

March 2023

AUGMENTING LANDMARKS: EXTENDING “PLACES” IN THE HYBRID CITY

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Recommended Citation

MOUSTAFA, MOHAB N.; ASHOUR, SHAIMAA S.; and BAKIR, RAMY A. (2023) "AUGMENTING LANDMARKS: EXTENDING “PLACES” IN THE HYBRID CITY," *Architecture and Planning Journal (APJ)*: Vol. 28: Iss. 3, Article 46.

DOI: <https://doi.org/10.54729/2789-8547.1241>

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Abstract

Several recent technological advancements are substantially altering how we interact with urban spaces. The existing physical space as we know it now encompasses a plethora of emerging realities into which we shift in and out, resulting in what is called Hybrid Spaces. Augmented Reality (AR) today gives way to forms of hybrid realities that are accessible through our handheld devices, and which allow us to engage with our physical reality in a new way. These devices allow us to access and view digital information that is saturating our urban spaces, and yet appear invisible to the naked eye. When this information is localized, it can be used to augment physical space with virtual overlays. These augmentations may become physically linked to the environment, establishing virtual landmarks that could only be accessed via these handheld or wearable digital portals through digital applications. This gives way to new forms of engaging in real-time with our socio-cultural daily activities. The literature shows that urban space is reimagined through augmented reality (AR) which plays a significant role in introducing new augmented “places” supporting our physical ones as hybrid realities. This paper, accordingly, investigates the notion of location-based AR experiences on landmarks in the urban space in accordance with our spatial memory, and how augmented reality through mobile devices, plays an important role as a gateway between our physical space and the virtual one. It also seeks to understand how these augmentations might insert and employ symbolic or personal meanings to the space, based on our different interpretations. In doing so, we conducted an integrative analytical review of the most recent literature, to study the forms of augmentations in multiple cities, and how they are used as agents in our spatial experience. The paper then introduced a framework that could be used to assess users’ satisfaction and the design considerations of the AR spatial experience. Finally, the paper adopts a few recent AR practices to be assessed by the proposed framework.

Keywords

Hybrid Space, Augmented Reality, Virtual, Landmarks, Mediating.

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ABSTRACT

Several recent technological advancements are substantially altering how we interact with urban spaces. The existing physical space as we know it now encompasses a plethora of emerging realities into which we shift in and out, resulting in what is called Hybrid Spaces. Augmented Reality (AR) today gives way to forms of hybrid realities that are accessible through our handheld devices, and which allow us to engage with our physical reality in a new way. These devices allow us to access and view digital information that is saturating our urban spaces, and yet appear invisible to the naked eye. When this information is localized, it can be used to augment physical space with virtual overlays. These augmentations may become physically linked to the environment, establishing virtual landmarks that could only be accessed via these handheld or wearable digital portals through digital applications. This gives way to new forms of engaging in real-time with our socio-cultural daily activities. The literature shows that urban space is reimagined through augmented reality (AR) which plays a significant role in introducing new augmented "places" supporting our physical ones as hybrid realities. This paper, accordingly, investigates the notion of location-based AR experiences on landmarks in the urban space in accordance with our spatial memory, and how augmented reality through mobile devices, plays an important role as a gateway between our physical space and the virtual one. It also seeks to understand how these augmentations might insert and employ symbolic or personal meanings to the space, based on our different interpretations. In doing so, we conducted an integrative analytical review of the most recent literature, to study the forms of augmentations in multiple cities, and how they are used as agents in our spatial experience. The paper then introduced a framework that could be used to assess users' satisfaction and the design considerations of the AR spatial experience. Finally, the paper adopts a few recent AR practices to be assessed by the proposed framework.

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ملخص

تعمل العديد من التطورات التكنولوجية الحديثة على تغيير كبير في كيفية تفاعلنا مع الفراغات الحضرية. يشمل الفراغ المادي الحالي كما نعرفه الآن عددًا كبيرًا من الحقائق الناشئة التي تتحول إليها ونخرج منها، مما يؤدي إلى ما يسمى بالفراغات الهجينة. ويفسح الواقع المعزز اليوم المجال لأشكال من العوالم الهجينة التي يمكن الوصول إليها من خلال أجهزةنا المحمولة، والتي تسمح لنا بالتفاعل مع واقعنا المادي بطريقة جديدة. تسمح لنا هذه الأجهزة بالوصول إلى المعلومات الرقمية التي تشبع فراغتنا الحضرية وعرضها، ومع ذلك تبدو غير مرئية بالعين المجردة. عندما يتم ترجمة هذه المعلومات محليًا، يمكن استخدامها لتعزيز الفراغ المادي باستخدام التراكبات الافتراضية. قد تصبح هذه التعزيزات مرتبطة ماديًا بالبيئة، مما يؤدي إلى إنشاء معالم افتراضية لا يمكن الوصول إليها إلا عبر هذه البوابات الرقمية المحمولة أو القابلة للارتداء من خلال التطبيقات الرقمية. ويفسح هذا المجال لأشكال جديدة من الانخراط بطريقة متزامنة مع أنشطتنا الاجتماعية والثقافية اليومية. تُظهر الأدبيات أن الفراغ الحضري يعاد تخيله من خلال الواقع المعزز الذي يلعب دورًا مهمًا في تقديم "أماكن" جديدة معززة تدعم أماكننا المادية باعتبارها عوالم هجينة. ووفقًا لذلك، تبحث هذه الورقة البحثية في فكرة تجارب الواقع المعزز القائمة على الموقع وتأثيرها على المعالم في الفراغ الحضري ووفقًا لذاكرتنا المكانية، وكيف يلعب الواقع المعزز من خلال الأجهزة المحمولة دورًا مهمًا كجوابية بين فراغتنا المادية والفراغ الافتراضي. كما يسعى إلى فهم كيف يمكن لهذه التعزيزات أن تُدخل وتوظف معاني رمزية أو شخصية في الفراغ، بناءً على تفسيراتنا المختلفة. وقد أجرينا في هذا الإطار مراجعة تحليلية تكاملية لأحدث الأدبيات لدراسة أشكال التعزيزات في مدن عدة، وكيفية استخدامها كوكلاء في تجربتنا المكانية. وقد قدم البحث بعد ذلك إطارًا يمكن استخدامه لتقييم رضا المستخدمين واعتبارات التصميم للتجربة المكانية للواقع المعزز. ثم تخلصت الورقة البحثية إلى تبني بعض ممارسات الواقع المعزز الحديثة ليتم تقييمها من خلال الإطار المقترح.

الكلمات المفتاحية: الفراغ الهجين، الواقع المعزز، الافتراضية، المعالم، الوساطة الرقمية.

1. INTRODUCTION

Cities are full of imagery with various cultural connotations. These visuals are personal interpretations in one's imagination that help us become accustomed to unfamiliar spaces. Space is the boundary into which we commute and go about our everyday lives. Exploring new foreign spaces is seen as a difficult cognitive effort, particularly in metropolitan areas (Axon & Speake, 2012). We employ our cognitive processes to move from one location to another, yet technology enables new hybrid realities to emerge alongside our physical ones. Cities nowadays are not only rich in physical sights and landmarks, but also in digital information associated with specific locales, resulting in the emergence of new emergent environments. A recent common form is the augmented space which hosts virtual overlays attached to the physical space multimedia in form (Manovich, 2006), only accessible through an electronic device.

Our handheld mobile devices now host plenty of applications that use augmented reality for navigation and gaming purposes. What's more interesting is that some of these applications are location-based software, which means that it could only be used based on one's location in an urban space. AR research and studies have long been concerned with the ramifications of such technology on user experience, as well as how to address the technological challenges confronting this kind of mediation to benefit us. Few studies, however, looked at AR as a design tool. This study represents the satisfaction and socio-cultural preferences of users in an AR-based environment, as well as the design considerations to make for an optimal spatial experience. This technology is being employed in many cities and metropolitan areas to improve users' mobility. This study aims to discover how these augmented landmarks affect our navigational aid and cognitive behavior. Also, to comprehend the nature of these augmentations' relationship to our built environments, as well as how they may insert symbolic or personal meanings into the space as we perceive it. A matter which raises very important questions: (A) would these augmentations after time, become constructed in our minds as mental images too? (B) How would these location-based augmentations affect our spatial memory? To answer these questions, this study will adopt certain academic research to form an integrative framework and use it to reflect on a few chosen private sector projects that use augmentations on existing landmarks.

2. HYBRID SPACES

It is challenging to commute in a city featuring digital and virtual overlays. Several researchers and authors sought to investigate the influence of such augmentations on our spatial experience in the built environment. (Qureshi et al., 2018) investigated how virtual, augmented, and mixed realities assist users to explore and enrich their experience of a city's rich history, phenomenology, and culture. Qureshi emphasized how technology, although "liberates" us, both restrict how we travel about the city. GPS is a typical case of how we follow specified directional routes that regulate our movement.

Due to its effectiveness and efficiency, GPS has lately become an important tool for mapping and surveying digital maps and has largely superseded other mapping methods. A feature that assists our understanding of the surrounding urban fabric and the most prominent landmarks, yet users assisted with mobile map GPS systems and have access to technology find it more difficult to orient, perform cognitive tasks, and acquire spatial knowledge in urban spaces than non-assisted users. (Ishikawa et al., 2008), (Willis et al., 2009).

Mobile devices are utilized to imbue physical spaces with digital information attached to precise locations. Because of the built-in location-aware technology in these devices, users may interact with one another depending on their relative proximity by viewing each other's positions on a map that can be accessed from a mobile phone screen. A "Hybrid Space" connects people (nodes) with mobile devices that are always connected to the internet (paths) and other users. This is the space where nodes, or "people," are organized and networks, or "communications,"

are established (de Souza e Silva, 2006). If we have access to the internet, we may access public places as well as information about them.

Augmented Reality is used in too many forms in the urban space, one common form is the Augmented Reality Navigation Applications (ARNs). (Huang *et al.*, 2012) examined the influence of different interfaces of ARNs on spatial knowledge acquisition. The findings showed that while AR navigation had no bearing on wayfinding, it had a negative impact on how well users acquired spatial information. However, a different study discovered that while being quite useful in knowledge-gathering, AR users tended to focus less on landmarks and displayed a lesser reaction in their visual behavior (Dong *et al.*, 2021).

ARN apps, whether developed by individuals or authorities, may be useful tools that play an essential part in our knowledge-gathering and way-finding processes. Artists, historians, and urban planners, on the other hand, employ AR technology to augment the historical and socio-cultural perceptual experience of visitors to the city. Artwork frequently reflects these efforts to conserve cultural heritage. This demonstrates that augmented reality (AR) plays an important role in reshaping urban space and providing new augmented "places" as hybrid realities that enrich our physical ones.

3. AUGMENTING SPACES

(Manovich, 2006) investigated augmented spaces as paradigms that artists and architects should consider as 'substance' rather than simply an unseen space or 'vacuum.' He wanted to determine whether these virtual overlays are as significant to our spatial perception. He discussed how to add significant layers of data to a real physical location without altering the experience to overcome this issue and design it like we would in an architectural dilemma. Manovich's Poetics of Augmented Space inspired the hypothesis that virtual augmentations might have a substantial influence on how current data space is physically structured.

He also explored how the augmentation of space influences the profession of architecture. The architect overcomes physical challenges and begins integrating virtual things into that space; the critical issue is how to merge layers of data with actual space. (Shafer, 2018) investigated the ontological nature of AR Points of Interest (POIs) temporally localized across the world, referring to them as "unseen hubs" in a constantly connected environment. Using qualitative arguments and contemporary AR activities, the research aims to frame these AR POIs as objective "wilderness" that may co-exist by artists without us being aware of their presence. For instance, a street painter who creates graffiti art on outdoor urban walls or fences may now employ augmentations of these artworks to only be visible through "digital media" on the streets without degrading the quality of the physical place.

In 2017, J. Jin investigated augmented spaces in more detail as fresh platforms for socio-cultural experiences (Jin, 2017). She suggested narratives in which we would employ AR technologies and "re-conceptualize" augmented space to create immersive engaging environments within physical spaces. These narratives are formed by three key elements. First, "bridging the physical and digital", which is to combine the physical environment with the digital data, or in other words, combining the real with the virtual. Second, "mediating social and cultural changes", that result in people using augmented spaces in more socially and collaboratively engaging ways. Third, "place-making" involves changing a space into a place by including actions and activities, meanings and interpretations, physical characteristics, the lived experiences of individuals and social groupings, and cultural aspects. (Kljun *et al.*, 2018) his study encourages designers and artists to employ AR with the purpose of "user engagement", he adopted several AR practices in artwork, tourism, and cultural projects. Users interacted more with the artworks in the mixed reality environment, which suggests that AR applications should be used more practically rather than merely for exploration.

In a case study, (Chan *et al.*, 2021) adopted the three "emotional design" characteristics to investigate the influence of augmented space on the responsive recognition of human presence in

urban space. The initial experience is "visceral," involving visual and sensory aspects incorporated into the design. The second level is "behavioral," which includes how we engage and interact with the environment, as well as whether the design meets the emotional needs of its users. The third level is "reflective," which entails engaging one's thoughts and consciousness to develop ideas for an effective emotional response. Another study sought to determine whether or not visitors to historical sites would value the use of AR technology in enhancing 3D representations of textual information on top of actual artefacts using QR codes (Wakefield et al., 2019). The study also found that, while older people were more likely to agree on the value of AR, it was helpful and improved users' experiences across age groups. The study also suggests that investing in AR for historical landmarks is wise. The levels and aspects that must be addressed for a successful AR spatial experience are shown in Figure 1.

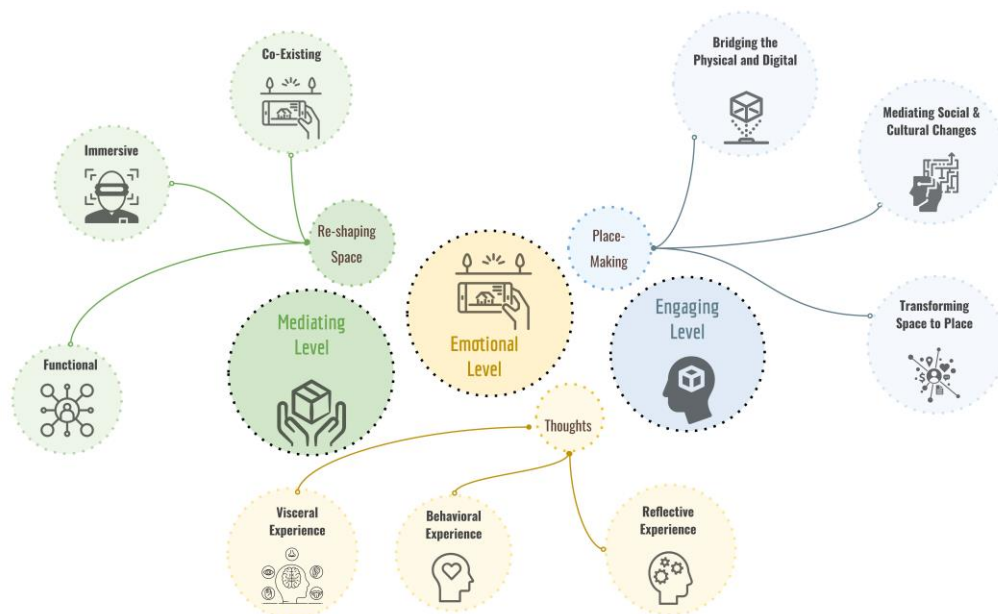


Fig.1: The framework of design considerations for a successful AR spatial experience. Source: (Authors)

4. AUGMENTING LANDMARKS

Designers, developers, and artists frequently face financial and commercial value challenges that prevent them from integrating AR technology into urban spaces and heritage landmarks. This is mostly because artifacts associated with device performance and development tools. Hence, AR could be a good aid for historical sites to revive tourism, as stated by Bec *et al.* (2021) "Tourism is an economic driver that could provide viable avenues to accomplish these aims." In his research, he introduced the idea of "Second Chance Tourism", which refers to techniques used in the digital preservation of tourist attractions and landmarks that require refurbishment or demolition. The study also promotes more research into how an idea like that might impact visitors' experiences and satisfaction.

Furthermore, Andrade & Dias (2020) adopted the notion of cultural marketing by exploring the impact of an AR application on Portuguese landmarks. They introduced the concept of "Phygital Society" which refers to the blurring of online and offline experience in new technological innovations like AR.

They discovered that utilizing AR to innovate cultural heritage helped users with their spatial awareness and added significantly to their awareness and familiarity.

The London-based Startup Company, Blippar, launched a recognition feature for well-known landmarks worldwide that are shown in figure 2 below. Users of this application point

their smartphones towards landmarks and Blippar technology identifies them. What's interesting about the software provided by Blippar unlike other applications, it uses "computer vision" to identify structures and not GPS or location-based information. Which gives the advantage to recognize a landmark just from a photo (Goode, 2018).

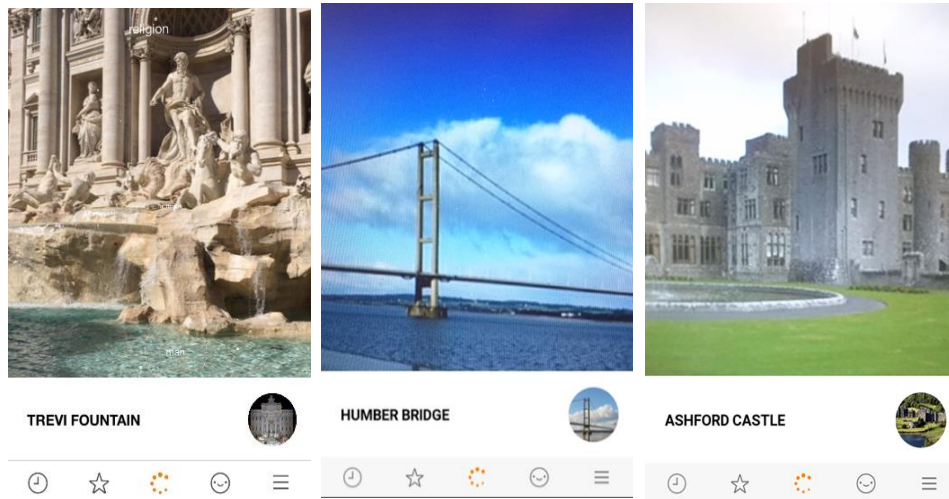


Fig.2: Blippar landmark recognition feature. Source: (Goode, 2018)

Snapchat, the giant social media application debuted the "Custom Landmarker Feature" in 2019. This feature uses their AR lens studios to augment virtual artistic representations above the real world as shown in figure 3 below, allowing "creators to anchor Lenses to local places they care about – from statues to storefronts – to tell richer stories about their communities through AR." (Snap AR, 2019). This feature is a location-based experience that is supported by Snap AR lens studios' developers using the real-world digital infrastructure. Here, AR is used to "enhance and transform the world" as part of their entertainment, educational, and marketing strategies to allow artists to tie stories to local locations as a socio-cultural experience. The "Local Lenses Feature" (Snapchat "Local Lens", 2020) was recently developed to include community "snaps" and a point cloud depicting the geometry and surfaces of a 3D reconstructed map of a local urban block. A function that enables artists to interact with a collaborative persistent AR space layered on the real world as shown in figure 4.



Fig.3: Before and After AR snap at Buckingham Palace, London Source: (Snap AR, 2019)



Fig.4: Artists using Local Lens feature from Snap AR to graffiti paint facades of a local street. Source: (Snapchat “Local Lens” London, 2020)

The "Detonator" interactive gaming project allows players to interact with the socio-cultural and historical context of several historical landmark sites in London. On a designated physical pole at the site, the project overlays representational data on landmine locations around the globe during World War II. The game displays the number of landmines that are present in a specific nation and simulates explosions by projecting digital representations of them onto actual physical poles.

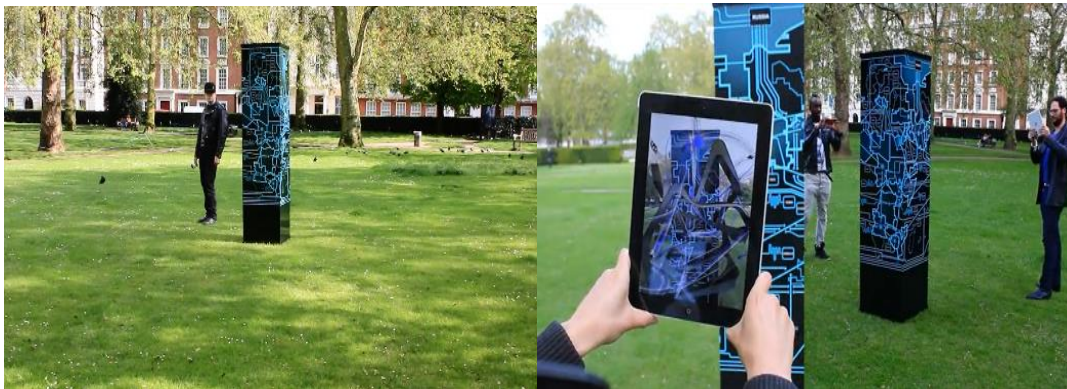


Fig.5: Detonator AR Social Game Source: (Detonator, 2012)

5. DISCUSSION

Research and studies around AR have always been concerned with the implications of such technology on user's experience, and how to develop the technical issues facing this form of mediation to benefit us. Few studies though discussed the AR practices as a mere design tool. This study signifies users' satisfaction and socio-cultural preferences in an AR-based environment and the design considerations to undertake for an effective spatial experience. AR practices must take the user's sociocultural preferences into account. Three important design levels, namely, the mediating level, the emotional level, and the engaging level could be used to satisfy these preferences. These levels resemble three steps in achieving a successful AR spatial experience. The first step associated with the mediation level is to Re-shape Space, which entails a notion of co-existing through an immersive medium. The second step involves an engaging level, to Re-Place Space by mediating our socio-cultural preferences through the digital medium.

The final step should enable a user to exert personal experiences to the design. To determine whether these levels are attained, the practices used above in this study are being put to the test.

The landmark identification feature of the Blippar application uses a digital database of previously scanned famous landmarks and offers users digital information on top of the actual landmark. As it offered helpful digital data that was localized on top of the physical world, it attained the co-existing and functioning components on the mediating level. Due to the virtual items' abstract character, it lacks an immersive aspect. This nature also prevented it from having any emotional impact. While on the engaging level, it did not mediate the social and cultural changes, although associated with historical and personal meanings.

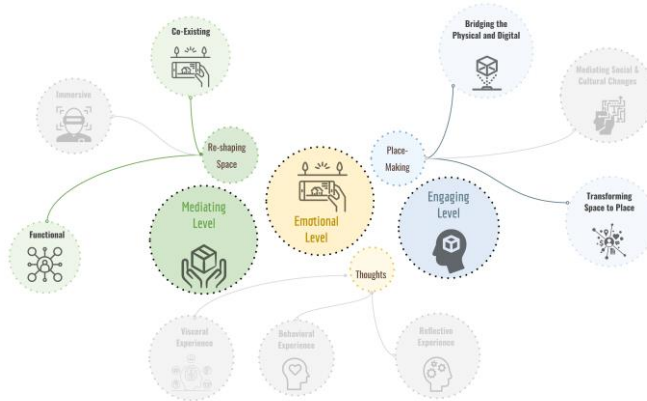


Fig.6: Blippar AR spatial experience. Source: (Authors)

While enabling users to create and collaborate on the AR experience, Snapchat also associated socio-cultural and personal perceptions. By delivering immersive, aesthetically pleasing, satisfying, and considerate virtual augmentations to the locals in the real world, it also accomplished the mediating and emotional levels. Detonator, on the other hand, did not incorporate the experience's social, cultural, and personal connotations. Consequently, a designer's objective vision that augments the physical landmark is offered.

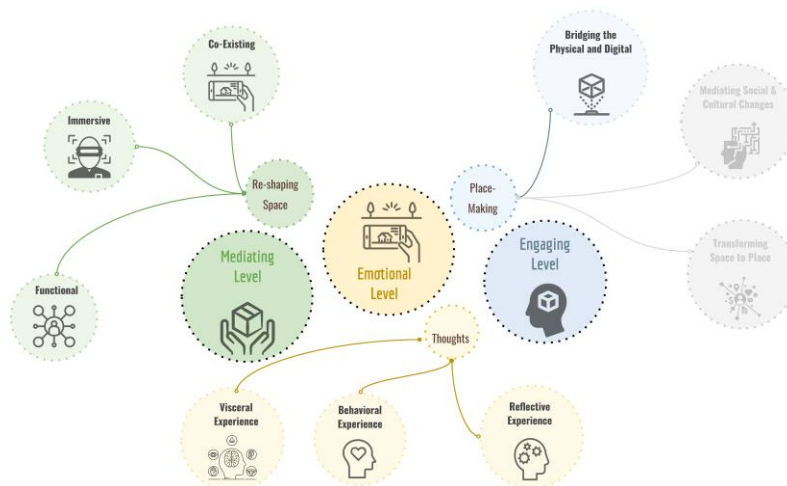


Fig.7: Detonator AR spatial experience. Source: (Authors)

6. CONCLUSION

In the modern era, urban space has begun to take on more distinct meanings. Adding new dimensions, producing overlapping features, or even permitting new forms of realities to coexist. This notion represents a significant milestone for technological interactions in our daily lives, supporting individuals in their navigation of urban spaces. According to the literature discussed

above, augmenting landmarks influences our navigational aids, and considerable studies indicated that it may even impair users' memory and spatial perception of the surrounding physical space. However, they still play an important role in our knowledge-gathering abilities and cognitive processes. This research sheds insight into how people interpret spatial experiences of augmented landmarks on a personal and collective level, particularly in-built urban environments that are rich in digital information. Based on contemporary practices that utilize AR to reflect socio-cultural preferences for engagement, it is convenient to argue that AR enhances our spatial experience and encourages users to engage with personal meanings and interpretations augmented on top of the physical space.

Our mobile devices are potent mediums that connect us to hybrid coexisting realities, offering us beneficial experiences when being in the proper hands. The main issue for several researchers is the future of augmentation mediums in the Metaverse. Social media companies, as well as other private sector corporations, are constantly developing haptic products and headgear AR glasses to make the experience more tangible. It's only a matter of time before these products are marketed and used in cities. So, it's critical to understand the nature of these gateways and the boundaries that will limit access to these coexisting realities, and the findings of this article are a start in that direction.

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