts et multimédia: l'oeuvre d'art et sa reproduction à l'ère des médias interactifs* (Vol. 2 de Esthétique, pp. 135–148). Paris: Publications de la Sorbonne.

DENA, C. (2008, March 13). "Social Interaction Patterns in Alternate Reality Games v0.1", Retrieved from http://www.christydena.com/Primer/ARGDashboard_Interaction.html

ELVERDAM, C., & AARSETH, E. (2007). "Game Classification and Game Design: Construction Through Critical Analysis". *Games and Culture*, *2*(1), 3–22. http://doi.org/10.1177/1555412006286892

FALK, J. H., & DIERKING, L. D. (2000). *Learning from Museums: Visitor Experiences and the Making of Meaning*. AltaMira Press. Retrieved from http://books.google.fr/books?id=ar1WgzGgj8YC

FILIPPINI-FANTONI, S. (2004). "La personnalisation : une nouvelle stratégie de médiation culturelle pour les musées". *MEI. Media et information*, *MÉDIATIONS & MÉDIATEURS*(n°19), pp. 211–214.

FOURMENTRAUX, J.-P. (2006). "Les dispositifs du net art entre configuration technique et cadreage social de l'interaction". *Techniques et Culture*, (n°47). Retrieved from http://archivesic.ccsd.cnrs.fr/sic_00109109

GAVER, W. W., BEAVER, J., & BENFORDd, S. (2003). "Ambiguity as a resource for design". In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 233–240). Ft. Lauderdale, Florida, USA: ACM. http://doi.org/10.1145/642611.642653

GENTES, A., GUYOT-MBODJI, A., & DEMEURE, I. (2010). Gaming on the move: urban experience as a new paradigm for mobile pervasive game design. *Multimedia Systems*, *16*(1), 43–55. http://doi.org/10.1007/s00530-009-0172-2

GRUBER, T. R. (1993). "A Translation Approach to Portable Ontology Specifications". *Knowl. Acquis.*, *5*(2), 199–220. http://doi.org/10.1006/knac.1993.1008

HEATH, C., LEHN, D. V., HINDMARSH, J., LUFF, P., & CLEVERLY, J. (2001). *Crafting Participation Interaction with and around artistic, mixed media artefacts* (No. IST Project 2606).

HEATH, C., LUFF, P., LEHN, D. V., HINDMARSH, J., & CLEVERLY, J. (2002). Crafting participation: designing ecologies, configuring experience.

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_____
Kinephanos, ISSN 1916-985X
Exploring the Frontiers of Digital Gaming: Traditional Games, Expressive Games, Pervasive Games, special issue, April 2016
www.kinephanos.ca

HINDMARSH, J., HEATH, C., LEHN, D. V., CIOLFI, L., HALL, T., & BANNON, L. (2001). *Social Interaction in Museums and Galleries* (No. DC Project 26069).

HINSKE, S., LAMPE, M., MAGERKURTH, C., & RÖCKER, C. (2007). "Classifying pervasive games: on pervasive computing and mixed reality". *Concepts and Technologies for Pervasive Games-A Reader for Pervasive Gaming Research*, *1*, 20.

HUIZINGA, J. (1980). *Homo ludens: a study of the play-element in culture*. Routledge & K. Paul. Retrieved from http://books.google.ca/books?id=2QpmAAAAMAAJ

JENKINS, H. (2006). *Convergence culture: where old and new media collide*. New York, NY, USA: NYU Press. Retrieved from http://www.amazon.com/Convergence-Culture-Where-Media-Collide/dp/0814742815

KIEFER, P., MATYAS, S., & SCHLIEDER, C. (2006). "Learning about cultural heritage by playing geogames". In *Proceedings of the 5th international conference on Entertainment Computing* (pp. 217–228). Berlin, Heidelberg: Springer-Verlag. http://doi.org/10.1007/11872320_26

LAMBERT, E. (2003). "Multimédia et médiation culturelle: Récréation, re-création de(s) sens ?" *MEI. Media et information*, *JEUX, MEDIAS, SAVOIRS*(n°18), pp. 181–190.

LANKOSKI, P., HELIÖ, S., NUMMELA, J., LAHTI, J., MÄYRÄ, F., & ERMI, L. (2004). "A case study in pervasive game design: the songs of north". In *Proceedings of the third Nordic conference on Human-computer interaction* (pp. 413–416). New York, NY, USA: ACM. http://doi.org/10.1145/1028014.1028083

LAURILLAU, Y., & PATERNO, F. (2004). CoCicero: Un Système Interactif Pour La Visite Collaborative De Musée Sur Support Mobile. In *Proceedings of the 16th Conference on Association Francophone D'Interaction Homme-Machine* (pp. 101–108). New York, NY, USA: ACM. http://doi.org/10.1145/1148613.1148628

MATEAS, M., & STERN, A. (2005). "Build It to Understand It: Ludology Meets Narratology in Game Design Space". In *Proceedings of DiGRA 2005 Conference: Changing Views – Worlds in Play*.

McGONIGAL, J. (2003). "A Real Little Game: The Pinocchio Effect in Pervasive Play". In *DIGRA Conf. '03*. Pays-Bas. Retrieved from http://dblp.uni-trier.de

McGONIGAL, J. (2004, April). *Play or Else - A performance studies approach to ubiquitous gaming*. Ph.D. Qualifying Lecture, Department of Performance Studies / Center for New Media University of California at Berkeley, USA.

McGONIGAL, J. (2006). *This Might Be a Game: Ubiquitous Play and Performance at the Turn of the Twenty-First Century*. University of California, Berkeley. Retrieved from http://avantgame.com/McGonigal_THIS_MIGHT_BE_A_GAME_sm.pdf

MICHAEL, D., PELEKANOS, N., CHRYSANTHOU, I., ZAHARIAS, P., HADJIGAVRIEL, L. L., & CHRYSANTHOU, Y. (2010). "Comparative study of interactive systems in a Museum". In *Proceedings of the Third international conference on Digital heritage* (pp. 250–261). Berlin, Heidelberg: Springer-Verlag. Retrieved from http://dl.acm.org/citation.cfm?id=1939603.1939626

MINISTÈRE DE LA CULTURE, (1982). Décret n° 82-394 du 10 mai 1982.

MOLES, A. (1967). *Sociodynamique de la culture*. Mouton Paris - La Haye.

MONTOLA, M. (2005). "Exploring the Edge of the Magic Circle: Defining Pervasive Games". In *CD-ROM Proceedings of Digital Arts and Culture. Copenhagen* (pp. 1–4). Danemark.

MONTOLA, M. (2007). "Tangible Pleasures of Pervasive Role-Playing". In B. Akira (Ed.), *Situated Play: Proceedings of the 2007 Digital Games Research Association Conference* (pp. 178–185). Tokyo: The University of Tokyo. Retrieved from http://www.digra.org/dl/display_html?chid=07312.38125.pdf

MONTOLA, M. (2011). "A ludological view on the pervasive mixed-reality game research paradigm". *Personal Ubiquitous Comput.*, *15*(1), 3–12. http://doi.org/10.1007/s00779-010-0307-7

MONTOLA, M., STENROS, J., & WAERN, A. (2009). "Philosophies and strategies of pervasive larp design". *Larp, the Universe and Everything*, 197–222.

MORTARA, M., CATALANO, C. E., BELLOTTI, F., FIUCCI, G., HOURY-PANCHETTI, M., & PETRIDIS, P. (2014). "Learning cultural heritage by serious games". *Journal of Cultural Heritage*, *15*(3), 318 – 325. http://doi.org/http://dx.doi.org/10.1016/j.culher.2013.04.004

NIEUWDORP, E. (2007). "The pervasive discourse: an analysis". *Comput. Entertain.*, *5*(2). http://doi.org/10.1145/1279540.1279553

150
_____
Kinephanos, ISSN 1916-985X
Exploring the Frontiers of Digital Gaming: Traditional Games, Expressive Games, Pervasive Games, special issue, April 2016
www.kinephanos.ca

PRONOVOST, G. (2005). *Temps Sociaux et Pratiques Culturelles*. Presses de l'Universite du Québec. Retrieved from http://books.google.fr/books?id=io70mcwoF4cC

REID, J. (2008). "Design for coincidence: incorporating real world artifacts in location based games". In *Proceedings of the 3rd international conference on Digital Interactive Media in Entertainment and Arts* (pp. 18–25). New York, NY, USA: ACM. http://doi.org/10.1145/1413634.1413643

REID, J., CLAYTON, B., MELAMED, T., HULL, R., STENTON, P., PEIRCE, A., HOLMES, S. (2008). "The design of prisoner escape from the tower: An Interactive location aware historical game". Presented at the Tate's 2008 Handheld Conference, U.K. Retrieved from http://tatehandheld conference.pbwiki.com/Escape+from+the+Tower

SALEN, K., & ZIMMERMAN, E. (2003). *Rules of Play: Game Design Fundamentals*. The MIT Press.

SCHNEIDER, J., & KORTUEM, G. (2001). "How to Host a Pervasive Game Supporting Face-to-Face Interactions in Live-Action Roleplaying"

STENROS, J., MONTOLA, M., WAERN, A., & JONSSON, S. (2007). "Play it for real: Sustained seamless life/game merger in momentum". In *In: Proceedings of DiGRA 2007 Situated Play conference* (pp. 121–129). Japon.

SZILAGYI, I. (2014). *Technologies Sémantiques pour un système actif d'apprentissage*. Université de Franche-Comté.

VAN MENTS, M. (1999). *The effective use of role-play : practical techniques for improving learning*. London: Kogan Page.

VIDAL, G. (1998). "L'interactivité et les sites Web de musée". *Publics et Musées*, *13*(1), 89–107. http://doi.org/10.3406/pumus.1998.1103

ZAGAL, J. P., & BRUCKMAN, A. (2008). "The Game Ontology Project: Supporting Learning While Contributing Authentically to Game Studies". In *Proceedings of the 8th International Conference on International Conference for the Learning Sciences - Volume 2* (pp. 499–506). Utrecht, The Netherlands: International Society of the Learning Sciences. Retrieved from http://dl.acm.org/citation.cfm?id=1599871.1599933

ZAGAL, J. P., & MATEAS, M. (2007). Temporal frames: a unifying framework for the analysis of game temporality. In *Situated Play, Proceedings of DiGRA 2007 Conference* (pp. 516–522).

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_____
Kinephanos, ISSN 1916-985X
Exploring the Frontiers of Digital Gaming: Traditional Games, Expressive Games, Pervasive Games, special issue, April 2016
www.kinephanos.ca

ZAGAL, J. P., MATEAS, M., FERNANDEZ-VARA, C., HOCHHALTER, B., & LICHTI, N. (2005). "Towards an Ontological Language for Game Analysis". In *in Proceedings of International DiGRA Conference* (pp. 3–14).

ZYDA, M. (2005). From visual simulation to virtual reality to games. *Computer*, *38*(9), 25–32. http://doi.org/10.1109/MC.2005.297

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Résumé

De nombreux jeux pervasifs ont été créés dans le domaine culturel, par exemple pour accompagner la sortie de films, de jeux-vidéos ou pour combler l'attente entre deux saisons d'une même série. Cependant, notre contribution se focalise sur les Jeux Pervasifs Culturels qui sont orchestrés dans les lieux culturels et touristiques. Nous avons pour but de proposer aux institutions culturelles et aux designers, des outils méthodologiques et conceptuels qui pourraient les assister à établir une compréhension réciproque.

Mot-clés : jeux Pervasifs, médiation Culturelle, jeux en réalité alternée, typologie des jeux pervasifs, conception de jeux pervasifs

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