

Cities Simulation and Representation in Locative Games from the Perspective of Cultural Studies

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Abstract—This work aims to analyze the locative structure used by the locative games of the company Niantic. To fulfill this objective, a literature review on the representation and simulation of cities was developed; interviews with Ingress players and playing Ingress. Relating these data, it was possible to deepen the relationship between the virtual and the real to create the simulation of cities and their cultural objects in locative games. Cities representation associates geo-location provided by the Global Positioning System (GPS), with augmented reality and digital image, and provides a new paradigm in the city interaction with its parts and real and virtual world elements, homeomorphic to real world. Bibliographic review of papers related to the representation and simulation study and their application in locative games was carried out and is presented in the present paper. The cities representation and simulation concepts in locative games, and how this setting enables the flow and immersion in urban space, are analyzed. Some examples of games are discussed for this new setting development, which is a mix of real and virtual world. Finally, it was proposed a Locative Structure for electronic games using the concepts of heterotrophic representations and isotropic representations conjoined with immediacy and hypermediacy.

Keywords—Cities representation, city simulation, games simulation, locative games.

I. INTRODUCTION

THIS study aims at analyzing cities and its cultural objects representation and simulation with locative games and how this changes the player experience, by means of a literature review and analyses on some digital games and groups of players. By cultural object, we understand a signal or a fragment of it, physically identified in the city such as, a theater, a movie theater, a monument, a statue, graffiti, museums and buildings or its parts, which does not limit to conventional historical interests. Cities representation relates geo-location provided by the GPS with augmented reality and digital image and provides a new paradigm in the interaction with the city and its parts, real and virtual world elements homeomorphic to the real world.

“Technology has become our environment, and environmental factors obviously perform an important role in producing consciousness and identity [13].”

City and its cultural objects simulation in applications and digital games, and the number of people who use these resources immersing in these worlds cause reflections on the

relation of people with simulation just as the complex composition of the simulation, productive tension caused by its development and usage, and production of new meanings.

Computer games remains quite dynamic, and this dynamic does not resemble slow transformations, where researchers in social studies have been previously used to, but it seems to be assuming the form of a multistage revolution [23]. They demonstrate to be cybernetic systems with complex interactions between nature, technology and identity in a point of view defended by [13], making technology an element of our environment and nature.

The ability of storage, manipulating and recovering information very quickly with mobile devices, such as computers, laptops, tablets and smartphones in an almost omnipresent way combined with a network of great insertion that connects all of these devices, makes the line between what is real and what is simulated to be thinner. The GPS, the possibility of generating and processing 3D graphics in real time, the stereoscopic images for cinema, television and games, the new interaction systems for games with body movement, and the mobile devices open up new horizons for the interaction between real and virtual [11].

Spatiality in locative games does not correspond to simple pre-determined scenery exhibitions but consists of a translation from physical spaces to mixed and virtual spaces in which experience is mediated. All of the locative games have a level of environment incorporation since the narrative is directly related to physical locations instead of just sub-using space [13]. Other elements, such as texts, photographs and 3D images are combined with technological parameters for a playful and complex universe simulation in virtual or augmented reality. These factors, mostly noticeable in locative games, engineer a new geography in the electronic world according to their players' collaborative and memorized action through mobile devices.

Aiming at conducting this analysis, a bibliographic review of studies related to the representation and simulation study, and their appliance in locative games was carried out. The applied methodology along with the systematic review and case studies are presented on the next section.

Starting from the fourth section, the concepts of representation and simulation and this new space setting are discussed. The sixth section is directed to the games created by Niantic Inc. as examples of locative games inside this study's perspective. Lastly, the locative structure concept is presented, and the study is concluded.

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II. RELATED WORKS

Representation is the way to access the world controlled by rules, that means the representation is a component of simulation [13]. Complementing these data, simulation is an event triggering defined by the computer to enforce the state change [22]. This event triggering by the computer is a matter of feedback in high speed, access to huge database, interaction with a large number of minds generating a simultaneous perception of several opinions in every dimension of the associative thinking [30]. In this context, the US Department of Defense works with three modalities of simulation: live, virtual and created, which consist of the physical reality status variation and simulation between humans and systems. Hereinafter, the description of each modality [18]: “In a live simulation, real people operate real systems. For instance, a pilot who throws weapons from a real airplane on physical targets with the purpose of training, testing or evaluating the operational capacity is a live simulation. In a virtual simulation, real people operate simulated systems. For instance, a pilot flying a simulated airplane, throwing simulated weapons on simulated targets would be considered as a virtual simulation. In a created simulation, simulated people operate simulated systems”.

Among the simulation modalities, the player's experience provoked by a locative game consists of the combination of live simulation and virtual simulation. By importing these two modalities to locative games in live simulation the player and urban physical representation are contained [13], while the computational dynamics in order to generate a playful environment consistent with the locative game corresponds to virtual simulation [22], [30].

There are three relevant aspects to articulate simulation in the environment [18]: varied factors of interest under control, non-interest factors that might be varied, measurable, and uncontrollable factors. These factors imply directly in the military training statistic result, analyzed by them. However, for the locative games, these factors become possibilities to be worked for the player's experience construction. To base the development by an uncontrollable simulation besides discarding the reasoning ability to solve the challenge, may cause risk to the player's integrity. At this point, the randomness overlaps the locative nature of the game.

The impacts of these concepts set the urban scenery as a group of representative possibilities useful for simulation, which form a specific locative spatial coherence with no commitment to reality and delimited by time for the game action [8]. The ability, the humor and the player's attention contribute to the simulation creation for space setting [31].

It is possible to add one more element to the established dynamics between game and player - the narrative [41]. The interaction between players and the game narrative is a promising direction, since such aspect directly collaborates to the uncertainty aspect being able to provoke the players' curiosity to obtain new progresses [8], [41]. From this point of view, the represented object in a virtual context establishes several connections of meanings, able to be, moreover, competing to social normative. The games temporarily

provide delimited transgression opportunities in the virtual environment [42]. In this scenario, it is possible to imply the links between virtual and physical spheres established by simulation along with their consequences, for instance the construction of simulations of the physical world in virtuality, influencing old concepts and habits.

The mobile practices are particularly appropriate to connect each other to our locations, our historical moment and our social and political commitments [40]. Besides, the identities are reconfigured, social life is more complex and imaginative and the display of affection takes root in the virtual environment [30]. Using these concepts in this study, the representation is the basic unit to create simulation, and it corresponds not only to physical elements, such as streets or buildings but to seasonal elements like weather conditions. Representation and simulation of cities come from the unfolding of the differentiation between simulation and representation [13], the ‘peripheral appropriation’ and ‘centralized use’ of the mobile technologies [1], [3]. Simulation, necessity for state change [22] and levels of interactions offered by the game [18]. Besides, simulation was analyzed through the playful, narrative and environmental layers concepts [22], as discussed in fourth section. Technology enables the relation of all of these concepts [20], [13], [19]. The main concept that made easier the understanding of this new environment setting was the categorization in heterotrophic and isotropic space [29]. These concepts were adapted to the locative games. This new space setting [8], [15], [1]-[3], [9] entices the interest and attention of the player and causes the immersion expanding the dichotomy between real and virtual by the concepts of flow [10], usability [25], augmented reality [5], [6] and deep experience [26].

The locative structure proposed in this study consists of the merger of all of the relations to be able to engineer a dynamic locative proposal in electronic games. The key-concepts used to handle these questions were the mediation and hyper-mediation because of their work with the interface degree of interference between real and virtual space [7], [12].

III. METHODOLOGY

A bibliographic review on representation and simulation of space was made, especially in locative games to comprehend how these concepts are articulated and cause the player's experience. An exploratory research studying mechanics, design, narrative and technology of several locative games was carried out, with emphasis in games developed by Niantic since when it was a Google's spin off, besides interviews with Ingress players organized in social network groups like Telegram.

The bibliographic review was performed using the database of Ebsco Host, Capes journals, CiteSeerx and SSRN, which are portals that cover all of the principal scientific publications produced. To assist the review elaboration, aiming at seeking researches related to this study's field, the DECIDE framework structure was used [43]. The scope of this part of the research consists of understanding the difference between

simulation and representation, besides identifying the concepts involved in the construction of spatiality in locative games.

For this review, the following keywords were used: locative experiences, locative games, location-based games (LBGs), locative case, game culture, game studies, ingress, augmented reality, site-specific, urban games and hybrid games, spatiality. The keywords can be divided in three groups: keywords that relate cities and electronic games (locative games, location-based games, *lbg*s, hybrid games e urban games), cities (site-specific) and technology and culture (locative case, game culture, game studies, ingress, augmented reality, locative experiences e spatiality). Still regarding the grouping of cities and electronic games, it is not held back in technology and culture since the main motivation does not consists of a technologist approach.

After researching the keywords in the databased mentioned, a sample of 59 studies was obtained. However, only 26 were coherent with the research aims of approaching new concepts of space, representation and simulation. The other 33 studies which were overlooked for the thematic were not directed to the computational codes implementation and to teaching-learning processes.

Beside the bibliographic review, it was carried out a study on the game-play of the games produced by Niantic in association with Google, since Field Trip, going through Ingress and Pokémon GO. These games used Google Maps database with its images and texts associated to locations, besides strategies that engage the user to validate these locations, what is an important aspect to give credibility to the locative games. Several players were interviewed in Ingress, Niantic game groups and in social networks like Telegram. The players elucidate how the player's immersion and the active participation of the most awarded players happen in the game validation.

IV. CITIES REPRESENTATION AND SIMULATION

Representation translates concrete and abstract characteristics from the physical world to the virtual environment engineering a space setting according to the game narrative proposal. The purpose of representation is expanded, since its articulation is necessary to generate state changes [22]. In locative games context, this state change corresponds to the player's route through the real world space caused by the game mechanics that can be totally controlled, partially controlled and incontrollable. In totally controlled, all of the environment reactions are programed and expected [18]. In partially controlled, the set of determined representations reactions do not need to be stipulated by the game mechanics while in the incontrollable, everything is random [18]. Incontrollable mechanics might direct the player to a random route, prejudicing the game's narrative proposal, since it annuls the game's moves consistency. Consequently, the next space works as a feedback to certify the level of right hits in the payer's interpretation on the narrative proposal presented by the game.

The GPS system caused a disruptive progress in the geographic representation of the cities through maps. Until its

advent, these maps were designed using theodolites and aerial and satellite photographs, quite often with the help of laser to raise the precision. Even if they are stored in computer memories, this representation needed to offer more interactivity and accessibility for the user. Cities' streets and buildings representation by pictures or photographs found a new way of being exhibit with Google Street View, which enables 360° navigation of streets in thousands of cities around the world. Computer algorithm and processors enabled to perform cities simulation in real time by constructing avatars and objects whilst it interacts with the application with greater photorealism and mimesis of real world. In consequence, the mobile experience is categorized in 'peripheral appropriation' of these technologies [1].

Peripheral appropriation happens when the locative simulation is determined by different elements. Exemplifying this idea in a better way, the player is defied to move to a determined location to accomplish his/her goal; however, the game just presents a mission. It is up to the player to use a location-based service or to rely on his/her sense of direction through the city. For the centralized use, technologies and location-based services are implicit components in these mobile experiences [1], [3]. Ingress (2012) and Pokémon GO (2016) from Niantic are examples of locative games with centralized use in technologies and location based services. After the popularization of mobile devices, the peripheral appropriation games became rarer comparing to the ones of centralized use [1].

The simulated world implements representation with its main interface [13]. Representation is means for accessing simulation of a world controlled by rules. Therefore, cities and its cultural objects representation are the visual result of how its attributes are implemented in simulation with its set of possibilities for the users before the application rules.

It is necessary to comprehend how the simulation dynamics work through playful, narrative and environmental layers [22]. In locative games, the playful layer is an imaginative limit imposed by the game's player role to go through the space or group strategy, while in narrative layer these limits are defined as rules and mechanics. Finally, in the environmental layer, the physical and virtual are integrated to build itself a simulation for a technological support that in most of the times is cell phones. These concepts collaborate to expand the simple dichotomy between physical and virtual, since incontrollable criteria like traffic, temperature and rain in physical world might form several patterns, besides the game's rules.

In simulation, experience and knowledge are created by the players' actions and strategies more than by a writer or screenwriter [4]. The result of cities simulation corresponds to the mediation between representational urban visual attributes managed by the set of possibilities offered to the players by the applications. Therefore, each fragment receives a representative equivalent in the virtual sphere and a meaning mutation. Regarding meaning, this slip of the meaning is inevitable in the open semiosis of a culture [17].

The simulations improvement with the technology

development affects the way in which the cities are represented and how the player visualizes and interacts with the game before its rules and narrative. The first cities simulation in games emerged in mid-1980 with representation made seeing a ground plan of the city from above. A classic example is SimCity [14], which is a very popular city construction simulator released in 1989 with its more recent version in 2013.

In 16 bits generation games, defined on these terms because of the type of processor available in 1980, cities were represented in oblique view designs and simulation happened in a linear sequence, most of the times allowing only navigation from left to right on game screen. This setting was often used by this game generation helped by perspective and image layer tricks that simulated 3D scenery in the games called 2.5D. Among the examples of cities simulation, in games from this period, we have Streets of Rage and Golden Axe. With processors technology improvement on 32 bit and 64-bit generation, games reached simulation and 3D representation of avatars and game scenery that allowed a greater loyalty with real world mimesis improvement, starting at the 1990s [20].

Before smartphones even existed, an augmented reality game modality called alternate reality games (ARG) that happen in real time but use internet, telephone, traditional mail and emails to expand reality appeared. In general, the games' narratives are mystery narratives, guided by solving a charade that requires players to register themselves to find clues, which are both, online and in real world locations [13]. These games use transmedia narrative and the experience is characterized by a borders fusion between real world and the game's world. Transmedia narrative consists of spreading fictional components in several output channels with its proper characteristics to establish a unified and coordinated entertainment experience [21].

On locative games, cities representation by images is integrated in other information transmission (text, images, sounds or videos), which are made available by the simple user access or by proximity criteria [19]. The cities representation by images receives a metaphor to work in the proposed simulation by the games, which means to be coherent to the narrative and game rules generating new usages. These new usages, implicitly carry, not only a city image fragmentation but also geo-referenced data, access time, local frameworks, technical information on the mobile device, along with the game's features. The captured image, while interacting with the game database, can recover information regarding advancements, dangers and/or partners in proximity in real time. Before it, the player can take the most coherent decision for him/her concerning his/her movement through the city in parallel to the virtual world. An extra view of reality can arise interest to visit determine locations [19]. This way, urban property works as scenery and point of contact to access extra data to continue until task conclusion.

Augmented reality games expanded in types of games and genders with the use of mobile device and consoles with movement capture controls, both with sensors, processors and

exhibition devices already included. There are hundreds of examples with different artistic approaches and quality. The game Geocaching, for instance is a locative game that exists since 2000 when the American government released GPS signal for civilian population with same accuracy of military use. Players hide small boxes with items such as pencils and books inside of it and the goal is the other players to find these boxes, which have its geographic coordinates offered in the game (Geocaching 2017). Locative games that are based on user location, with mobile device GPS [16] and accelerometer use have become more popular with original storyline and innovatory experiences. Other games of the type have appeared since 2000, but neither of them used urban space like Niantic products, as it will be discussed on next sections.

Sometimes, there is a dissociation of real locations relevance because of the game rules. However, historical monuments and important buildings inside the city dynamics can only reach their original emphasis according to the players' strategies until the players apply the strategy historical monuments, old buildings, graffiti and house walls are all at the same level and are simple computer data.

V. ANOTHER SPACE SETTING

The heterotrophic space covers all of the daily complexity, while isotropic space is composed of coordinates dispersed around the environment and its merger happens by a third path, the accessibility space according to [29]. The accessibility space operationalizes the heterotrophic aspect of tangibility for an 'embedded experience' in the locative game. It can be inferred that this operationalization occurs both in representation and simulation sphere. In representation, the tangible environment is processed in an isotropic way, which means that its georeferenced coordinate, textual and image information create a repository of information. In simulation, the heterotrophic aspect of the locative game appears because in this moment the meaning is expanded due to the game's rules or technologies use, such as augmented reality.

The player's locative experience is established by the accessibility space that is constructed by the georeferenced locations and the cities heterotrophic information. With this data georeferencing by the game, a new reality is presented, simulated to present to the player, involving in other experiences. Inside this georeferencing process, the locative game translates the georeferenced locations and the heterotrophic information into a narrative challenge, transforming buildings and viaducts in portals or fighting arenas in real world.

Material space coordination involves an accessibility space adaptation, since the criteria that rule are different [2]. In determined contexts, the real distances of the material space are irrelevant to the accessibility space. However, this method of projecting accessibility space is nor a news neither an exclusivity of the digital environment. In 1933, the designer Henry C. Beck (1903-1974) outlined the London subway route, replacing the sinuous lines that corresponded approximately to the geographic route by strictly geometric traces with 45° diagonals to highlight the line and the sequence

of stations [24]. This accessibility space representation was able to communicate clearer - even not being loyal to geographic reality and the British capital flow possibilities - and inspired other projects around the world [24]. Although the illustration is analog, the concept is relevant, since in some cases it is expected until representation to be discrepant regarding the material space.

Spatial awareness is not the same between daily life and the act of playing [8]. It is necessary to comprehend the concepts involved in this spatial awareness in locative games perception and how they are used to engineer a simulation. Basically, the locative game dynamics consists of the coincidence between the location described by the game and the geographic location of the player. On this intersection, it is possible to classify such components in three spatial stages [15]:

- Imaginary space that corresponds to the environment that supports fictional events.
- Enunciation space related to the meanings of the visual attributes of representations.
- Material space that is the real world composed by every possible being.

Application of the spatial stages to locative games is inferred that material space's function is decisive to the players' decision making, since they carry the necessary actions to progress. This way, simulation is the result of the conflict between enunciation space in the city and the locative game's imagined space. According to this information, our relation with mobile devices will not be more distinct to other activities like in the games and city's daily life, that means we will be "incorporated in a computation sea" [2].

Place and space are different terms to the locative games context [1]. Space is an intangible concept that works as a support to the placement of an element, while place means the social relation on the space generating meanings that can be divided in [9]:

- Location that corresponds to geographic coordinates of an element in space;
- Place as the material setting and environment visual;
- Sense of place that refers to the meanings the place evokes.

The location concepts, place, and sense of place gradationally structure with more intensity to cities simulation in the locative games. The georeferencing of the referred place - location - together with its physical characteristics - place - works as a point of contact between the locative game and the user. By adding this process to the locative game, the sense of place is reached because the game delimitations involve the new senses to all of the involved components.

Most of the technological data are directly connected to geographic components, such as spatial coordinates or geographic meta-data [27]. However, this new setting does not limit to physical and virtual issues but to how these relations are established in representation and simulation. This information is unfolded in the digital interactive entertainment field with the locative game, what means it is a program that uses the physical world as material for representation and simulation creation in its scenery and narrative.

The locative games might be classified in three categories [32]:

- Mobile games: the game's events only happen with the meeting of two players. Their position does not need to be exact and the location communication is enough.
- Games sensible to location: the positioning is the main criterion to define the progresses and games' consequences.
- Games with facial recognition: In this case, the main criterion to define progresses and consequences is when the player's equipment is able to identify the environment where it is.

For these authors, these concepts are gradual because when the mobile games are contained in games sensible to location, the games with facial recognition contains the games sensible to location.

Another way of understanding space consists of the technological possibilities and its semantics articulation, together with a variety of purposes to hold people's attention. To help this analysis, the characteristic components of a pleasant activity were used [10]: possible tasks, clear goals, fast answers, deep involvement without effort, action control, safety and change in time perception. Aiming at a better application of these concepts to situation understanding of space simulation, they were segmented in three groups. The first group refers to classical usability: possible tasks, clear goals and action control. The second group refers to technology: fast answers. At last, the third group refers to part of the experience: deep involvement without effort, safety, and change in time perception.

About the first group: possible tasks, clear goals and action control correspond to usability aspect in space simulations. At this stage, simulation needs to offer an interface of easy understanding with consistent functionality and artistically appropriate to the user's profile. About the action control, heuristic of consistence and patterns is widely used to standardize activities regarding technical configuration of simulation and its main features.

The second group, fast answers are not topics that are important only on the great experience construction, but they are one of the key points to augmented reality [5], [6]. At this point, augmented reality appears as a real alternative because it holds a point of contact very explicit with the great experience. In this case, the great experience offers necessary requirements to augmented reality implementation pointing to the best answers through the information viewer coordinates.

Finally, the third group is more related to experience criteria. Deep involvement can be illustrated by observing amusement arcade players from Argentina's high concentration to the extent that they seemed hypnotized by the game considering that they were fixed before any event [26]. With a support to achieve this focused attention, safety is one of the decisive aspects, which consequently changes time perception. Expanding time perception, memory is a way of prolonging space that in some cases is completed by imagination. In experience, space is not limited to virtual or real aspects only but it directly suffers from interference in the

individual subjectivity [28].

VI. NIAN TIC GAMES

Niantic Inc. was a Google startup, formed in 2010 under the name Niantic Labs and became independent in 2015. Niantic developed Field Trip application and the games Ingress and Pokemon GO sequentially, all of them involving urban property and cultural objects of real cities. Each new release was possible through the cities and their cultural objects database improvement - developed by the company in partnership with Google- from the previous application and the used technologies [33].

The first application developed by Niantic was the Field Trip [36], from 2012, which used at its release time a repository of the company data with information and images of a reduced number of geo-referenced monuments. Initially, it only worked in The United States [34]. Nowadays, it works in several world cities that have maps from Google Maps and information on geo-referenced locations of interest. The field trip is like a tourist guide of the city, providing messages in text, images and voice to the mobile phone, locations of interest because of the architecture, lifestyle, historical or cultural importance, as well as restaurants, bars, movie theaters or outdoor art. These locations are listed in the mobile phone screen with images next to the names that identify the place. By opening the files, detailed information is presented on these locations, based on publications of specialized websites partners of Niantic. Locations of interest are marked by special icons and might be visualized in Google Maps inside the application's interface and by clicking on its icon, the same information on the place appears. The application detects when the user is driving and automatically "speaks" about places and experiences of interest in the neighborhood. In one of the operation modes, the field trip sends text or voice notifications to the user's cell phone when she/he comes close to one of the locations of interest [35].

The Ingress locative game was released in November of 2012, at first only for users who were invited and used the operational system for Android mobile phones. Different from Field Trip, it had a story and a mechanics. As a part of the game, the users were invited to take photographs of monuments and important locations in their cities and send to the game's producer, so in the future they could be a part of the game acting like portals. These references were added to the Google database to generate new information of locations of interest around the world. The players navigate in their neighborhoods capturing the locations of interest that are portals and developing tasks related to their geographic location.

The game's script bases in the idea that along with the discovery of the Higgs boson in CERN, a new type of matter called Exotic Matter (XM), was also discovered. The XM is being used to enslave mankind or to evolve in a higher consciousness depending on the player's option. Upon entering the game at the first time using the Google email to access it, the player must choose one of the two groups that compete in the game: resistance, the group who seeks to

destroy exotic matter and to make mankind free of exotic matter's control; enlightened, the group who seeks to control the exotic matter's power in order to expand mankind's conscience. Once she/he chooses a side, there is no way of changing it unless she/he starts again with a new Google email account.

The game's navigation uses a map of the player's neighborhood with its location and portals in proximity that were previously mapped in its interface. The portals are locations of interest in the real city, for instance a theater, a movie theater, a monument, a statue graffiti, museums and buildings or its parts and they do not limit to conventional historical interests. These portals began to be mapped before the game's release for the public by players who received an invitation to install it in their smartphones and play it, like information from Google. Portals mapping is still going on nowadays with suggestions sent by the players. All of the portals have geo-referenced images and information sent by the players.

The map is extracted from Google Maps and it is stylized with change of colors and information to create one of the game's interface option in a different city representation. In the map visualization, the player is identified by an arrow with a circle around it that considers the GPS precision. By physically approaching the portal and clicking on the location in the game's interface map, information and portal images appear on the mobile device screen with possibility of capturing score and weapons or to capture it entirely. Several capture missions are performed in groups that cover the referenced city places because of its cultural, historical or political importance for that community. According to what Tom Hatfield stated in a study when he joined a Resistance fraction group in London, there are cases of groups that rented a plane to go to a remote place in Alaska to capture portals and due to it, increase their control zone [37]. The game promotes events called Anomalies when the groups gather to accomplish missions that involve great distances and dislocation in the planet. In The Guardian study, there are some stories. He writes that Hanke is quiet open on the game's dependence in narratives generated by the player. He calls Ingress "an entertainment provider". "The game is the motivation itself. But, it is social interaction and geographic exploration that the game encourages what really breaks the tie", according to Hanke in the interview to Hatfield [37].

The game might be used as a tourist guide as it was discussed in many studies hidden to a distracted look, because of the details and curiosities on locations of interest in the city where the players must go. However, the most interesting aspect from the player's perspective is the social integration and geographic exploration like highlighted by Hanke in a true immersion that enables the flow in this mix of real and virtual world where the physical references refer to an equivalent portal in the virtual world, part of the augmented reality game. Many times, that leads to the loss of time notion and identity in a deep process of immersion. The flow is a state where people are so involved in an activity that nothing else seems to matter; the experience itself is so pleasant that people will do

it even at a great cost by the simple interest in doing it [38].

In some situations, the game enables the players to indicate places in the city to become portals, although there are acceptance criteria. According to Ingress Help, the portals have the purpose of promoting the players' community places such as places with historical, educational, architectural, artistic value or typical spaces [39]. Besides these criteria, Ingress requires the submission of an actual photograph in good quality to collaborate with the acceptance process. The Ingress Help states that the game does not accept as portals: places with no safe access to pedestrians, living beings, natural landscapes, seasonal constructions, other people's pictures, private residential property, fire stations, police stations, hospitals and elementary/high school buildings [39]. Portals validation check is not an Ingress exclusivity, the players can report portals through the game's interface by stating: non-existence, being in an unsafe location, not accessible to public, copy of other portal or describe another reason. Still on this interaction, Ingress enables the players to add photos and additional information that will be evaluated by the system to the portals already implemented.

Pokémon GO was developed in a Google-Nintendo partnership using the database and experience accomplished with Ingress, released in July of 2016. The player captures virtual objects in the named PokeStops to capture and train the Pocket Monsters so they can evolve in their lineage and compete in fights inside the Pokémon Gyms. The Pokémon appear on the mobile phone's screen as if they were in the real environment through a camera and the devices' gyroscope. This was a huge improvement regarding Ingress that used maps and photographs of the portals to be captured and not the camera image in real time. The PokeStops and Pokémon Gyms are located in the same portals of Ingress.

In these two games, Ingress and Pokémon GO, the players must move around the cities to get score and capture game tools moving in the city's cultural objects. With these places, mapped and available in a database in thousands of cities around the world, enables to glimpse other applications.

In the interview made with Ingress players who were in a Telegram gamers group, some of them pointed the necessity of more portals in the city's peripheral zones. Many of them need to move to more central regions using public transportation to be able to play. The mechanics established by the game goes beyond the two teams in the game because it is a way Niantic uses to feed its database using its public. Players of higher rank can suggest new portals and validate new portals that are not used just in Ingress but in Pokémon GO and other projects in the future. It is noticeable the similarity between the places mapped in Ingress and Pokémon GO by accessing both applications including the same photographs referencing these places.

VII. LOCATIVE STRUCTURE

The city is not only the urban environment but a network of social and cultural meanings referenced geographically, that means it is formed by heterotrophic representations - streets, squares, people - and isotropic representations - geographic

coordinates and technological infrastructure of services and devices. The heterotrophic aspects of the cities provide unusual options directly implying in the ecologic space identification. Still on the material space it is possible to analyze heterotrophic and isotropic representations through the perspective of immediacy and hypermediacy. Immediacy is when the environment and technology - the services and devices - establish a high level of symbiosis that is not possible to identify in an interface [7]. Hypermediacy is diametrically, what means the interface is emphasized on purpose [7].

Therefore, it can be inferred that the immediacy and hypermediacy are material space states ruled by the proximity conditions between the heterotrophic and isotropic representations. Immediacy happens when heterotrophic and isotropic representations are totally integrated with no limits defined, while in hypermediacy, the heterotrophic and isotropic representations are explicit on purpose, making necessary an interface to create a point of contact.

Because of the main characteristics of the main locative games like Ingress (2012), Pokémon GO (2016) and Harry Potter: Wizards Unite (2018), the hypermediacy state must be worked together with the playful, narrative and environmental layers proposal [22]. According to Ingress players, one of these patterns besides the game's rules, corresponds to the mosaic formation, however it is important to highlight the game's main mechanics. Ingress is a locative game where two faction compete for the territory control by accomplishing score in the city and delimitating an area of influence. Depending on the team members' enthusiasm, these locations make huge pictures on the map in a spontaneous way. Describing this activity through this study's concept, these mosaics are parts of a playful layer, since there are no game rules and let alone interfere in the achievements. They are a way of interfering in virtual space using physical world. The contrary, from virtual to physical is also noticeable because the system consistency establishes a pattern network in physical world. That makes the network a system, making available points of contact with the user in real world and engineers its mechanics to entice the desire on the players. In this line of thought, the importance is not on space division in virtual and physical, but on how these two dimensions relate to create new spaces and possibilities. This new space setting does not limit to routes definition but to how people will connect with new experiences [12].

VIII. CONCLUSION

Technological progresses concerning image computational configuration implied in a fusion between physical and virtual realities but they did not limit to these two aspects. These new space settings have these mixture dimensions. However, the most important part is how the fragments of real space are articulated with virtuality to arouse flow on the player. Real space encompasses a quantity of variable that lends a renovation of its mechanics to virtual space. In this concern, virtual space is a structure, while the real space covers it with its unpredictability.

At this point, the inconsistency is re-signified as a positive attribute to the users' interaction, what means the same path can assume any type of consequence because of the collaborative competition. The competition happens between the players ignited by the game mechanics and story, while collaboration involves the players and the game technological aspects. With this context, competition is a way of outsource the definitions that were performed by the artificial intelligence or by the game. Besides, competition between players provides a set of georeferenced data and temporarily designs this new interaction possibility in the virtual space. Augmented reality is a substantial strategy to reach flow because it offers an interesting possibility of mixing reality fragments with the game's mechanics in a screen with cell phones basic features. This interaction happens in real time through the registration of the geographic location and provides a feedback that implies directly with the game progresses, in normal conditions.

This new panorama is a hybrid between physical sign and algorithm that creates a complex network of new meanings and a mix of possibilities practically infinite. It is speculated that with a more intense computerization of urban fragments along with the locative game mobile technology development to be more integrated in physical reality.

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