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URBAN DESIGN ANALYSIS OF NEW YORK CITY'S VIRTUAL MODEL - THE CASE OF TOM CLANCY'S THE DIVISION

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Abstract

People have started spending time with digital tools and virtual worlds to escape reality's horrors. However, designed spaces are more than the players' needs, especially those digital games that their stories involve urban environments. This inefficiency causes spending futile efforts both in time and cost for the digital games' productions; The urban environments in these digital games are replicas of real-world cities. Some companies use some techniques for downgrading replicas. Therefore, this study aims to uncover the used techniques for designing Tom Clancy's The Division (2016). By using reverse engineering methodology and qualitative comparative analysis, the in-game map compared with the real-world map. Based on the results, the used techniques allowed the designers to scale down the game environment to be 2.5 times smaller than the actual city. Rather, verisimilitude is achieved by combining sufficiently accurate elements to give the impression of complete accuracy. By implementing the results of this research, designers can develop smaller replicas to be perceived as more extensive.

Keywords

Digital games, Metaverse, Virtual City, Virtual World, User Experience

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ABSTRACT

People have started spending time with digital tools and virtual worlds to escape reality's horrors. However, designed spaces are more than the players' needs, especially those digital games that their stories involve urban environments. This inefficiency causes spending futile efforts both in time and cost for the digital games' productions; The urban environments in these digital games are replicas of real-world cities. Some companies use some techniques for downgrading replicas. Therefore, this study aims to uncover the used techniques for designing Tom Clancy's The Division (2016). By using reverse engineering methodology and qualitative comparative analysis, the in-game map compared with the real-world map. Based on the results, the used techniques allowed the designers to scale down the game environment to be 2.5 times smaller than the actual city. Rather, verisimilitude is achieved by combining sufficiently accurate elements to give the impression of complete accuracy. By implementing the results of this research, designers can develop smaller replicas to be perceived as more extensive.

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ملخص

بدأ الناس في قضاء الوقت مع الأدوات الرقمية والعوالم الافتراضية للهروب من أهوال الواقع. ومع ذلك، فإن الفراغات المصممة أكثر من احتياجات مستخدمي الألعاب خاصة تلك الألعاب الرقمية التي تتضمن قصصها البيئات الحضرية. وتؤدي عدم الكفاءة تلك إلى إنفاق جهود غير مجدية في كل من الوقت والتكلفة لإنتاج الألعاب الرقمية؛ فالبيئات الحضرية في هذه الألعاب الرقمية هي نسخ طبق الأصل من مدن العالم الحقيقي. وتستخدم بعض الشركات بعض التقنيات للخفض من تلك النسخ المتماثلة. ولذلك تهدف هذه الدراسة إلى اكتشاف التقنيات المستخدمة لتصميم لعبة The Division لتوم كلانسى (٢٠١٦) باستخدام منهجية الهندسة العكسية والتحليل المقارن النوعى للخريطة داخل اللعبة مقارنة بخريطة العالم الحقيقي. وبناءً على النتائج ، سمحت التقنيات المستخدمة للمصممين بتصغير بيئة اللعبة لتصبح مرتين ونصف أصغر من المدينة الفعلية. وبدلاً من ذلك، تم تحقيق التوافق الفعلي من خلال الجمع بين عناصر كافية الدقة لإعطاء انطباع الدقة الكاملة. ومن خلال تنفيذ نتائج هذا البحث، يمكن للمصممين تطوير نسخ متماثلة أصغر حجمًا يُنظر إليها على أنها أكثر شمولاً.

الكلمات المفتاحية: الألعاب الرقمية، الميتافيرس، المدينة الافتراضية، عالم افتراضى، تجربة المستخدم.

1. BACKGROUND

The COVID-19 pandemic drastically impacted human lifestyles, transforming every paradigm into various virtual ways. Universities, school classes, and offices started to be remote, and people started to spend time with digital tools and virtual worlds to escape reality's horrors (Zhilong Chen et al., 2021). In this regard, metaverses can solve multiple social problems that emerged from the COVID-19 pandemic (lin z et al., 2021). The term "Metaverse" consists of two distinctive parts: the "Meta" meaning beyond, and "verse" derived from the word "universe." It aspires to describe a synced, shared, and persistent simulated three-dimensional virtual world. Users are defined by their avatars, being able to navigate in an immersive manner and interact through their presence (Shah, 2021). As metaverses are a sort of virtual worlds, they must follow six requirements. According to Bartle (2020), a world should pass through six different filters to consider as virtual. It must possess a defined physics, the user or player must be represented as an individual avatar, the world cannot be a turned-off and turned-on type, the world must be either multiplayer or multi-user, the world must be persistent, and finally though it may seem evident that world must not be the reality (Bartle, 2020).

Designing replicas of the cities helps humans to shape their understanding of the concept of the metaverse. According to MacCormac (1995), metaphors help to describe and explain the unknowns; without them, it would become impossible. These replicas are metaphors created to reflect the physical world and its assets (Jones et al., 2020). These places can resemble the physical appearance while performing the functions and behaviors of the physical world assets.

According to A. El Saddik (2018), Knowing which physical world elements should be mapped to the replicas is essential (El Saddik, 2018). A virtual place is an example of places simultaneously everywhere and nowhere (Auge, 1995). However, these places are within the concrete and symbolic construction that can engage with the history and physical place's identity. Moreover, replicated cities are the result of the architect and landscape architect designers' works (Van der Merwe, 2021). Therefore, they are the people who perceive virtual places differently from the programmers and UI designers (Kim, 2018).

On the other hand, architects and landscape architects are the designers who are trained to enhance the sense of place (Friedman, 2021), so based on their knowledge, metaverses are the new territories for them to redesign the virtual worlds stylishly to strengthen the sense of place. Hence, with the growing aspirations for metaverses and digital games, their infrastructure is tormented by the lack of design methods (Solman, 2022). According to Solman et al. (2022), the architecture industry plays a crucial role in articulating the virtual domain as replicas are the direct products of architects' decisions rather than duplicating the physical world. The decisions by landscape architects on whether to allow or disallow the components' presence in the digital environment directly affect the shape of the virtual worlds' outcome. The current metaverses are developed and designed by game designers. However, from architects' viewpoint, in the virtual domain, designers are free to design without any set of physical-world rules; in this regard, architects can develop these places in a stylized way that does not seem as the physical world.

2. LITERATURE REVIEW

Currently, the digital game industry has many limitations in terms of level designing. Creating a well-developed virtual world requires more time and effort, which is generally considered as a time-consuming task for game designers (Kim, 2018). Unlike other tasks in digital game design, such as user interface design, game rules, sound design, and character design, designing a virtual world for a digital game requires careful consideration. Although some digital games are designed brilliantly, they are the outcome of practice and experience over many years (Kim, 2018). According to Kim (2018), many textbooks have proposed various techniques and methods to design virtual worlds for digital games; however, they mainly focus on technical parts and do not provide practical design techniques for the designers. For instance, Huijser et al. (2010) presented a method for designing a natural landscape in a virtual world; however, it only covers specific landforms (Darken, 1993). Although scientific articles and

textbooks cover all aspects of digital game design, their approaches to urban design are insufficient (Kim, 2018).

Due to the mentioned limitations and the close relationship between virtual and physical cities, game designers use the same techniques as architectural designers. Some game companies are trying to use the physical world's cities for their game environments. These environments are similar to the physical world, including urban patterns, architectural styles, and landmarks (Morris and Hartas, 2004). Designers use architectural methods in AAA game companies (a type of game company with a high budget) (Rotzetter, 2017). In addition, some companies, such as Ubisoft, try to develop replicas of the physical cities for the digital games' environments by employing creative methods. Due to the similarities of the replicas with the real ones, such models increase the players' sense of immersion (Catros, 2021).

In the physical world, architects and landscape architects use spatial properties to make a space seem more extensive than the original scale. For instance, using optimal ratios for street width, the appropriate setbacks of buildings, and using proper trees, street lamps, and other design features to make vistas and manipulate the peoples' sense of scale (Friedman, 2021). Applying all those techniques for developing virtual worlds need much time and effort, and it does not fulfill the players' needs (Rotzetter, 2017). Reconstructing the virtual version of urban environments and cities carries a high value as they act as a vessel beholding human experiences between physical and virtual. However, it is vain to represent all the elements of the physical world in the virtual one because, cognitively, we are more comfortable with abstraction. By applying subtle changes to the replicas, players feel more comfortable and more immersed during playtime (Shields 2002).

Catros and Maxime (2021) mentioned in their recent research about re-constructive historic cities for digital games that Assassin's Creed III has achieved the feeling of authenticity. However, the modeled world is dissimilar to what the historical city looked like (Catros, 2021). Moreover, some researchers, such as Danilo Di Mascio (2017), analyzed the architectural and historical aspects of digital games, but the research only introduces general information to the designers and not any design techniques. Two factors led to these restrictions; firstly, most companies do not have precise techniques and methods. Secondly, if the company has a specific method or technique, they protect it. Hence, those techniques are industrial secrets companies do not want to expose; therefore, collecting any helpful references on this topic is challenging. In this regard, this research investigates how the game designers and artists abstracted their reconstructions, consequently evoking the city's image observer.

3. METHODOLOGY

3.1. Case Study

Ubisoft published Tom Clancy's The Division (TD) in 2016. This game was a commercial success, and the reviews for this digital game were positive. According to Ubisoft, the game broke its own record for the most first-day sales (Ubisoft, 2016). This game fits the MR33FP category according to the standards for classifying digital games (Kim, 2016). The game has been studied and analyzed by several scholars who have focused on some technical parts and cultural effects; however, none of the researchers focused on the design process. The game is based on New York City, which means the player can freely explore and engage in various activities, from simple activities like walking around the city to fighting. The user can play the game from a third-person perspective, meaning that the avatar is visible (Gies, 2015). The designers modeled a small part of Brooklyn and nearly one-third of Manhattan, representing over 113 square kilometers. This paper uses reverse engineering methodology and qualitative comparative analysis to uncover the techniques used by designers of TD.

3.2. Reverse Engineering

Reverse engineering plays a dominant role in uncovering digital games' development techniques (Linhoff, 2004). The research started by searching for scholars about TD and the used techniques for downgrading the environment. However, there was no relevant scholar, but some users in the game forums identified what portion of New York was excluded, which were not valid. In this regard, research started by overlaying the in-game map with New York city's map to explore the excluded portion. Since the game gives measurement information, it is evident that the whole map is 2 kilometers in length and 2.8 kilometers across the width (Figure2). For studying a book, it is necessary to read it; to understand and analyze a digital game, it is essential to play it (Di Mascio, 2021). In this regard, the first five- levels of the game have been played to access the Chelsea map, and the methodology below is designed (Figure1).

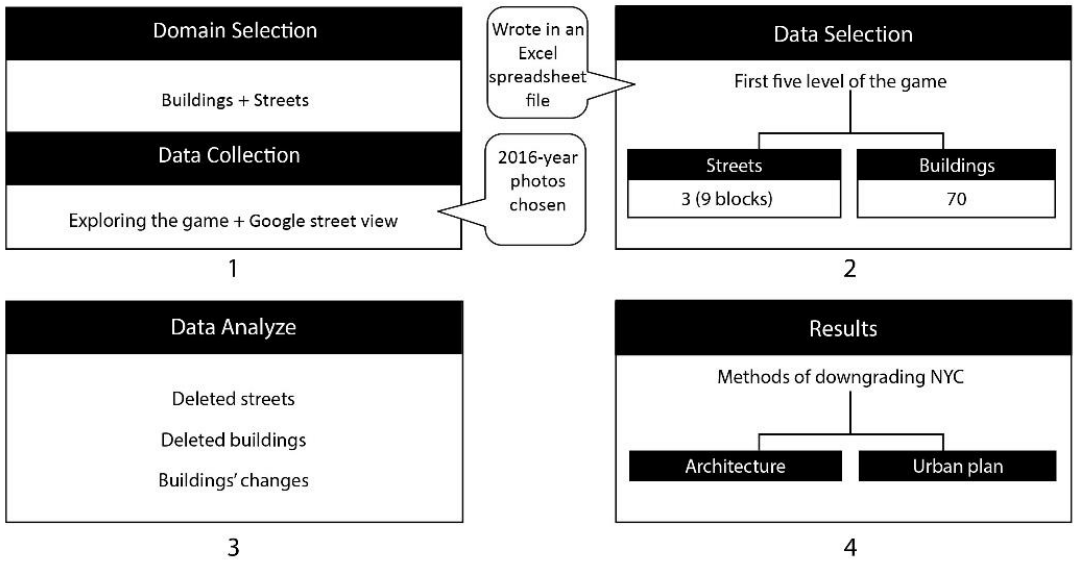

Fig.1: Methodology for analyzing the game

Streets and buildings are the major elements of a city (Lynch, 1984), so this research analyzed these two components. Since the study deals with the 3D representation of the cities in the digital games, the streets and the buildings of Chelsea compared with the Google Street View Map and all of the details written in an Excel spreadsheet file. To collect the exact shape of the urban environment in the game's production year, 2016-year photos have been chosen from the Google Street View map. The screenshots and the files are available in the author's archive. After the analysis, it was relevant to know how Ubisoft's designers approached the challenge of reconstructing a large environment as small as possible, and it is clear which part of New York was tried to recreate as a replica.

4. RESULTS

Ubisoft's designers were able to create a replica of New York City, which is 2.5 times smaller than the physical one (Figure2). The designers used several ways for this challenge. For instance, they made the city aesthetically more intriguing by using symmetric scales and appropriate color palettes to support the gameplay's dynamics better. This research's outcome is a determination for knowing that the designers used techniques to develop a verisimilitude version for New York.

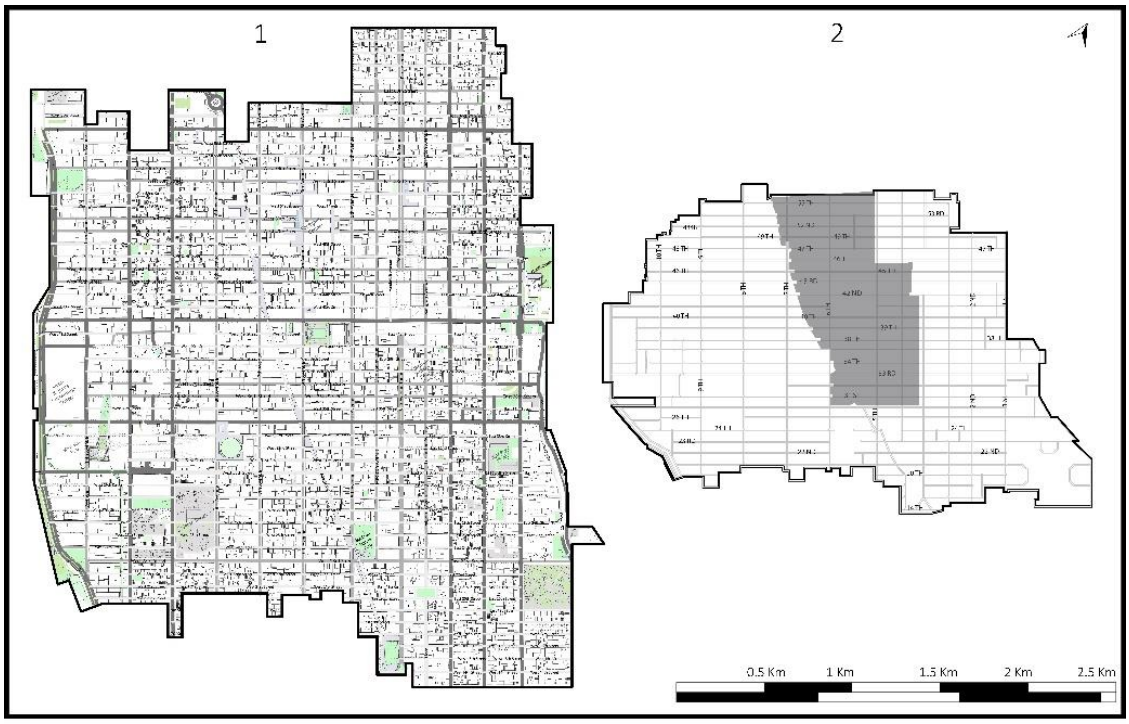

Fig.2: Designed parts of the New York City map for the game (1). In-game map (2)

4.1. Architectural Design

The architectural style of this game is the same as the architectural styles in New York. Each district represents the same social and economic condition of the neighborhood. For instance, by using proper colors, fog effects, and decorating the buildings and streets, designers tried to reflect the luxurious lifestyle of the area. Furthermore, according to Lynch, landmarks are described as "point references" and have a significant role in a city's image (Lynch 1984). TD presents the landmarks visible from long distances and various locations in the game. The designers modeled the landmarks with a high level of detail. However, some landmarks, such as Penn South Plaza or London Terrace, are duplicated in two or more streets. On the other hand, some landmarks, such as Greenwich Savings Bank, have not appeared in the game. By exploring the online forums, we noticed that due to some buildings' duplication in the game environment, a range of players were more curious to explore the game environment. However, it disrupts the player's attention who lives in New York. For the next step, the research used qualitative comparative analysis proposed by Charles Ragin (Ragin 1987). The research compared 70 buildings on three streets to find the dissimilarities (Table 1). Yellow, brown, and red are the primary colors used for the buildings to communicate a warm feeling. For 61% of the buildings, colors and textures are identical; for 27 structures, colors and textures have been changed to synchronize them with the game's atmosphere. The research could not measure the elevation and width of the buildings. In this regard, the number of windows rows', and columns have been compared. 45.7% of the buildings had the same number of window rows. For the other 54.3% of the buildings, designers increased or decreased the height of the buildings to make grand vistas. For comparing the width of the buildings, the number of window columns was counted one by one, and 14% had the same number of window columns. Furthermore, ten buildings of the mentioned three streets are excluded in the game. Instead, they are replaced with buildings from other streets, or in some cases, after excluding the buildings, vacant spaces are used as open urban areas. The research divided the used techniques into four different categories.

Table 1: Comparison of the physical buildings with the in-game buildings.

Charactrestics	Similar		Different		Total
	Quantity	Percentage	Quantity	Percentage	
Window's column	10	14.2%	60	85.8%	70
Window row	32	45.7%	38	54.3%	70
Color and texture	43	61.4%	27	38.6%	70
Buildings	60	85.8%	10	14.2%	70

4.2. Techniques

4.2.1. Technique 1

Ubisoft's designers excluded some buildings in three different styles. Buildings with the high level of details that do not count as landmarks have been excluded, or the level of the details has been decreased. For example, in figure 4, the designers excluded building B and widened building A to compensate for it. This technique was applied in multiple streets, which helped the designers to decrease the number of modeled buildings.

Fig.3: Screenshot of the Street View Map (left). Screenshot of the exact location in the game (right); It shows a sample of excluded buildings

In New York City, one can find several buildings with similar façades constructed next to one another. However, for the virtual version of those cases, designers can merge those buildings into one building and extend it. In TD, adjacent buildings with minimum details have been merged into one building. For instance, in Figure 4, instead of modeling buildings A and B, they merged them and modeled one structure. This approach of representing is applied in various game scenes. The technique consequently decreases the length of the streets and helps to downgrade the urban scale in a stylized way.

Fig.4: Screenshot of the Street View Map (left). Screenshot of the exact location in the game (right).

Moreover, using a metaphor is to digesting the concept and letting the user clearly understand the second object by representing minor elements (Dieberger, 1998). For instance, Ubisoft's game designers tried to show building C with fewer windows (Figure 4). This structure describes the style of the building to the players and lets them remember which building this is.

According to (Kim, 2018), the game's story is an essential part of designing a virtual environment, so designers should design the environment based on the game's story. In the TD game, the designers excluded some of the small buildings or shifted the buildings' lots in order to create their desired places where they needed more space. Figure (5. A) describes three applied techniques of shifting the building's lots, merging, and excluding the specific buildings.

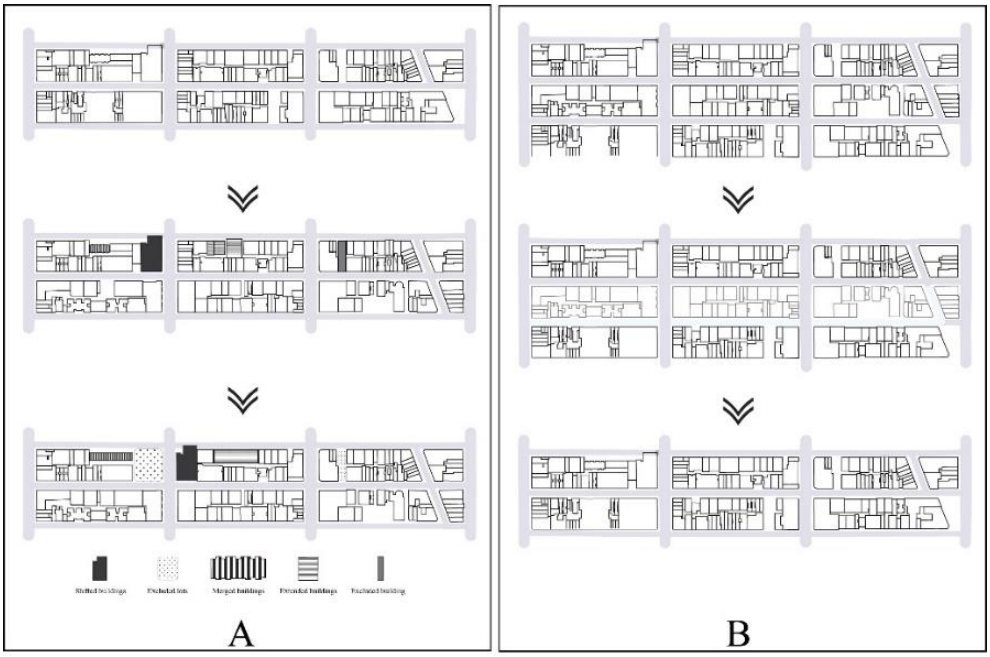

Fig.5: Diagram A (left) describes the techniques1, which relates to excluding and merging the buildings. Diagram B (right) describes the technique2, which relates to merging the streets

4.2.2. Technique 2

As Kevin Lynch mentioned, districts are the elements that play the primary role in the image of a city (Lynch, 1984), so it is significant to let the players experience most parts of each district. Designing whole parts of each district considers lots of time and effort. In this regard, to minimize the replica's vastness and prevent developing unnecessary spaces, designers chose one row of the street and merged it with the next street row (Figure 5. B).

4.2.3. Technique 3

Vision is an essential sense of the human in both physical and virtual environments; however, most users focus on what attracts them more in virtual environments. For instance, during exploration in a virtual world, players do not focus on the whole travel experience as people usually do in the physical world. In addition, according to the story layer's significance in designing the game environment (Kim, 2018), the designer can exclude blocks of streets that do not involve the game's story. For those cases, Ubisoft's designers excluded the whole road in several places (Figure 7. A).

This technique, however, is different from the previous one, as the actual subject carries an attribute strange in appearance. A good example can be the architectural style of New York's some streets, where a block or a road is made up of a single building façade. In this game, the replica of these cases are excluded, and the whole street are designed with the same façade.

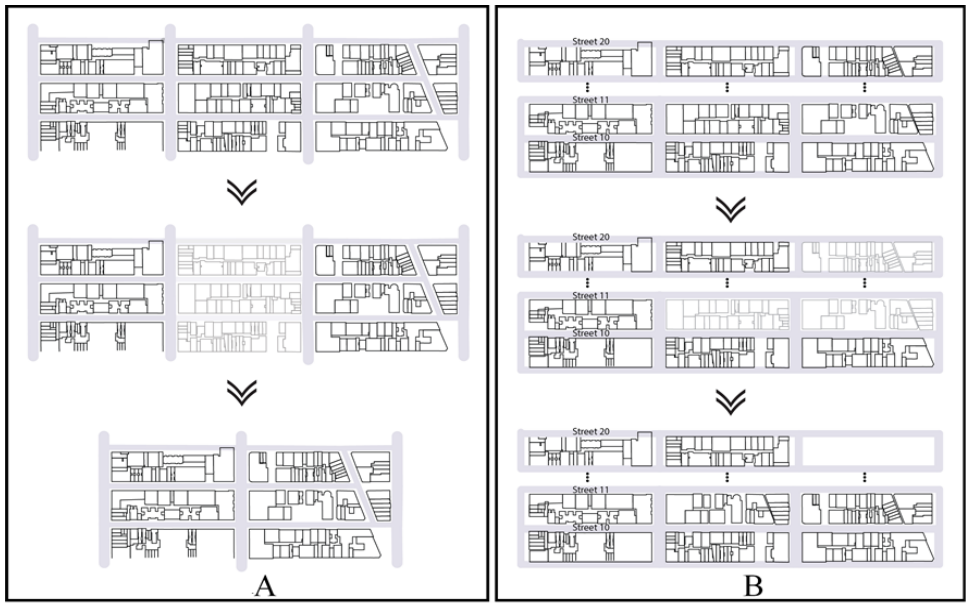

Fig.7: Diagram (A) describes the deleting streets with similar blocks. Diagram (B) describes the shifting blocks

4.2.4. Technique 4

As the person moves around the physical world, one perceives the environment subjectively and then creates a movie-like mental image through the encountered images. Primarily the person uses the landmarks to make that mental image. So, it is logical to decrease the length of the long streets or avenues by deleting the blocks that do not contain important buildings or landmarks. In addition, streets or avenues containing high buildings create grand vistas (Friedman 2021). For instance, if most buildings have ten floors and some have less than four floors in the middle of the streets, designers can cut those small buildings (Figure 7. B). On the other hand, most open-world games contain missions, and the player focuses on the close view, not the distant view, so it is possible to fool the player who knows the physical version of the city. Therefore, deleting blocks containing small buildings helps make a grand vista.

5. CONCLUSION

The digital game industry's economic importance means spending time on design research. Instead of trying to recreate all parts of an environment to look like reality or exclude some parts of the built environment, we need to collaborate across disciplines, which is more efficient in the design effort. TD analysis has identified several factors of interest, and the mentioned results are the techniques that can apply to virtual landscape designs. First, it revealed that senior designers in the AAA game companies are trying to interpret creative techniques for their designs to increase time and cost-efficiency. Demonstrating the techniques helps junior designers or people outside of the game industry learn these approaches in their designs or use the concepts to interpret more creative approaches. This research helps the players be aware of digital games' artistic qualities and pay more attention to the relevant aspect of digital games.

Furthermore, although the virtual world domain is not new, it has not been used much in our daily lives; However, nowadays, we need them more than before. For instance, due to

COVID-19, we felt the importance of the concept of metaverses in our lives. Therefore, it requires lots of research and scholars. This domain will grow and become increasingly critical due to its usage in any virtual reality device. Let consider the virtual worlds as necessary as the physical world and understand the users' requirements. Our designs can raise the emotional senses of the users, as in the exploration of real cities. Investigating virtual worlds can trigger further research questions that have not previously been formulated. For the following research, we will analyze more digital games, and one of the future aims of this research is to use cognition science principles and find more efficient techniques to increase the efficiency of the designers and manipulate the players' sense of the place for designing the twins of the cities.

This paper has shown that in the game TD, New York City is dissimilar to what New York is in the physical world. We accurately compared the in-game map with the New York map, and many dis-similarities have been found. Probably Ubisoft purposed to reduce the city's travel time without teleporting. However, it can trouble players' perceptions, especially those living in New York. Searching on the game forums found that some players understood the excluded parts, which disturbed their sense of place.

The research highlighted that architecture and landscape architecture are essential in designing virtual worlds. For instance, landmarks are crucial cultural elements that players can communicate with and get historical information, making them curious to explore that area. It may be necessary to use these techniques in the development of games to enhance their playability. Therefore, as Lynch describes, to create a realistic city model, there must be enough accurate elements in the city.

As a result, by implementing the meaning and values symbolized by place features or place icons, architects and landscape architects can form new places that mimic reality. Results demonstrated some techniques to redesign the spatial layouts for designing the physical world's replicas. It must be acknowledged that this study has limitations. The main limitation of this study is that only one digital game was studied as the case study; more digital games with different land uses should be examined. In addition, we should consider that every human being shares different procedures and priorities to recognize a space based on their experiences. Therefore, making a clear order for the spatial layout components will be challenging. Instead, this research will provide statistical results. However, this paper's methodology and logical procedure will be valuable for future developments related to designing replicas of the physical world.

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