



Authoring a Serious Pervasive Game for Reflecting upon Urban Spaces

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Abstract. This paper investigates how pervasive games, which explore the potential of storytelling on mobile and locative media, can transfer knowledge about serious topics regarding public space. The discussion anchors on *Chronica Mobilis* (Barcelona 2014), a situated playing experience devoted to supporting critical thinking about contemporary cities' issues. The authors expose the inception, interaction design, implementation and public presentation process of the mentioned artwork, as well as a qualitative analysis of the participants' experience. They evaluate the manner in which this serious pervasive game manifests as a ludic mechanism to inform the reflection on the immigration and gentrification phenomenon.

Keywords: Serious games · Storytelling · Urban space · Locative media
Situating learning

1 Introduction

The exponential rise of digital gaming in popular culture has been an opportunity to expand the use of these cultural forms to support teaching processes. This increasing interest in adopting computer games for educational purposes relies on the belief that they positively facilitate learning by evoking high levels of engagement [1–3]. The growing field of “serious games” embraces such playing applications, whose goals transcend the purpose of mere entertainment [4]. The difference, when the ‘serious’ adjective qualifies these ludic activities, refers to the prior objective of supporting critical thinking and the learning and training process in a variety of areas.

The game industry concentrates mainly on producing fun and enjoyment experiences [5], though relevant content can also appear as a topic to let players learn about a particular universe in this manner. Even such games devoted solely to leisure have learning as one of their fundamental motivations, because the formal structure of goals, rules, and challenges can entertain as well as instruct. The learning process can be latent and involve the skills needed to overcome the challenges established by the gameplay [6]. The formal characteristics of a game, the competitive and collaborative strategies it demands, the choices it requires, the fantasy it creates can also influence and incentivize the discussion of serious topics.

Digital gaming can transfer knowledge across diverse contexts, even though it happens in quite a different manner when compared to traditional teaching methods [7].

This paper investigates how to facilitate learning experiences in alternative ways, by making players reflect on and learn about determined topics by situating them within the discussed context. The focus is on the potentialities of pervasive games, or on “the construction and enacting of augmented and/or embedded game worlds that reside on the threshold between tangible and immaterial space” [8]. These playing activities, which include a range of formats and technologies, adopt computational procedures of a post-desktop paradigm, including wearable and mobile media to facilitate the physical environment for gameplay.

This paper considers this particular genre and a specific subset that figures among the broad spectrum of serious game-based applications: those devoted to supporting reflection upon urban spaces¹. It discusses the potential that a situated and collaborative game experience has in generating debate and promoting interest in community issues. It investigates how to enhance critical thinking by fostering situated, embodied and collaborative activities supported by mobile and locative media².

The authors analyze such a possibility through a case study approach based on *Chronica Mobilis*³, a pervasive game that uses the computational and communication infrastructure of cities, working to integrate virtual and physical elements into the game world. The piece turns portable technology into a delivery channel, recording and incorporating player position meaningfully in the rules that govern the play activity, and considers the mobility features of the supporting medium in the game mechanisms. The resulting playful experience brings attention to a local reality, inviting a discussion about the serious topic of gentrification in the urban planning field.

2 A Situated Game Experience About Gentrification

Chronica Mobilis does not have the explicit intention of creating an experience that could serve to define itself as a learning game. Rather, it proposes a narrative with game dynamics that aims to bring attention to the current situation taking place in Poblenou, a neighborhood in the city of Barcelona. In the late nineteenth century, it was an industrial district largely inhabited by low-income people. The area, characterized by abandoned factories, is currently experiencing an urban renewal. The 22@Barcelona technological district project⁴ has triggered profound changes in the lifestyle of the residents as well as in the profile of the community. The gentrification process, akin to

¹ In this particular domain, designers have been adopting the gameplay dynamics for creating playful public participation in urban planning. For example, see: [9].

² This paper defines locative media according to Lemos and Josgrilberg [10], as the technological interfaces, such as mobile phones with Global Positioning System receivers, 3G and Bluetooth technologies, which allow interaction between the physical, social and digital networks, by generating data that identifies the location of people and objects in physical space.

³ <http://chronicamobilis.net>.

⁴ The project 22@Barcelona claims that it will transform “two hundred hectares of industrial land of Poblenou into an innovative district offering modern spaces for the strategic concentration of intensive knowledge-based activities. This initiative is also a project of urban refurbishment and a new model of city”. See: <http://www.22barcelona.com/>.

that in Poblenou, is a global phenomenon and a serious topic within the research agenda of contemporary cities [11].

The narrative embedded in *Chronica Mobilis* has gentrification as the central conflict responsible for triggering a series of story events represented and split into three subplots. Each stands for a moment in the life of a character: childhood, adolescence and adulthood. The childhood plot brings us to a neighborhood deteriorated, abandoned and neglected by government policies. Adolescence frames the time in which the area becomes gentrified, affecting long-term residents like the protagonist, who must leave his home. Adulthood marks the return of the character to the place where he grew up, a moment surrounded by the memories of the past and the newly gentrified reality of the present. Chronological, the whole narrative with its three subplots shows how the protagonist and the urban space changes significantly over the time. While the story is very linear, the discourse formation is interactive and gains its motive with a structured game dynamic.

Chronica Mobilis investigates the rhetoric potential of mobile and locative media by stressing the connections between the content and the space in which participants experience it. Following the tendency of projects enabled by location-aware technologies, it integrates some historical, ethnographic and architectural information provided by the cityscape as a layer of meaning [12]. Narratives that geolocate their content normally operate by reinforcing the relation between site, story, and participants, creating an embodied experience rooted in particular places and moments, lived and shared. Immersive and compelling experiences can result from such dialogue, making participants engage with the space mapped out for the diegesis that can even be the original location of the represented events.

Chronica Mobilis geolocates its embedded story in Poblenou area. Real sites in the neighbourhood function as locative nodes containing a virtual layer of added content. The story, organized in a network architecture, appears fragmented into twelve audiovisual scenes. Only an explorative journey through the area can discover and trigger the geolocated content. Three groups of players take part in this rewarding and collaborative experience. Stimulated by a positive spirit of inquiry, they reveal the invisible fictional story which inhabits the places they visit. They see the geographical space of Poblenou turning into both: an extension of the embedded narrative and a game board for a site-specific experience.

Such integration between place and content involved studying the neighborhood through exploratory journeys. These practices followed the premises of the Situationist technique of *dérive* [13]. The process allowed the perception and integration of some resonance of the area, found on a denotative and immediate level, as well as on a connotative deeper and inferred dimension. The reality of the district and the fictional story establish a productive dialogue, as the narrative contains much of the current situation experienced by the residents of Poblenou. In the fictional narrative, for instance, the house of the protagonist is demolished when local gentrification starts. The site in the neighborhood chosen to geolocate this scene is an empty lot containing the remains of a demolished building protected by a construction fence. In front of it, a large sign announces the sale of a new and modern enterprise. Should players look through the metal plates, they see written on the walls: “speculation: the neighborhood virus”. The video geolocated there depicts story events recorded in the same place,

which are the protagonist returning to the gentrified district, looking for his former house, discovering that it was demolished. Such parallels and connections enrich the situated experience and blur a possible line built in participants' mind separating fiction from non-fiction Fig. 1.

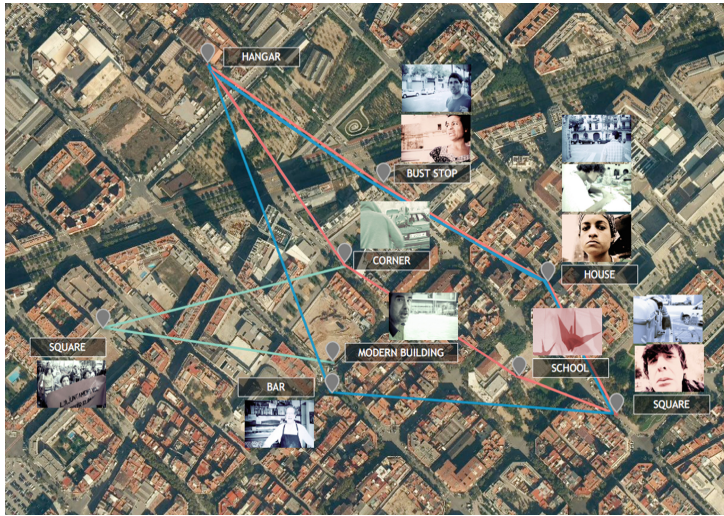


Fig. 1. Locations in Poblenuu, where players can find the video fragments.

Players in *Chronica Mobilis* engage with a geohistorical and sociopolitical tension, whose conflict relates to demographic shifts, gentrification issues, and preservation concerns. They become immersed and participate in that particular context transpiring in Poblenuu. The environment they are placed in serves as a source of information to support critical thinking about these topics through observation. Players have the opportunity to experience, acquire and learn information and skills in the physical and social environment. Such situated learning is one of the educational values of serious pervasive games [14]. It represents a valuable opportunity, considering that meaningful learning experiences encourage understanding by calling on the reflection and connection between gaming and life situations [15]. While situated learning facilitates the development of critical thinking and skills, it also increases the potential for players to later transfer the learned knowledge to other similar situations in new contexts [16]. In the case of *Chronica Mobilis*, though it became a site-specific work, the narrative also translates some of the issues, shifts and consequences gentrification can cause in other places. Though the narrative experience points to the particular process in Poblenuu, on a broader level the fictional story emphasizes a multifaceted and global phenomenon of contemporary cities.

3 Engagement with Experiential Learning

A logical structure governs the situated experience proposed by *Chronica Mobilis*. The schema foregrounds the player's participation in the game and with other players [17]. It explores some motivational features, such as fantasy, control, challenge, curiosity, collaboration, and competition [18]. Those who play engage in experiential learning with active participation in tasks based on problem-solving, decision-making, communication and team-playing. Rather than giving didactic instructions about the serious topic discussed, the acquisition of knowledge comes from the players' actions. They need to analyze the context they are engaged with, gather the necessary information and articulate it to solve the challenges posed by the gameplay. In such cases, as observed by Rooney [19], critical thinking is one of the cognitive skills they acquire while playing, but the knowledge resulting from such experiential learning is also cognitive, physical and emotional.

3.1 Formal Structure to Motivate Playing

As previously stated, the narrative embedded in *Chronica Mobilis* involves immigration, gentrification and preservation issues. When discussing a serious topic in a game, the definition of a pleasurable metaphor able to create fantasy and to raise curiosity is one of the core aspects in achieving and sustaining the motivation of players [18]. In *Chronica Mobilis*, a futuristic metaphor makes players enact the role of archaeologists in the year 6014, trying to understand what society was like four thousand years ago. There are no digital or analog registers from the past. By collecting geolocated memories embedded in the game, they can retrieve some objects that a determined person kept hidden. These are the last analog recordings remaining from the past. The metaphor justifies and enhances the interest in the game activity. It also determines a clear task to players, letting them identify their roles and responsibilities within that playing context, which is an important feature to generate motivation [19].

While goals are responsible for shaping the player's experience and keeping their desire to move forward [14], maintaining the player's relationship to the goal is a challenge [20]. *Chronica Mobilis* achieves this by establishing short-term tasks to bring instant gratification, while players wait for the delayed long-term outcome. These step missions nurture the core mechanics and maintain engagement until the end. The goal creates pleasure, while a set of fixed, binding and repeatable rules sustains motivation [20]. The first rule: each of the three teams playing the game has to define who will play online and who will go to the streets. These two sub-teams will be in different spaces and with a particular set of equipment and technology. Those online must stay inside the exhibition space playing from computers connected to the Internet. Those in the city carry mobile phones enabled with GPS and connected to a 3G network.

The essential rules of the game stem from the predefined manner in which these two categories of player have to communicate and interact. Presented with the goal, they identify their roles: players on computers guide their partners through the city, whereas those in the city find and visit determined locations. According to the rules, street players must send audiovisual streaming showing their experience in the city, receive instant text messages with guidance, and send location data to inform their team

of their spatial location. On the other side, online players watch the auto-report streaming and observe the location and displacement in the map, to send text messages with guidance Fig. 2.

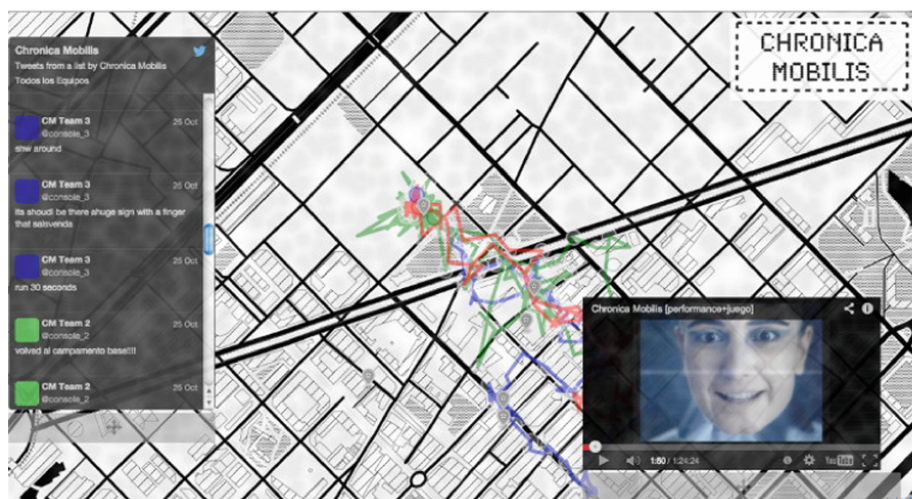


Fig. 2. Layers of content generated as a result of the playing.

The rules of *Chronica Mobilis* pose difficulty by preventing teams from directly and freely communicating, as well as setting a limited time for the game activity. The intention is to increase difficulty but preserve equilibrium between challenge and frustration. They do not let play be so easy as to result in apathy and do not make the task too difficult to master, which could generate tension. Avoiding anxiety or boredom, the degree of difficulty and the restrictions in the gameplay try to create a flow between the skills and the challenge to overcome, between anxiety and pleasure [21].

The dynamics of reward and punishment also integrate a psychological operant conditioning into the core mechanics of the game, which encourages or discourages certain players' behaviors and influences their actions, motivation and overall experience [17]. Player activity in *Chronica Mobilis* is intrinsically rewarding, in an attempt to involve them in the desire to achieve more and more. They receive a reward every time they visit a place that geolocates a story fragment: a video featuring a memory of events that took place in a determined narrative temporality at that precise location. The final bonus is gaining access to the whole story of the protagonist and his analog belongings from the past.

3.2 Player Positioning in the Interaction Model

Chronica Mobilis integrates different levels of engagement that correspond to two reception conditions: contemplative and interactive. The contemplative audience does not interact but follows the game activity. Some audience members are in the

exhibition space, while others watch streamed footage on the project website. They have a secondary and mediated experience of Poblenu, which comes in part from the data that street players generate as a result of their playing activity, and in part from the audiovisual fragments exhibited every time they manage to find a location. The videos of the embedded story are meant to be memories of a character, so they simulate a subjective view of situations he has lived through as they occurred in the past. It shows, from a first person perspective, the same physical locations in Poblenu in which the audience sees the players Fig. 3.

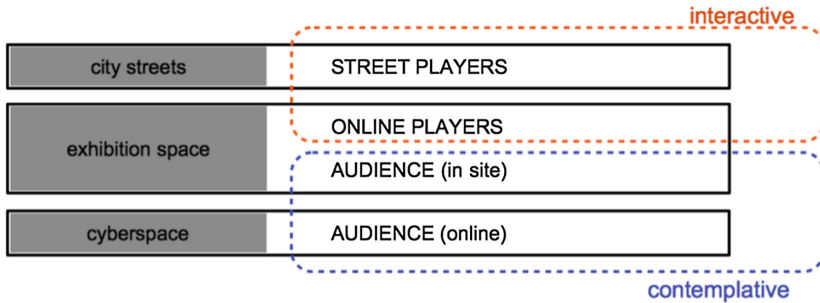


Fig. 3. Modes of engagement in *Chronica Mobilis*.

In contrast to the audience, players assume an interactive position and can either play inside or outside the exhibition space. The game's demand for collaborative strategies integrates the online and situated positioning of players. Both categories have to act as a coordinated team; communicating, sharing information and formulating their strategies using the technologies available to them. Collaboration is also relevant among the three teams of players, as the narrative embedded in the game works like a jigsaw puzzle with its parts assembled collaboratively by the work done by each group.

Those playing outside have a direct experience of Poblenu. On the other hand, online players experience a simulation of being in the streets, because they contribute to decisions regarding the destiny of their partners' exploration of the neighbourhood. They act to control street players' navigation as if they were directing an avatar. The mediated experience they have from the computer screen simulates a third person perspective of Poblenu.

4 Agency in the Construction of the Meaning

One of the major discussions in the game studies field regards the Ludology versus Narratology question, or whether these cultural forms possess a narrating instance [22–24]. *Chronica Mobilis* has a design devoted to exploiting the controversial interrelation of both traits. Working as a narrative of discovery [19], it combines two layers of meaning: a predefined and embedded story about gentrification and an emergent story based on the ludic exploration of the urban space.

The embedded story is a predefined narrative, whose plot follows the classic linear structure and the discourse organizes according to an interactive scheme. As a reward-based storytelling, it comes fragmented in the format of cut-scenes presented every time players complete a step-mission. Its fragments linked to sites in the city serves as a kind of treasure hunt that those engaged in the game will have to encounter. The game turns players into storytellers, giving form to the narrative discourse exhibited to the contemplative audience following their progress. Nevertheless, the playing activity does not restrict itself to the recounting of the events in this embedded narrative. The meaning does not come only from the scenes players collect through the city. The interaction model of *Chronica Mobilis* enhances the sense of personal control, allowing players to build a parallel story based on their performative playing activity. The range of strategic options given in the gameplay open space to rule-governed actions carried out by them [23]. They have the possibility of creating an emergent story that also possesses narrativity, as it contains some basic elements - actions, events, characters, and a setting - organized into a story-like order [24]. This narrative is not told but performed by players. Their actions within the game world are what depict the representational level [22].

They enact the story of archeologists of the future searching for invisible memories living under the visibility of Poblenu. This emergent storytelling, concurrent and complementary to the embedded one, is relatively unstructured, with unexpected and unscripted events and actions. It is dependent on the interaction with the built environment, thusly representing the neighborhood experienced and seen from the players' perspective. They control the storytelling by exploring the space, unlocking its secrets, and producing diversified layers of content: a psychogeographic map, messages and audiovisual content reporting the exploratory experience of the neighborhood. Players become authors and characters, agents and spectators, which live through and watch the gentrification phenomenon. They are expected to conclude their experience motivated by the retelling of the embedded narrative and that which they experienced in the streets. In both cases, the retelling includes critical thinking motivated by situated experiential learning.

5 Evaluation of Participants' Experience

Immediately after the presentation of *Chronica Mobilis*, participants completed a questionnaire with open-ended questions that served as an essential mechanism to the understanding of their experience. It allowed self-reporting in order to gather qualitative data about the different participation modes. The responses given by five street players, nine online players, and twenty-one audience members correspond to three levels: cognitive (feeling and satisfaction), system (technical, interaction and usability aspects), and content (story and discursive strategy).

Streets players qualified their experience employing adjectives, such as exciting, interesting and original. The sense of adventure in discovering the sites within the real city appeared as one of the recurrently referred aspects. Some mentioned how they felt responsible for the mission; others pointed to the amusing ludic dimension of running through the streets. They also commented how the atmosphere set for the game

motivated and created a futuristic feeling for them. Nevertheless, some of the street players also complained of exhaustion caused by the physical effort required by their situated play activity. Concerning the narrative, the majority of the comments mentioned the emergent rather than the embedded story. They evaluated positively the feeling of agency, which was seen as an opportunity to freely create their own story based on the exploration of Poblenuou. Wrote one participant: “It felt like being a documentary, reporter creator [sic]”.

Online players reported the originality and the novelty as positive aspects influencing their experience. “Motivating”, “exciting”, “intriguing” were some of the adjectives employed by them. They evaluated the game activity as enjoyable, though they spent their time sitting in an enclosed space attached to a computer screen. Many of them justified the enjoyment, mentioning the game dynamics and its demand for collaborative strategies. Rather than commenting on the narrative content, online players referred more to the system level. They described positively the infrastructure, the presentation based on the combination of multiple sources, and the use of geolocation data. They also mentioned the accessible nature of the media employed, or the “easy technology” as one described. As a negative aspect, the main complaint also concerned the system level, especially the delay and inconsistency of the tracking system, which occurred due to the low bandwidth connection of the 3G network.

The audience members also considered the experience original and exciting. They emphasized the fun and ludic dimensions, even though they did not play any role in the game. “As the public, I did not expect to have so much fun. I believed that the players would enjoy more, but the public too [sic]”, wrote an audience member. Another made associations with the memories of his childhood: “It was like being a child again in a game of discovering”. Regarding the narrative, the most frequently mentioned aspect was the discursive strategy, or the manner in which they discovered the story. They referenced the interesting and important role of the gameplay for the storytelling act, or “the idea posed as a game”, as one described it. Some of the audience members also praised the narrative content of the embedded story, by saying that it contained “very powerful memories”, or mentioning “the poetry of the fiction”. Regarding the emergent story, they emphasized how the enthusiasm of street players in their exploration of Poblenuou had spread a vibrant energy through those following them, which was associated with the futuristic metaphor of the game. The negative aspects listed by the audience members referred mainly to the difficulty in following the different layers of content. They reported that sometimes the complex combination of different data sources resulted in confusion.

6 Conclusion

This paper focused on the field of pervasive games, investigating the potential for combining learning and playing activities to support reflection on serious issues in contemporary cities. The discussion anchored on *Chronica Mobilis*, a situated experience about gentrification, a controversial topic in urban planning. The authors detailed how this serious pervasive game draws attention to the Poblenuou neighborhood and its sociopolitical and historical issues, by situating players in the center of a conflict.

The description included design decisions taken in the creative process; from the definition of the content and the manner chosen to geolocate it, to the game strategies created to generate motivation and engagement.

By unveiling the authoring process of *Chronica Mobilis*, the authors also explained how the game overcomes the Narratology vs. Ludology dilemma. They showed a scripting, design and implementation method, which integrates production and dissemination as roles to be actively and critically played in a location-aware process of co-creation. The paper presented experimental results based on the feedback given by players to support a better comprehension of their experience. Despite the importance of such findings, further investigation could be done to obtain a deeper evaluation of whether the playing experience did result in participants' critical thinking and willingness to engage in local issues. Future works based on such data could enrich the analysis of the potential of serious pervasive games in directing people to learn and reflect upon the urban space.

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