

THE DECLINE OF VIRTUAL REALITY AND THE RISE OF AUGMENTED REALITY

-A DIGITAL RESHAPE OF PUBLIC SPACES-

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Abstract

The development of virtual reality over the last century supported a slow shift of activities from the public space towards the private one. However, virtual reality offers incomplete sensations and less face to face social interactions, which reinforces the need for public spaces. Augmented reality is an emerging technology able to better connect the two realms: the virtual and physical reality. This article aims to briefly explain the shift from virtual reality towards augmented reality and the effects of this process on the public space. The focus will be on the ways that augmented reality can improve the attractiveness of contemporary public spaces by strengthening its essential features, such as: access to information, playfulness and adaptability. In order to be competitive and attractive public spaces have to evolve and adapt to the new trends, of which ICT is one of the most significant.

Keywords: Public space, augmented reality, virtual reality, digital spaces, social interaction.

1. A QUICK GLANCE ON THE EVOLUTION OF THE RELATION BETWEEN PUBLIC SPACE AND VIRTUAL REALITY

The evolution of what we nowadays call public space can be described in many ways. Since this article will focus on the relation between public spaces and ICT (Information and communication technology), the perspective of Gernot Riether [1] is maybe the most appropriate. He splits the history of public space into two distinct periods "pre-internet times" and the "era of digitalization", based on the accessibility of information.

In the "pre-internet times" public space had the role of informing and keeping people up to date while being the main place for debate, more precisely "a domain of our social life in which such a thing as public opinion can be formed" [2].

The era of digitalization gradually extended this place of information and debate into the private realm. Television, internet and other media devices connect people to information reducing the need to leave home and supporting the rise of home working. This easy and convenient way to access information, or "commodification of information" [3] diminished the role of public space which cannot offer the comfort of delivering these resources without the cost of "space and time". The emergence of new media, as defined by Lev Manovich¹ [4], widened the gap between public and private realms by providing access to customers, from their own homes, to a wider range and a higher quality of entertainment and communication services. The possibility to satisfy needs such as access to information, entertainment, social interaction (social media and the rise of interest based communities) and even shopping from home diminished the interest towards public space which was mostly used to access this services.

In this context, contemporary public spaces have to evolve and establish a better connection to the virtual reality.

2. THE RISE AND FALL OF VIRTUAL REALITY AND ITS EFFECTS ON PUBLIC SPACE

Virtual reality, as defined by Brooks [5]: "*Any experience, in which the user is effectively immersed in a responsive virtual world*", is one of the major competitors of physical public spaces. I added the notion of physical to public spaces, because connecting the possibility to generate virtual environments with the ability to communicate and the omnipresence of multiple persons in the same realm are the basics of what we call "virtual public spaces". So here we are, we generated a virtual environment populated by "virtual communities" [6] acting as a complex parallel world. Multi-User Simulated Environments or Massively Multiplayer Online games (MMO's) like World of Warcraft (10 mil. users), Diablo or Second Life (approx. 60.000 users) are good examples of how attracted people are to these new virtual public and private spaces. After a fast rise in population, these complex virtual environments have started to decay over the last years and lost massive amounts of users. World of Warcraft alone lost 1.3 million account holders in 2013. Albeit there are many reasons behind this slow decline of virtual reality, the article will focus on only one aspect: the lost connection between virtual reality and physical reality.

¹ According to Lev Manovich, new media is characterized by the following principles: numerical representation, modularity, automation, variability and cultural transcoding.

Reality is perceived through our 5 senses: sight (ophthalmoception), hearing (audioception), taste (gustaoception), smell (olfacoception or olfacception), and touch (tactioception). Virtual reality relies on only two of these senses (sight and hearing). Therefore, the presence in virtual reality will amplify one's focus on these two senses, while the other three senses still remain connected to the physical reality, but conceive it in a diminished way.



Fig.1. A caricature depicting a common behavior in public spaces by Angel Boligan (<http://ioanaradu.com/defectele-noastre-capturate-in-caricaturi-umoristice/>)

The way our perception works when we are present in a virtual environment affects our behavior in the public space. New technologies such as smart phones and tablets allow us to be connected to the virtual reality while being present in the public space. This duality forces us to focus our perception on only one environment or its aspects at a time. A good example in this sense is the fact that we often see people in public spaces staring into their media devices without realizing what happens around them. Tali Hatuka, the head of the Laboratory for

Contemporary Urban Design at Tel Aviv University, is studying the influence of smart phones on the perception of public spaces. One of the main remarks she made is that fact the smart phone users tend to develop a kind of privacy feelings while focusing on their devices even though there are present in a public space. "It's very interesting to see that some of the basic ideas of public spaces are conceived totally differently by smart-phone users," [7] Hatuka says. According to Mrs. Hatuka's research, people barely perceive the places they pass through when using their smart phones and therefore they can't really memorize their physical shape, neither are they engaged in social interactions. This lack of face to face social interaction is also mentioned/ pointed out by Sharon Zukin in the *Electric Signs* (2012) documentary where she states: "Space is valued because we are all in it but how is that true if we are all in cyberspace". Distraction by smart phones is also an increasing cause for pedestrians getting involved in traffic accidents [8]. This type of injuries have doubled over the last year in New York, the main reason for authorities like Transportation Secretary Ray LaHood to impose a ban of smart phones for pedestrians crossing the street. In "DOMESTI/CITY" Keiichi Matsuda also considers the weak relation with physical reality as being one of the major weaknesses of virtual reality and mentions that: "collaborative, imperfect but developing environment is preferable to a simulated 'ideal' space." [9]. To conclude, this incomplete sensorial information that virtual reality offers (using only sight and hearing) and its weak connection to physical reality are some of the main reasons why it loses ground to new technologies such as augmented reality. The later succeeds by yielding a better connection between the two realms (physical reality and virtual reality). On the other hand, people tend to realize that dependency to virtual reality is dangerous and even more: they start to look for a better connection to reality and value face to face social interaction. This context favors the rebirth of public spaces as main places for social interaction.

3. WHAT IS AR AND HOW DOES IT "SHAPE" THE CONTEMPORARY PUBLIC SPACE?

Augmented reality is a rapidly developing trend that already influences significantly the perception and use of public spaces. Augmented reality is a mix between virtual reality and physical reality and consists of virtual elements that are rendered through various devices, overlapping the physical, visible reality by using geo-referencing. Augmented reality has three essential features: 1. combines real and virtual elements; 2. is interactive in real time; 3. is registered in three dimensions [10]. Relating this new technology to urban space, Lev Manovich develops the concept of "Augmented Space", which he defines as: "the physical space overlaid with dynamically changing information. This information is likely to be in multimedia form and it is often localized for each user." Therefore "Augmented Space" is a combination between augmented reality and David Benahum's *Cellspace*². Manovich's concept highlights the dependency of augmented reality to the connection to internet or geo-location services. However, as the next paragraph shows, augmented reality can also be projected without these two features.

² The idea of *Cellspace* developed by D. Benahum, is a virtual space generated through the use of cellular phones while being connected to the internet.

Augmented reality has to be registered in three dimensions and therefore has to be referenced to real objects for a good merge with reality. At the moment there are two methods through which augmented reality elements can be rendered upon reality: 1. Qr codes³; 2. GPS. The overlaid object is projected using the reference data from Qr Codes; for larger objects or mapping augmented reality has to use GPS technologies for rendering. The fact that augmented reality is not only related to reality, but is built on it, is its major competitive advantage when compared to virtual reality.

To be able to use augmented reality we are relying on devices such as: smart phones, tablets, PDA⁴ or the new "Google Glass"⁵, which enable us to see the rendered objects. Smart phones and tablets are widely spread (1.1 billion. smart phone users with a 100% increase estimated for 2015 [11] and a large amount of people have access to these devices. PDA is a not so often used device, but, combined with augmented reality technology, it faces significant development opportunities. Google Glass, one of the most disputed technologies of the last two years, has the potential to be the breakthrough tool for augmented reality as it makes rendering information much easier. This head mounted optical display has the possibility to augment reality by using a miniature wearable computer engine. Compared to other devices, Google Glass has the ability to deliver augmented reality in a much more comfortable way. Users can see the augmented objects whenever they wear the device, which is more attractive and easier than watching reality through the screen of a smart phone, tablet or PDA. However, Project Glass⁶ has a difficult step to overcome before it can enter mass production. Its possibility to record without being noticed is a huge concern for privacy [12], a fact that transforms it into a surveillance and sousveillance⁷ tool. According to Shaq Katikala [13], Google Glass brings up three major issues when it comes to privacy: 1) access to your subconscious which gives Google precise information about what you are looking on; 2) you can act as a "surveillance camera" considering you can record anything that happens around you and, for example, police can demand access to that information or you can record in forbidden areas without being noticed; 3) a hacked Google Glass can deliver various private information (for example your credit card number you saw with your device).

Therefore, overcoming privacy issues is a priority for Google Glass-like technologies and one of the reasons why, according to Gartner's hype cycle⁸, the expectations towards augmented reality decreased from 2012 to 2013. Augmented reality is in the "Disillusionment phase", something similar to a testing phase, when various producers try to apply this technology and market it. The expectations

³ A Qr code (Quick Response Code) is similar to a bar code and when scanned by a device (ex. smart phone) it can link to specific information, generally to a website.

⁴ Personal digital assistant

⁵ Although there are several other devices that offer similar services like "Google Glass" I did consider this as first option due the fact that it is the only one available on the market (even if stocks are limited).

⁶ Project Glass is the project developing Google Glass.

⁷ Sousveillance refers to recording of an activity by a person that is also involved in that activity. For example a mountain biker that records his contest lap using a head mounted camera.

⁸ Hype cycle is a specific graphic used to present the evolution, adaptability and market potential of new technologies. This article relates to Gardner's hype cycle, the graphic developed by one of the most renowned research companies in the field of ICT.

should be met in 5 to 10 years, when augmented reality should have a clearer description, as well as a better idea and indicators of its beneficial or harmful effects. Mass production of technologies such as Google Glass⁹ will have a major role in the "Disillusionment phase", enabling the next generation of augmented reality. This step should refer to a more domestic use of augmented reality, as K. Matsuda presents it in "Domesticity", where close future life is improved by various augmented layers that either give additional information to everyday objects or just improve the aesthetics of our surroundings.

Augmented reality can also be shown using simple screens. Various elements can be projected onto the visual information delivered by, for example television. Maybe the most familiar example is the offside line projected over the game field during soccer matches. Starting from this basic idea various augmented reality applications were developed. A good example is the National Geographic campaign in London trying to bring people closer to creatures that once lived on earth or today's rare animals. Within a mall, a semiprivate space, they placed a camera recording a specific area marked with the National Geographic logo, where people gathered. While recording, the device was augmenting animals over the initial images, broadcasting the modified video on a large screen. People could see themselves surrounded by ice bears or tiny raptors, and started to take photos of themselves among the augmented objects. This intervention managed to attract a high amount of people, all willing to virtually engage with the augmented animals and thereby boosting the attractiveness of the place.

In order to better understand the influence of augmented reality applications on contemporary public spaces, the article will present several opportunities AR offers for the improvement of the public realm. In this sense, three major features of public spaces that can be improved using augmented reality technologies were identified: 1. access to information, 2. playfulness and 3. customization/adaptability.

Information

We often wander through the public space and see things we don't really understand or we just need information. Modern technologies allow us to add the desired information on virtual layers, accessible through the internet. For example, a building can be perceived on site, but can also have a digital identity on the internet, where it can be presented in a detailed manner or from different perspectives. Rarely can we find out insights about a building's history directly on site, maybe from a brochure or a book; however, we can easily access this information online.

For example, Cellspace (D. Benahum 1998) enables the access to a virtual layer of information on site by using mobile technologies. Augmented reality has the capability to visually link the physical appearance of cities with the data behind it. Augmented reality applications can allow us to access additional information about a building when looking at it (for example looking for rooms for rent within a building or property for sale, features provided by Homespotter). They can also help us navigate through the city and find specific points of interest like Nokia's city lens does. A project presenting historical aspects of public spaces was developed in Romania. Cronobitor, a new media company, developed an augmented reality application named Colorbitor, allowing visitors of the Revolution

⁹ BC "Heavy" Biermann even predicts future steps of augmented reality as contact lenses of even chip implants.

Place (Piata Revolutiei) in Bucharest to see how the area was looking 30 years ago. By scanning a Qr code on the pavement, users can download the application which augments the past over the physical reality. Colorbitor helps people to better understand the past of this historical place by offering a more complete and realistic perception of it.

There is a fast growing number of other augmented reality applications that manage to visually link virtual data to reality in public spaces. Starting from the public space of debate in the Greek city, to contemporary public spaces as portals to the internet, access to information plays an essential role in society and remains an essential feature of competitive public spaces.

Playfulness

Fun, entertainment and joy are things we often miss in public spaces and one of the reasons why we tend to continue playing games on personal mobile devices. By fulfilling this need using virtual reality we distance ourselves from the physical environment and the chance for face to face social interactions. Therefore, a main goal of attractive public spaces is unmet. The lack of playfulness in public spaces is starting to be fought by various new urban interventions. Such interventions were also recorded by the "Pop-Up City" team and presented in "Urbanism Made To Like" [14] as an important contemporary trend. Small interventions such as the transformation of a recycle bin into a basketball hoop, as "The WA"¹⁰ did in Marseille, can upgrade public spaces by adding new playful interactions.

Augmented reality fits well into this scheme, as it can answer the ongoing need for entertainment and support face to face social interaction. Playfulness can be added to public spaces: it can be augmented over them. There are already several new augmented reality applications which are bound to public spaces, aiming to offer a more realistic game play. The positive side effect is that they manage to also make public spaces more attractive for people.

Ingress, an augmented reality application developed by Google, builds a game directly related to our cities. This time it is not a game that happens in a virtually-constructed city, but it is a game built upon the city, as a new layer of information. The application relies on a layer of points of interest correlated with objects in reality that have to be visited by the player in order to advance in the game. The player can interact with several points of interest in the city by using the smart phone or tablet. When scanned by the device, the object offers game-specific information and can be activated. Ingress may look like a typical Massive Multiplayer Online (MMO), however it happens in two parallel but interconnected worlds (reality and virtual). One of the main goals of the developers was to bring people back to the public realm and to make them discover their city from another perspective. By bringing players to specific places, such as, for example, the library, the game manages to let them discover unknown or unfrequented parts of the city. This is also one of the main reasons why players choose the game, in order to better understand and discover their city. Similar to this example Layar, one of the main augmented reality applications, developers created a game for Animest, the short animations festival in Bucharest. In order to win tickets for the festival, people had to explore the city while using the Layar application to "hunt" augmented sheep using a radar.

¹⁰ The Wa is a small organisation developing experimental projects for public spaces around the world, using art in order to make them more playfull and socially equal.

Augmented reality games start to be more and more attractive by promoting a better relation to reality, while also managing to promote public spaces by using them as gaming environments. This new way of interacting with public spaces sometimes also educates citizens in a joyful manner and motivates them to explore and better understand their cities.

Customization

Public spaces have to fulfill the need of an increasing diversity of people, each of them having different habits, traditions and using this common ground in various ways.

The private realm, our homes, our workplace, can be shaped by us and tailored to our specific preferences. Therefore, customization is an essential step towards attachment and appropriation of a place. On the other hand, public space design has to accommodate the needs and potential preferences of a large variety of users. In this context, a way to better understand the users' specific needs and to better adapt the public space is using participatory design methods.

Augmented reality can bring the desired chance for customization through its ability to overlay information upon physical reality or even to visually edit reality. For example, one often addressed problem of public spaces is the "visual pollution" by the overwhelming amount of billboards. "Time Square Art Square" foundation is gathering funds to transform the famous Time Square from New York into an open art gallery by temporary replacing the billboards bordering the place. A similar project, with similar goals, was built by Julian Oliver and relies on an augmented reality application. By localizing, referencing and indexing the billboards in the surrounding public space, this application manages to overwrite them with distinctive art objects. By installing Artvertiser you can place your smart phone or tablet to overlap the image of a billboard, and it will be immediately replaced by a piece of art. The project also includes a hardware part, the "Artvertiser binoculars", also used to replace the ads with art. Going further with this idea, using augmented reality we can improve or customize various visual disturbances within the city and, even more, we can better adjust the aesthetics of specific public spaces to our own preferences. Public consultation and the design processes can be improved using augmented reality, by augmenting the proposals over the existing sites for a better understanding.

The abovementioned features that augmented reality technologies can add or enhance when it comes to the contemporary public spaces may bring improvements in terms of attractiveness, but do not completely remove the harmful effect of the shift away from reality. New games and applications, even if bound to reality, will increase people's dependency on ICT devices, widening the gap between the traditional citizen and the contemporary media citizen¹¹. The distraction and the diffusion of senses are diminished in AR as compared to virtual reality, but are still present. Using augmented reality we can visually perceive the physical reality, our surroundings, but our view is still focused on the inserted augmented objects. This is why, for example, there is a debate whether or not augmented reality should be allowed while driving, because, while it can provide useful information, it still distracts the driver. Another problematic aspect of augmented reality, which applies to most of the new technologies, is the fact that it segregates. Not all people have access to these new tools or are ready to

¹¹ I consider the media citizen as a person which is familiar with new technologies (ICT) and uses them on a daily bases.

understand and use them. Therefore, even if we manage to better correlate the physical part of the city with its virtual aspect and manage to show it in a more realistic way, some people won't have access to this new layer of information. Not everyone will perceive public spaces in their large complexity. Moreover, trends show that the offline, traditional face of public spaces will still remain attractive. For example, this is the reason why "No Wi-fi zones"¹² became a rapidly evolving trend. All these difficulties and risks have to be considered when developing future hardware and software tools based on augmented reality in order to successfully enhance the attractiveness and usefulness of public spaces.

4. CONCLUSION

Access to information, playfulness and customization (adaptability) are some of the main characteristics of what we could call: the portrait of a successful contemporary public space. These features can be brought into the public space without having any physical interventions, by using augmented reality. This new technology can greatly increase the usefulness (information) and quality (playfulness) of contemporary public spaces, while also increasing their efficiency in meeting our personal needs and expectations (customization). However, augmented reality is still in the development phase, and even though it is built on the weaknesses of the virtual reality it doesn't manage to mitigate them completely. Visual perception while being connected to the internet in public spaces will be improved but the easy access to information will make more and more people dependent of this new technology, widening the gap between users and non-users of augmented reality and the ways they perceive and use the city. Hardware similar to Google Glass plays an essential role in reaching the next step, in which augmented reality can be used in a more comfortable way. Cities and particularly public spaces will have to adapt to this new trend and make sure they improve or develop their digital identities, making possible for users to connect to them in order to access additional information. In conclusion, it is desirable for contemporary public spaces to start a digital reconstruction, linking virtual and physical reality to address and engage larger audiences.

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¹² The trend became visible by the Kit Kat advertising campaign that developed several for 'No Wi-Fi' zones.

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