Pervasive Computer Games and Processes of Spatialization: Informational Territories and Mobile Technologies

André Lemos
Federal University of Bahia

ABSTRACT Pervasive computer games (PCGs) combine digital mobile technologies and location-based systems by creating an interface between electronic and physical spaces for playing. PCG is a general name for mobile games such as hybrid reality games (HRGs), location-based mobile games (LBMGs), and urban games. Our goal here is to show how these games, along with new digital mobile technologies, have the potential to produce “spatialization,” i.e., to socially produce the space in which they are embedded. I suggest that spatialization is achieved through the use of technology such as sensors and digital mobile networks (smartphones, PDAs, global positioning systems [GPSs], and augmented reality [AR] devices; radio frequency identification [RFID] tags and global system for mobile communications/general packet radio service [GSM/GPRS]; Wi-Fi and Bluetooth). The goal of this article is to examine the forms of spatialization created by the use of location-based services and location-based technologies.

KEYWORDS Pervasive games; Locative media; Cybertulture

Introduction Pervasive computer games (PCGs) intersect with the areas of computer games, location-based mobile technologies, and location-based mobile services. Still in their
infancy (the first one, BotFighters, was created in 2000), PCGs have made inroads within the scientific, academic, and artistic fields but have had limited impact in the commercial sphere. However, development of games for mobile devices, including those that do not employ location-based systems, represents a large slice of the worldwide mobile market.

It has been argued that pervasive computer games break traditional borders of game play through an amalgamation of urban and electronic spaces and, in effect, augment not only physical space, but also traditional assumptions of space and spatialization (Lefebvre, 2004) through location-based services and technologies (Benford, Anastasi, Flintham, Drozd, Crabtree, Greenhalgh, Tandavanitj, Adams, & Row Farr, 2003; Capra, Radenkovic, Benford, Oppermann, Drozd, & Flintham, 2005; Chang & Goodman, 2006; Cheok, Goh, Lui, Farbiz, Fong, Teo, Li, & Yang, 2004; Hansen, Eriksson, & Lykke-Olesen, 2005; Hinske, Lampe, Magerkurth, & Röcker, 2007, among others). The main characteristic of location-based media, or locative media, is that it connects physical spaces with digital spaces through electronic sensors, wireless networks, and mobile communication and information devices.

Together these technologies create a new informational layer, what I describe as “information territorialization,” a layer of information that erupts in the tension between physical and electronic spaces. For example, although PCGs occur within physical spaces, they depend on digital elements, such as network coverage or passwords, for access. On the other hand, PCGs also build on traditional forms of play, such as the institution of rules, the creation of social networks, and the use of urban space as a game board. In turn, mobile devices and digital networks expand the scope of the traditional game, producing new narrative forms, new entertainment purposes, and new temporary uses and functions of urban spaces.

In order to illustrate the process of spatialization through pervasive computer games, the emphasis of this article is on the theoretical. The analytical data, which encompass an analysis of 73 PCGs (from 2000 to 2008), support the argument that informational territorialization occurs through (1) game play in physical space (hunt and chase games form the majority) and (2) the convergence between physical and electronic spaces (location-based mobile games form the majority).

There are two sections to this article. The first begins by examining the forms of spatialization produced by location-based services and location-based technologies within the last eight years of PCG creation, offering a typology of these games. The second section provides a theoretical interpretation of both locative media and PCGs. In this section, I first explore the relationship between locative media and games. I then situate the meanings of place, territory, and spatialization in relation to my definition of “informational territories.” To clarify the spatialization of informational territories through PCGs, I point out the main characteristics of these new types of mobile devices, which I refer to as “hybrid mobile devices with multinetworked connections” (HMDMDMs). These characteristics include interpersonal communication, mass communication, and post-mass media functions (Lemos, 2007). Finally, I argue that mobility and temporality as essential features to understanding the spatiality of location-based services and PCGs.
Analysis and methodology

Pervasive computer games

Location-based services (LBSs) and location-based technology (LBT) have interpersonal, mass media, and post-mass media functions enabled by informational digital territories that allow physical and informational mobility through a temporary use of public space. As previously mentioned, spatialization is shaped by the rules of the game and the way the game is related to physical space, digital networks, and electronic devices.

Broadly defined, PCGs are games that utilize urban streets as a game board, enabled by LBSs and LBT (Broll, Ohlenburg, Lindt, Herbst, & Braun, 2006; Chalmers, Bell, Brown, Hall, Sherwood, & Tennent, 2005; Cheok et al., 2004; Eriksson, Hansen, & Lykke-Olesen, 2007; Facer, Joiner, Stanton, Reid, Hull, & Kirk, 2004; Henrysson & Ollila, 2004; Nova & Girardin, 2004). The use of LBS and LBT devices differentiates PCGs from other pervasive games (for example, from a medieval battle in a role-playing game that uses no electronic technology, such as a live action role-playing [LARP] game). Hence I use the concept of “pervasive computing game” (Nieuwdorp, 2007), though there are several other definitions (Benford, Crabtree, Flintham, Drozd, Anastasi, Paxton, Tandavanitj, Adams, & Row-Farr, 2006; Benford, Magerkurth, & Ljungstrand, 2005). According to Walther (2005b), pervasive gaming “implies the construction and enacting of augmented and/or embedded game worlds that reside on the threshold between tangible and immaterial space” (p. 177).

This interface between electronic and physical space is what many have referred to as “mixed reality”: the combination of electronic and physical properties of a place (Hinske et al., 2007; see also Hansen, Eriksson, & Lykke-Olesen, 2005). PCGs “extend” cyberspace (Rashid, Mullins, Coulton, & Edwards, 2006, p.1) by mixing it with physical places and objects. The game action occurs through movement (physical and informational), digital interaction in public space, the exchange of information on specific locations (the context), and, at the same time, interaction between players and real and virtual objects (Capra et al., 2005; Garvey, 2007). PCGs blend the real world with the game space using LBT and LBS, creating what Thomas Vander Wal refers to as “info cloud” (quoted in Roush, 2005, p. 51). As I will argue, “bubble” and “info-cloud” are shapes: metaphorical images of informational territories.

As Walther (2005a, 2005b) claims, PCGs encompass an explicitly computational component and preserve the total footprint—meaning the invisible traces created by mobile devices—which is bound to specific locations based on user movements. PCGs are implemented in both an isotropic (mathematical, abstract, algorithmic) and a heterotrophic (the players in socially produced space) use of space. The game takes place in the relationship between the tangible and the informational space, in establishing control of the territory that Walther calls the “area of accessibility.” The ontology of this area is what I call an (informational) territory, because it is an area of control (area of accessibility) (Nieuwdorp, 2007; Walther, 2005b).

What separates PCGs from other games is the possibility of digital interaction between physical space, the environment, and the context, and, at the same time, the potential to play with other players, objects, and different places and to do so in real
time. In this case, social interaction is not only virtual, as in traditional computer games, but also face to face. Magerkurth, Engelke, & Memisoglu show that social experience is a fundamental difference in the PCG paradigm, because the game is based on human-to-human “competition and cooperation” (2004, p. 2).

Besides the social experience, an additional paradigm shift is that PCGs are location aware; that is, changes in a game are sometimes based on changes in the physical space. Therefore, physical changes are also felt electronically. Change in one space (physical or electronic) necessitates change in another. Moreover, the particularity of the public space can be used in the game design to highlight some features of that place. For example, educational, cultural, or historical games can exploit certain areas of the city and its social, cultural, and historical features. What is clear here is that it is the particular relationship between physical places and electronic spaces that is paramount.

To illustrate this, consider the following games. Geocaching is an outdoor treasure-hunting game in which the participants use a GPS device to hide and seek containers anywhere in the world (480,000 “geocaches” are registered in over 100 countries). Uncle Roy All Around You and Can You See Me Now? by the British performance group Blast Theory use a personal digital assistant (PDA), cellphone, and the Internet for game play that occurs between players on the streets and players participating online; street players can see the virtual movements of online players in relation to their physical movements using a map provided on their hand-held PDA. Another example, Pac-Manhattan, which is a street version of the original Pac-Man game, unfolds through the coordination of actions through mobile phones and Wi-Fi networks in the streets of Manhattan. In Brazil, there are two similar games: Senhor da Guerra (Lord of War), a short message service (SMS) strategy game that uses text messaging game play in a city, and Alien Revolt (the first such game in Brazil), which integrates city space as a playground for alien battle. Other examples include ARQuake and NetAttack, which also merge game play in physical space and augmented reality to create new experiences.

According to Lonthoff & Ortner (2007), pervasive computer games can be categorized as location-based mobile games (LBMGs), mixed-reality games (MRGs), or augmented-reality games (ARGs). PCG is a subcategory of mobile games, which can be classified in terms of location-aware (pervasive games) and non-location aware (consoles, games for cellphones) (Kiefer, Matyas, & Schlieder, 2005). With PCGs, the context, users’ positions, and relationships between physical and electronic spaces are fundamental features (Chang & Goodman, 2006). Location-based mobile games implement location-based technologies and location-based services. In LBMGs, player positions are a key element of the experience; for example, in Geocaching and Swordfish, players are located on the street (see Table 1). In mixed-reality games, player interaction can occur simultaneously within physical space and cyberspace (with wireless Internet, one does not have to be indoors). Thus, in games such as Can You See Me Now? and Pac-Manhattan, players participate on the street and through the network. These games are also called hybrid reality games (HRGs). Finally, augmented-reality games use special devices with which the information layer is interpolated within the real world and mediated by a user’s point of view through a cellphone or PDA device (see Broll et al., 2006), as in NetAttack or Epidemic Menace.
These examples demonstrate forms of spatialization produced by PCGs at the intersection of electronic and physical space. However, spatialization is also a type of game, the manner in which players utilize the streets, and the goal of the game. The spatialization created by PCGs is, at the same time, a spatialization created by location-based services and location-based technologies (LBMGs, MRGs, and ARGs) and the goal of the game (hunt, chase, puzzle, strategy).

Spatialization in PCGs: A preliminary analysis
The goal of this article, as a preliminary analysis of pervasive computer games, is to point out an analytical matrix. This matrix implements four categories proposed by Kiefer, Matyas, & Schlieder (2005): “Chase,” “Hunt,” “Puzzle,” and “Strategy.” I reviewed 73 PCGs (released in the period 2000 to 2008), seeking ways to identify the spatialization process created by LBSs and LBTs, and in doing so classified the PCGs by the following: “Name,” “Year of Creation,” “Place,” “Mobile Devices Used” (cellular, PDA, GPS, RFID, HR devices), “Type” (LB, MR, HR), “Use of the Place” (chase, hunt, puzzle, strategy, poker), and “Communications Networks” involved in the process (mobile, GPS, Wi-Fi, Bluetooth, RFID). While it is important to go deeper and try to put more variables in this matrix, it is impossible to do that within the confines of this paper. What follows is a brief overview of the history of PCGs studied, including year of production, country of origin, and technologies employed, to situate the reader.

The boom of pervasive games took place in 2004 and 2005, with a total of 26 PCGs launched. The centres of PCG development are Sweden, the United States, and the United Kingdom, with 58% of total production. Concerning the technological platform (i.e., cellphones, GPS, PDA devices, and HR), the research demonstrates that the majority of games use cellphones (46) and GPSs (38). Therefore, in terms of networking, mobile phones (cell and cell-ID) and GPSs are dominant in pervasive gaming.

Regarding the use of space, the spatialization process and LBMGs are the most common types of games, accounting for 75% of the total. Regarding the use of public places, the majority of games are “chase” and “hunt,” specifically treasure-hunt and persecution-of-the-enemy games.

 Relevant concepts to understanding PCGs

Locative media
Locative media can be understood as a combination of location-based technologies and location-based services (Barkhuus, Chalmers, Tennent, Hall, Bell, Sherwood, & Brown, 2005; Benford, 2005, Benford et al., 2003; Chang & Goodman, 2006; Hightower & Borriello, 2001; McCullough, 2006; Pope, 2005; Rao & Minakakis, 2003; Smith, Consolvo, Lamarcia, Hightower, Scott, Sohn, Hughes, Iachello, & Abowd, 2005). The term “locative media” was first proposed in 2003 by Karlis Kalnins at the Centre for New Media in Riga, Latvia (Galloway & Matthew, 2006) to distinguish corporate use of location-based services from artistic and critical uses. Location-based technologies are the digital devices, sensors, and wireless networks constructed to facilitate exchanges of information within physical places. Locative media can be used for locating, mapping, and accessing services and information, and for the development of artistic projects or games (Benford, 2005; Benford et al., 2006; Benford, Flintham, & Drodz, 2006;
The content and the information exchange supported by these devices and networks constitute location-based services, which can be classified into information and directory services, tracking services, emergency services, navigation, advertising and promotion, art, and games. These subcategories of LBS can be grouped into four basic categories (Karimi & Hammad, 2004; Lonthoff & Ortner, 2007): (1) search for location/navigation (maps, real-time traffic, services); (2) personalized services (individual profiles); (3) niche consumption/corporate and industrial applications (tracking products, consumers, suppliers, and employees); and (4) art projects and games.

Locative media are ubiquitous and pervasive. The term “ubiquitous computing” was proposed by Mark Weiser in 1991 to account for computational processes integrated into and sensitive to the external environment and integrated with diverse objects (Weiser, 1991, 1993). IBM used the term “pervasive” in 1998 to describe the “paradigm that deals with the integration of computers in our surroundings” (Hinske et al., 2007, p. 20). For the purposes of this paper, I will not differentiate between pervasive and ubiquitous computing. I use the term “pervasive computer games” to describe games that use ubiquitous and pervasive computer technologies and services (other terms may include location-based mobile games, locative games, ubiquitous games, mixed-reality games, hybrid-reality games, etc.). As PCGs are beyond the scope of day-to-day activities (as are any ludic experiences, any game or play) and constitute a social, leisure activity, they are excellent examples to understand spatialization as a social production of space. As with location-based games, spatialization is produced by playing in a hybrid urban and electronic space. Although a deep analysis of game theory is outside the scope of this article, I will focus on cultural game theory as explained by Huizinga (1955). The goal in the next section is to show that PCGs create a temporary, ludic use of physical and electronic spaces.

\textit{PCGs’ physical and electronic playground}

Games are an excellent demonstration of the processes of spatiality. Play, for example, is a social production of space that is made possible by the creation of a “magic circle” (Huizinga, 1955). The magic circle created by the play activity represents a temporary way to live in a specific space and time. Huizinga defines play as a temporary activity marked by rules and agreements that takes place outside of “ordinary life.” Games create playful territories. I understand “territory” as a physical and/or symbolic control of place—through borders, rules, and codes—that can be applied to games such as soccer, hopscotch, and baseball, or to “live ludic activities” such as skating and parkour (see Lemos, 2007, 2008a, 2008b). We might suggest that every game produces particular territorializations in place. Every game creates a ludic function in a specific place by producing territorializations, creating a physical and/or symbolic control of that place. Similarly, all games create ludic functions of space. For example, some places, such as stadiums, are built specifically for games. Other games, however, such as PCGs, create new functions, or heterotopias (Foucault, 1984), by transforming urban spaces into playful spaces.4

Games also create specific spatial and temporal social relationships that are outside the circle of ordinary life. For Huizinga, culture grows and develops in the game
and by the game. According to Huizinga, games are worldwide cultural phenomena that exist even in societies that do not have a specific word to express them. Games can also be characterized as voluntary non-serious activities, beyond material interests and developed for a limited time and a defined space (Huizinga, 1955). Games require isolation (from the “real world”) and a territory (control zones: the well-defined rules and orders). This dimension of unproductive consumption (Bataille, 1967) gives games a critical facet—politics—imposing tensions with the immediate reality.

If every game creates a magic circle, we may suggest that games produce spatiality due to the temporary social use of their delimited playful space. However, in the case of PCGs, the territory of the game takes on a new dimension, because digital information is exchanged between players, objects, and physical places. PCGs create a magic circle with computational properties integrated with the physical space, producing forms of ludic spatialization and new types of relationships among players, between players and physical and electronic space, and between physical and electronic spaces. Therefore, PCGs allow us to examine how to create spatialization with digital mobile technologies, wireless networks, and sensors in public spaces. For example, in the game Can You See Me Now? from Blast Theory, players both in cyberspace and on the streets use electronic (wireless networks) and physical places (in a specific city) to play. Like all PCGs, the “game board” is the street (Björk, Falk, Hansson, & Ljungstrand, 2001), not only allowing play on the street, but also requiring reactions appropriate to the street environment. This is unlike the experience of portable consoles such as the Nintendo DS or Sony PSP, which allow play anywhere, even on the street, but without incorporating the street into the game. PCG players, unlike portable console players, must be aware of the physical context surrounding them. In order to understand how PCGs transform the physical context in which they take place (spatialization), we must explore their relationships with the ideas of territory, place, and space.

**Territories, places, spaces, and spatialization**

Space is generic and is socially produced by places and territories. Territories are areas of control over borders where mobility and flows are exercised (with different speeds, forms of access, power, and range). Borders are membranes that allow communication. Control and surveillance are forms of monitoring and tracking movements and flow within boundaries. So to think about territory is to take into account mobility and flow: ways to exercise control, surveillance, and violence. The meaning of a territory depends on tensions between borders (Delaney, 2005; Gottmann, 1973; Lyman & Scott, 1967; Raffestin, 1988; Sack, 1986), which reveals a communication problem, since this tension deals with limits, access, control, and exclusion—defined by social relations. Globalization has created new problems with borders, increasing the porosity and possibilities of communication. Today, we face crises in territoriality dimensions (frontiers of nation-state, expansion of the physical body [e.g., cyborgs], postmodern subjectivity, multiculturalism, global politics, and economy).

Place must be seen as a lived space, as a portion of a socially constructed space, an “event” (Thrift, 1999) created by territories, and not as a fixed and permanent “home” (Tuan, 2003). A place is never just an immutable “topus”; “instead of thinking of places as areas with boundaries around, they can be imagined as articulated mo-
ments in networks of social relations and understandings” (Massey, quoted in Cresswell, 2004, p. 69). A place is always the result of crossing cultures (wars, trade, communication, transportation), an update of a temporary endless virtuality that transforms it (place) into a matrix of intersection and connection of flows (Amin & Thrift, 2002; Coultry & McCarthy, 2004; Cresswell, 2004; Massey, 1997). As Pred (1984) argues, “places are never ‘finished’ but always ‘becoming’. Place is what takes place ceaselessly, what contributes to history in a specific context through the creation and utilization of the physical setting” (p. 279). Places are also flow and movement, produced by territorial negotiation (horizontal dynamics) and place negotiation (vertical dynamics).

The process of spatialization is the creation of places by social life. Within places there are territories, zones of control (laws, frontiers, borders, norms, habits). Places are socially built based upon an endless process of territorialization and deterritorialization. Space is composed by places and places by waves of territorialization and deterritorialization (territories) (Deleuze & Guattari, 1980). As Thrift puts it, “places are ‘stages of intensity’—traces of movement, speed and circulation” (quoted in Cresswell, 2004, p. 48). PCGs exemplify these new movements (informational and physical) in places. Instead of eliminating places, as was often suggested, PCGs create new meanings for existing places and spaces. PCGs also define and change space based on the content and the movement of information (data, image, sound). We can see here how place must be defined by taking into account its database dimensions. 5

Space is constituted by/for places that are created by/for territories in the endless process of mutual influences, both horizontal and vertical (inside each category and among them). The process of territorialization (control of access, rules, and practices) modifies places, and places therefore change other places. Today we have to take into account a new form of territory in contemporary societies: the informational territory. Every territory is a place of social control of borders. We are always immersed in territorial layers (subjective, physical, cultural, political, and economic), and these layers constitute places. The combination of these three components (territory, place, and space) is what we call the process of spatialization, or as Lefebvre (2004) points out, a “social production of space.” So we can understand spatialization as an open process.

Spatialization is created by changes in space and by producing new places. Spatialization is thus a process of intense flows (of capital, commodities, information, and people) that create a sense of belonging. Territories are within these places, zones of control and power, and we can say that the dynamic between territorialization and deterritorialization is what gives meaning to places (Deleuze & Guattari, 1980). Harrison & Dourish, 1996 and Dourish, 2006 show there is a general scale of space. Space is representational, geographical, and abstract, as well social, produced by people in society. So, in addition to this mathematical abstraction, all spatialization processes are a result of a social production that creates territories, places, and space. As Harrison & Dourish (1996) say, “place’ denotes the ways in which settings acquire recognizable and persistent social meaning in the course of interaction” (p. 299).

To understand PCGs’ spatialization, we must take into account not just the physical territorialities of the place, but also the informational territoriality of it. PCGs use a new
form of territorialization, a new way to produce and control space and place: an informational territory. These territories change the way we see, live, and understand places. They are new social productions of space in informational societies where new informational functions are created in physical places (new or old ones). Changing places—given its new electronic capabilities with sensors, networks, and technologies in recent years—creates new meanings for them. Adding information to places does not eliminate them, as it has been suggested (Augé, 1994; Harvey, 1989; Meyrowitz, 1985), but it actually produces new meaning and new functions. For example, searching for hotspots makes people go to one place instead of another; the exchange of phone calls or SMS messages creates new movement on the streets and new forms of synchronicity or meetings of people; locating and mapping services position and change the way we view and interact with the city structure; and accessing and creating information through blogs, microblogs, or social software change the way people produce content about their urban experiences (Ito, Okabe, & Matsuda, 2005; Katz & Aakus, 2002).

Ito, Okabe, & Matsuda (2005) have argued that digital mobile technology does not necessarily create new places, but allows new uses of space and the creation of social networks for games, art, and political mobilizations, transforming them with new practices. Because games define new space and time (the “magic circle”), they can be viewed as a suspension of space and time. What I mean by space and time suspension is that, according to Huizinga (1995), and Callois (1995), a game creates by the means of its intrinsic rules, a time and a space to play. When we are playing, we are in “another space and time.” When the game finishes, we come back to “reality.” That suspension is important to create a temporary tactical use of space by the players (de Certeau, 1984). For example, Dourish (2006) uses the experience in the PCG *Can You See Me Now?* to show these new meanings of place. Dourish argues that a tactical play emerges when players have to understand urban and electronic networks, exploring streets and Wi-Fi or GPS black spots: “Like place, space is being produced here and it may be that the meaningful local people are bounded by actions rather than by walls and ceilings” (Dourish, 2006, p. 305). For example, I played *Can You See Me Now?* in 2008 in Belo Horizonte, Brazil, and from my experience, I can say that people who were playing and people who were “watching” the game were aware of the urban and the electronic space. Santa Teresa Square, the “board of the game,” was transformed (temporarily) by this “tactical” use of place. This is what I mean by “ludic production of space” by the means of PCGs. In PCGs, places can also be understood as physical and electronic databases: places now include a new territory, which I call informational territory. Informational territory is the ontology of these new places.

**Informational territory**

Today it is imperative to think about places with this new layer of information control constituting a new territory created by electronic networks. Informational territories can be understood as areas where informational flows between digital and urban spaces are digitally controlled. The concept of informational territory describes the spatialization process of locative media projects and location-based games. By informational territory, I mean the area of control of digital information flows intersecting with a physical area. Territorialization is created in an area of input and output controls
of electronic information in urban space. By accessing wireless networks and consuming, producing, and circulating electronic information, informational territories create new functions for places. As we saw above, places are results of territorialization (geographic delimitation, laws, and regulations).

The informational territory is not solely the digital space, but constitutes a place formed by the relationship between the physical dimensions of territorialities and the new electronic flows, creating a new form of territorialization. By merging physical and digital spaces, places become more complex, because this new type of informational territory is now related to other territorialities that represent forms of power and control, such as laws, regulations, subjectivities, cultures, and politics. Empirically, we can study these informational territories by examining the use of public spaces equipped with the new infrastructure of wireless networks and devices, or from ethnographic research showing the relationship between users and the space before and after the formation of informational territories.

Informational territories are the main components of PCGs. As shown above, games like Can You See Me Now? (CYSMN) use both the absence and the presence of informational territories in the design of the game (GPS black spots are the absence of informational territories, for example). In that game (and in my experience with CYSMN in Brazil), people had to deal with rules, habits, and laws that control physical space (Santa Teresa Square) as well as with control of access to network and mobile devices to play in the informational layer. Players have to deal with physical and electronic constraints. Control and power are related to the PCG.

It is accurate to conceive of cyberspace as a “digital territory,” following Kameas & Stamatiou (2006). Others speak in terms of a “bubble” (Beslay & Hakala, 2005) or a “cloud” (Vander Wal, quoted in Roush, 2005). These images provide a picture of the “form” of the informational territory. However, neither “digital bubble” nor “digital cloud” shows the ontological dimension of place; they do not inform us about the basic principles of these “bubbles” or “clouds.” I propose the concept of informational territory because, although it may take the form of a “bubble” or “cloud,” it indicates not a form but a function, that is, a way the place is reconfigured by digital technologies and mobile networks. If we think in terms of territories, we can see the new dynamics, new forces, and new powers being established in places through these devices and networks (e.g., political problems such as surveillance, monitoring, and privacy). Thinking about territory allows us to take into consideration issues of control and power that the image of the bubble or cloud does not reveal. A place is always controlled (by law, ethics, morals, rules). It always consists of territorializations and tension with deterritorialization by means of new laws, changes in ethics or morals, etc. The notion of informational territory allows us to see new processes of control (through information), adding more complexity to places, as a shown in the CYSMN example above.

In the case of PCGs, users are in areas of informational control within territorialities for the purposes of play (devices, networks, public spaces). Therefore, users have to control what to receive and what to produce in terms of information (though sometimes they have to deal with the loss of control), but also have to deal with other forms
of power and control (other territories) present in any place. For example, they have
to deal with rules, laws, habits, and other forms of territorializations that are present
in all kinds of places, as well as with the availability of informational territories in these
places (network connections within a place). Like all kinds of territorialization, infor-
mational territories in PCGs temporarily change places, adding new functions to them,
such as new possibilities to access, produce, and distribute digital information in places
where it was impossible before, for example, in buses, trains, squares, and coffee shops.
The difference between electronic annotation and “analogical” annotation (graffiti or
posters) is only technical. Both are spatialization practices. These new functions must
be taken into account by the game designer, as well as dangerous places in a city, ac-
cessibility, network connections, et cetera (McMullan & Richardson, 2006).

**HMDMCs and post–mass media functions**
To understand PCGs, I propose a theoretical matrix (applicable to all LBSs) that takes
into account two central features apart from the informational territory: post–mass
media functions and the use of hybrid devices such as smartphones.

Several studies point out characteristic uses of cellphones in different countries
(Cooper, Green, Harper, & Murtagh, 2002; Ito, 2003; Katz & Aakhus, 2002; Licoppe &
Heurtin, 2002; Licoppe & Inada, 2005; Ling, 2004). These studies show that cellphones
should not be thought of as phones for interpersonal communication, but as hybrid
mobile devices with multinetworked connections (HMDMCs) (Lemos, 2007). They
are hybrid digital devices that bring together the functions of telephone, computer,
camera, video, and word processor, in connection with many networks (Bluetooth
and infrared for short-range connections; cellular—global system for mobile commu-
nications (GSM), code division multiple access (CDMA), general packet radio service
(GPRS)—Wi-Fi Internet or WiMAX, satellites for GPS, radio waves with RFID).

McMullan & Richardson (2006) support this idea. For them, the cellphone is a
“hybrid multiplatform medium.” The new functions of these HMDMCs do not fit well
in traditional mass media theory, which addresses TV and radio. We thus must speak
in terms of “post–mass media functions,” which include mobility and the extension
of communication properties to the consumption and production of information by
the user without passing through massive distribution centres (Lemos, 2007).
HMDMCs have three basic functions: interpersonal communication, mass communi-
cation, and new post–mass media functions. “Post–” mass media function does not
mean something that arrives at the end of the mass media process, but is a new way
to understand what cannot be labelled “mass communication.”

These are post–mass media functions. Unlike mass communication functions,
post–mass media functions operate from technologies and networks where the user
can produce information, “releasing” the editorial centre. They are not state conces-
sions, as they allow customization, publication, and dissemination of information
worldwide, with multimedia capabilities. Furthermore, the communication is based
by on conversation (many-to-many, unlike the one-to-all of mass media). For example,
a large portal on the Internet tries to act as a huge journalistic mass medium, while
printed fanzines and flyers have post–mass media functions. The role of mass media
is “information,” while the role of post–mass media functions—blogs, free software,
podcasting, wikis, and collaborative maps—is “communication” (a bidirectional flow of information). These applications operate under the three basic principles of cyberculture: “release of the emission,” “bidirectional connection,” and “reconfiguration” of cultural institutions and industry (Lemos, 2006). LBSs, in turn, can have both mass and post–mass media functions. For instance, we can see services such as “Bluetooth New” as mass media functions and “geotags” or “public authoring” as post–mass media functions).

**Mobility and temporality in informational territories**

As we have seen, PCGs are good examples of HMDMCs that have post–mass media functions, creating informational territories and spatialization for play. Two more features are fundamental to understanding spatiality in LBSs and PCGs: mobility and temporality. With PCGs, we can say that spatialization is produced by mobility (informational and physical) and by a temporary use of space.

Mobility encompasses communicative, technological, geographical, economic, cultural, and social aspects (Castells, 1996; Castells, Fernández-Ardèvol, Qiu, & Sey, 2007; Hannan, Sheller, & Urry, 2006; Höflich & Hartmann, 2006; Kellerman, 2006; Kwan, 2007; McDowell, Steinberg, & Tomasello, 2008; Sheller & Urry, 2006; Sorokin, 1964; Urry, 2000). It is what allows us to go from one point to another, whether imaginarily, physically, or virtually—to “dis-place.” The “dis-placement” is not a denial of place, but a way of reinterpreting it (Kellerman, 2006). Mobility is deterritorialization—virtual, physical, or imaginary—and transportation and communication technologies (mass and post–mass media functions, as we have seen) are a way to reinforce these mobilities. By playing on the street with portable devices and wireless networks, PCGs manifest both physical and informational mobilities.

Informational mobility, as suggested by Dourish (2006), can be thought of in two ways: as “static” (mobilizing applications to give users access to information on websites, email, social software, blogs, et cetera) and as “dynamic” (providing information about the location of the user and services that emerge from the context) (Tamminen, Oulasvirta, Toikka, & Kankainen, 2004). These two informational mobilities are employed in LBSs and in PCGs by accessing information in electronic databases, blogs, chats, or other services, or by locating the player and content related to the context. PCGs present two informational mobilities (static and dynamic) and physical mobility (leisure), as well as imaginary mobility (in the game world). Moreover, we see that physical and informational mobilities converge, because the user (or the player in a PCG) can now consume, produce, and circulate information (post-mass functions) on the go (physical and informational mobility). As Kellerman (2006) argues, mobile technologies enhance both physical and virtual (informational) mobilities.

Bonss & Kesselring proposed the term “motility,” borrowed from biology, to think of mobility as a potential virtual property: “the propensity to be mobile ... which is likely to vary in intensity from one person to another” (quoted in Kellerman, 2006, p. 8). With LBS and LBT we face an increase in “motility” in a global sense, an increase in human power of movement. For example, this is manifest in the potential to move through the street, to have devices, to have access to networks, to pay for services.... But this potential is constrained by the existence of informational territories in two
ways: “extensivity”—the ability of a person to overcome distance (physical, virtual, imaginary)—and “accessibility”—opportunities available to perform the movement (virtual, physical, or imaginary) (Kwan, 2007). We see here the power within informational territories, or the differences between those who have and those who do not have access to transportation or communication devices in new informational territories (Wood & Graham, 2005).

Mobility is linked to temporality. From the players’ perspective, PCGs are temporary. That is, there will always be a time to begin and to end or to suspend the game, even if we can say the same for the use of public places. Mobility in urban space is a temporary use of space. As we have seen, some games, such as PCGs, deal with a temporary use of urban space by creating a “magic circle.” For example, in Uncle Roy All Around You, players have 60 minutes to solve the mystery. In electronic spaces, the game is always available. But from a player’s perspective, there will be a time and a space to begin and end the game. For example, a massively multiplayer online role-playing game (MMORPG) is not temporary, but the player has a time (and a space) to begin and to stop playing.

We can say the same for the use of public places. Mobility in urban space is a temporary use of space. Our experiences in public spaces are always temporary: moving by car or by public transportation, using public restrooms, sitting in the square, or strolling on the streets. The temporary use of space creates a meaning of place through spatialization, through social production of places (Haydn & Temel, 2006; Tonkiss, 2005). These temporary uses of space (for games, political protests, carnivals, et cetera) evidence the flow that characterizes places in contemporary cities. We can see a temporary use of places to access informational territories such as cyber-cafes and public hotspots.

Conclusion

As we have seen, PCGs produce ludic spatialization using informational territories, mobility, temporary uses of urban space, and post–mass media functions in HMDMCs that create new senses of places. This hybrid spatialization issues from PCGs through the creation of an informational territory and the overlap of physical and electronic space in temporary mobilities. PCGs exist because we have new territoriality: informational functions bound to physical places. We saw that PCG informational territories are precisely bound to the network characteristics, the devices used in the games, the type of relationships between these spaces, and the use of the place to achieve the game goal.

The most-played types of PCGs are LBMGs, i.e., games where players participate only in public space, using HMDMCs such as cellular phones and PDA and using cell networks (GSM and GPRS) and GPSs to control information. The spatialization process created by PCGs refers also to a use of space with physical and electronic characteristics and for “treasure hunting” or to “chase” and “fight” potential game enemies. Here, the imagery of urban space arises as an unknown public space where users must “find” something, or as a dangerous place where players must “fight the enemies.”

Put simply, PCGs use informational territories in physical places for ludic purposes, temporarily producing two functions of the space:
The use of the public space for the game’s goal—hunt, chase, puzzle, or strategy (the majority are hunt and chase)—i.e., the goal in physical space; and

The relationship between physical and electronic space, and the way to achieve the goals of the game in the physical space—via LBMG, MRG, or ARG (the majority of PCGs are of the LBMG type).

PCGs appeared in 2000 and were developed primarily in the U.S., U.K., Germany, and Sweden. PCGs combine physical and informational mobility and basically use the phone and GPS location for action in a physical space. It is in that context that a new role (play) arises and disappears in the place—the process of social production of space acting as an instrument for taking action with digital mobile technologies, networks, and sensors for communication and interaction between networks, objects, and people.

Notes
1. According to Kiefer et al. (2005), there are also other categories, such as discrete games in relation to space and time (which happen in a certain place and time), games that are only spatially discrete (these are time continuous: the place is given but the player can play when they want), and continuous in relation to space and time (game can start anywhere and anytime). I will not use these categories in this chapter, because it was not possible to determine these aspects in all games in the matrix.

2. Ben Russell’s “Headmap Manifesto” (1999) is the first articulation of a “location-aware device,” although he does not use the expression “locative media.”


5. I would like to thank Kim Sawchuk for her helpful insights here.

References
location-based game. In N. Davies, E. D. Mynatt, & I. Siio (Eds.), Nottingham, UK, UbiComp 2004: Proceedings of the Sixth International Conference on Ubiquitous Computing, September 7-10, 2004 (pp. 70-87), Springer.


Kiefer, Peter, Matyas, Sebastian, & Schlieder, Christoph. (2005). *Systematically exploring the design space of location-based games*.


Lemos, André. (2008a). In P. Arantes & L. Santaella (Eds.), *Estéticas tecnológicas: Novos modos de sentir* (pp. 207-230). São Paulo, Brazil: EDUC/SP.


