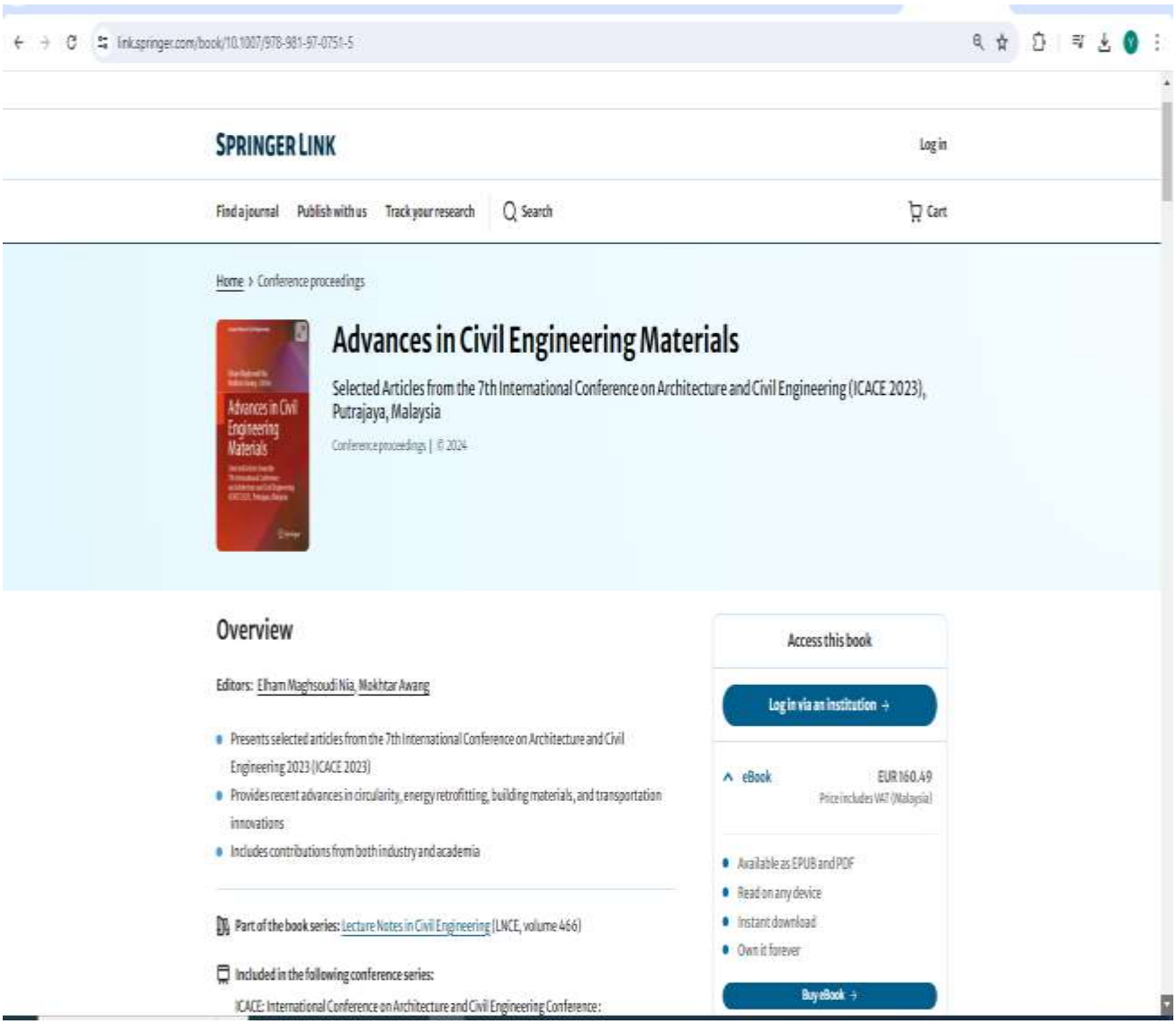
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Form Follows Familiarity: A Design Paradigm for Architecture in the Metaverse

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Abstract. The acceleration of the digitalization process during the COVID-19 pandemic has led to a mass interest in Web 3.0, blockchain and the metaverse, where digital assets traded and owned are given a new sense of authenticity. Academic discourses too seem to envision architecture in the same light, by looking into the standardization of architecture to add to its authentic position in the metaverse. We argue that it needs to be further reduced into a design paradigm, as architecture here is symbolic representations. A design dictum 'form follows familiarity' is proposed, as familiarity serves as the internal logic set for designing architecture in the metaverse. This study employed visual surveys on 'Decentraland' and 'Voxels' platforms on familiarity variables, which are reduced versions of buildings' recognizability variables in the real world. We observed that architectures in the metaverse act more like an avatar and are mostly independent of architectural conscience, but the sense of familiarity has a major impact on its form as they are constantly noticeable from our surveys. This study found that the design paradigm 'form follows familiarity' is already practised throughout the metaverse worlds although with different degrees of negotiations, but unclear whether they are intentional. 'Form follows familiarity' also carries with it a philosophical agenda of understanding the fate of architecture represented in a different world that shares similar stakes of authenticity, scarcity, and ownership with the real world. We advocate more studies to continue understanding the disposition of architecture in the metaverse.

1. Introduction

It is not uncommon for architects to reframe conventional thinking on design paradigms at times of innovative changes are introduced. Architecture has always been a continuous adaptive by-product of new technology and it keeps on being so albeit may accomplish differently at various stages. But despite the aggressive development in technology over the past decades, nothing is quite disruptive in the architectural thoughts and practices, especially when the world seemed to flourish in what we can call the architectural plateau. As we may have been introduced to many treatises and philosophies evolved from Vitruvian thinking, the pursuits of architecture recently tend to look at the prospects of prolonging our survival rather than formulating new paradigms, by emphasizing more on the aspects of sustainability and resiliency. Architectural thinking for the past decades seems to stand unscathed, without much critical mass that turns it around since.

The recent COVID-19 pandemic may be an epoch of refreshed architectural ideas, transferring unprecedented situations into opportunities in various ways. One aspect is the apparent new interest in spatial design discourse and general architectural wisdom. Another aspect is the acceleration of the digitalization process, triggered by people staying at home and performing more activities in digital environments (Narin, 2021). This led to the explosive increase in the mass interest in Web 3.0, accelerated development of a more tangible, actualized internet particularly backed by ultra-fast connectivity, maturity of extended reality (XR) technology and the discovery (or rediscovery) of the metaverse (Moneta, 2020). The conventional idea of travelling, occupying a space, trading or even conducting activities has evolved into an engaging experience not necessarily constrained by the two-dimensional interface navigation of Web 2.0. Together consolidated by these hyper technologies, the rise of blockchain, cryptographies, and non-fungible tokens (NFTs) technologies are crucial in determining the authentic rights of assets in the metaverse (Wang et al., 2022). It has normalized the culture of accepting the previously trivial digital assets, to the point, that it is mirroring the real-world sense of ownership.

Discourses seem to envision architecture in the metaverse as somewhat authentic too, justifying its functions and forms as no longer merely a hypothetical construct. The problem with this, we propose is twofold. First, it defeats the seductive appeal of the metaverse in the first place, for it needs to be radically imaginative that rejects the standardized boundaries set forth by the architecture itself. Secondly, it undercuts the Vitruvian tradition of how architecture should be well-designed and well-serving. Here, we argue that the idea of physical tangibility is important to architecture despite how authentic and convincing digital assets can be owned, exchanged, and experienced. Architecture in the metaverse, we propose, is co-constructed perceptions of authenticity, like how architectural illustrations could exist in architects' proposals, or how architectural depictions are used to be portrayed as narrative-givers to the works of fiction.

Thus, drawing the line between what is real and what is not ought to be honoured regardless of how real architecture can fit into the metaverse. As it requires participants to actively shape this world, standardization could potentially disrupt the development of the metaverse that yearns to be further defined. This is different from designing architecture in the real world, whereas in the metaverse, we are permitted to design based on imagination free from the restrictive nature of the world. Our architecture in the metaverse might not agree with the Vitruvian triad simply because it breaches one of the triads one way or another despite how much we want to justify the translations to the virtual world. One thing, architecture is governed particularly by the greatest foe (or friend) of architects, which is gravity. Taking this restrictive dimension away, the discourse could no longer be justifiable. Although at the same time, we must emphasize that a design paradigm needs to be established regardless, as in any design practice, a direction should be set not to restrict our work but to uphold its integrity. To proceed, this study laid out these objectives:

1. To establish a design paradigm for architecture in the metaverse.
2. To identify the social perception basis of architecture in the metaverse.
3. To reframe the concept of architectural representation in the metaverse.

2. Literature Review

Narin (2021) has previously done a compelling content analysis on literature discussing the metaverse from a total of forty journal articles in all fields published in the Web of Science (WoS) database for the last 20 years. From this review, some works have examined the education, art, religion, and socio-cultural interactions in the metaverse, and some have utilized metaverse applications in certain areas. However, there is a paucity in the body of WoS works that discussed the subject of architectural design or built environment in the metaverse. But this has improved within a couple of years or so whereby this subject is discussed quite commonly, especially in non-WoS databases as presented in Table 1 below:

Table 1. Compilation of Recent Non-WoS Publications Addressing Architecture in the Metaverse

Author: (Ibáñez & Naya, 2012)		**Aligned Research Objectives**
Key points	Possibly the earliest contemporary work discussing the metaverse and architecture. The work highlights standardization towards designing architecture in the metaverse through integrating 'Virtualitas' with the pre-existing Vitruvian triad from the real world.	To establish a design paradigm for architecture in the metaverse.
Research Gap	Although it dismisses the appeal of how the metaverse should not always be governed by any standards, this work introduces a gap in how the pre-design stage of architecture in the metaverse could be further understood, as standardizations could stem from a design paradigm that has yet to be established.	
Author: (Tang & Hou, 2022)		
Key points	The work discusses the designing methods of architecture in the metaverse, by proposing the framework with examples by taxonomizing the negotiations between architectural space and the holographic world.	
Research Gap	The frameworks are of differentiating classes of the real and the virtual world collisions. Although it serves the narrative of metaverse and architecture, it discusses after-the-fact taxonomy, rather than establishing a design paradigm for the metaverse which sits at the decision-making level.	
Author: (Seidel et al., 2022)		
Key points	The work discusses the designing methods of architecture in the metaverse, with the intentions of creating experiential tensions of the design space through the actor, space, time and artefacts.	
Research Gap	The experiential tensions are relevant concerns as these create the dramatization of encounters, which suggests how design in the metaverse are exploitations of experience. As it is this open-ended, and heavily fuelled by fictionalizations, a design paradigm is needed to preserve the integrity of architecture, which could be a product, or a by-product brought about by the open-ended tensions.	

Author: (S. M. Park & Kim, 2022)		
Key points	The work breaks down the technical definitions, scenarios, trends and challenges related to designing the metaverse world, which also includes implications for spatial, architectural and urban design.	To reframe the concept of architectural representation in the metaverse.
Research Gap	The representational components in the metaverse's concept of 'avatar' are limited to the perceiver's/ actor's representation. It is not however discussed in the work that architecture, too, can be subject to the digital twin of the metaverse.	
Author: (Moneta, 2020)		
Key points	The work appraises the role of architects and new methods which help to improve the architectural heritage in the metaverse based on the lexicon and memories of the perceiver. The work tested the Architecture by Elements (ABE) methodology, a prior work developed by the author for the real world, into the metaverse.	To identify the social perception basis of architecture in the metaverse
Research Gap	The aspects of lexicon meaning and built-form accuracy are essential in the metaverse, suggesting this familiarity with the real world could have fundamental precedence.	

Despite the fitting discussions of justifying architectural considerations in the context of the metaverse, we argue that these are more of a spinoff caused by the exposure of architectural qualities to the virtual world, rather than serving as a design paradigm that could precede (or justify) early architectural design decisions in the metaverse. This is understandable across many studies as they were optimistically motivated by the first fundamental characteristic of the metaverse which acknowledges architecture, too, can be authentic. But it is unlikely that efforts to define architectural standards can sufficiently capture this diverse, emerging, and experiential landscape.

2.1. Architecture in the Metaverse

The metaverse is literally the 'beyond universe'. It is usually a three-dimensional, fully immersive and self-sustaining virtual environment with a shared set of values and a separate economic system that enables real-time interaction, communication, and content production, consistent with the real world (Ibáñez & Naya, 2012; SCMP Editorial, 2022; Wang et al., 2022). The term was coined in 1992 by Neil Stephenson who authored Snow Crash, a sci-fi novel that describes the metaverse as an all-encompassing digital world that exists in a parallel universe to our physical world (Wang et al., 2022). It recently received a bigger boost when Mark Zuckerberg announced Facebook's name change to Meta Platforms Incorporated, reflecting the company's attempt to 'plant a flag' on this potentially lucrative enterprise (SCMP Editorial, 2022). Some companies are to the extent of hiring architects to design them, and then eventually the game developers to make them interactive akin to designing an open world videogame. But metaverse here needs to be understood as not just an improved videogame, neither it is the next generation of virtual reality (VR). Seidel et al. (2022) clarified that the metaverse stands out

from other virtual worlds due to two fundamental characteristics. First, the metaverse combines and connects various social experiences into a single all-encompassing system. Second, it accomplishes this without the need for objectives and rules.

We look at the first fundamental characteristic from the angle of standardization, as it is argued to be crucial due to the unexpected, remixed, and reformed nature of the metaverse. Not so long ago Ibáñez & Naya (2012) appropriated the Vitruvian tradition into the metaverse by introducing *virtualitas*, modulating virtual aspects upon the historically recognized triad of *firmitas*, *utilitas* and *venustas* in the real world. Other examples that propose standardization could be in the form of design schemes. The work of Tang & Hou (2022) modelled the architecture for the metaverse through strategic frameworks that can direct designers to explore ways of fusing physical and virtual architectural elements. The outcomes include four architectural design strategies which are 'transform', 'collocate', 'correlate', and 'stitch' that target various levels of the mixture as shown in Figure 1, akin to the Milgram and Kishino's reality-virtuality continuum proposed back in 1994, which describes the negotiations of how far the virtual elements can co-exist entirely or overlaid in a diptych manner with the real world. The extreme end of each opposite would be either physical or holographic, but both would accept the metaverse elements as authentic.

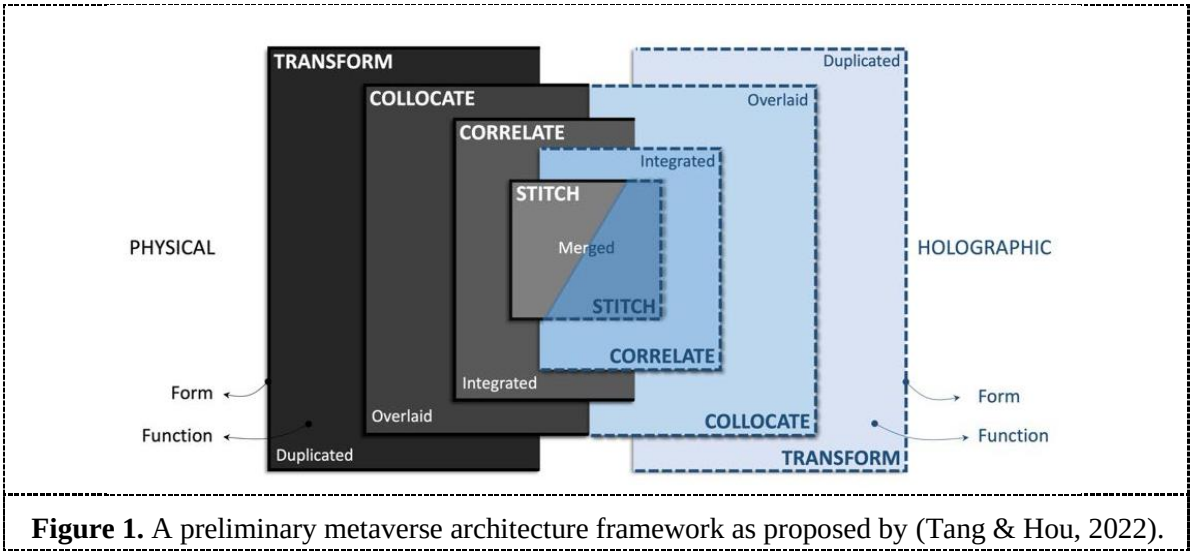

Figure 1. A preliminary metaverse architecture framework as proposed by (Tang & Hou, 2022).

Next, we arrive at the second fundamental characteristic, which is the non-existence of objectives and rules which is essentially what makes architecture dignified. Architecture in all its flaws and magnificence is intended to be purposeful and some rules do apply. To add to the uncertainty, architecture sits at an awkward position in the metaverse whereby, on one hand, the economics of buildings and ownership of assets are real by value. On the other hand, they are imaginary by virtue, as metaverse buildings can defy the laws of physics that itself are the design problems yearning to be negotiated through architecture. The metaverse offers different human experiences that transcend the limitations of the real world to the point participants have the option of changing their gender, taking on non-human avatars, flying, teleporting, and switching back and forth between these various personas (Seidel et al., 2022). This fluidity and freedom of the metaverse push architecture here to be more of an artefactual representation acting as architecture. What is real is merely some elements of design just enough to project familiarity to the participants. Architecture in this sense is of symbolic representations, similar to the idea of how avatars are a symbolic embodiment of an actor in the virtual world.

2.2. Recognizability and Familiarity

While the social perceptual basis of architecture in the metaverse is unclear, they are expected. All contemporary bodies of works discussing architectural design in the metaverse earlier commonly

suggest the factor of perceivable familiarity, as intentional or unintentional precedence that shapes the artefacts of architecture. While familiarity in this sense is also ambiguous, we could take precedent from the notion of actor's representation in the metaverse. The study of S. Park et al. (2021) as cited by Narin (2021) has previously discussed the elements that can influence a user's social perception of likeness, familiarity, beauty, liking, and engagement of personalized virtual avatars created by taking into account the user's facial features. In their study, avatars with the participants' facial expressions resembled them more closely and gave off a more familiar sense than the others. The question of why a house should look like a house in the metaverse could also be understood as such as they bear resemblance to its host, an ideal form that projects the outward appearance and reflects the ego or an exaggerated alter-ego of a house itself (S. M. Park & Kim, 2022). The architectural representations in the metaverse are likely to resemble architecture with its artefactual and spatial identity, which projects familiarity. But what architectural components constitute familiarity as it does not have a literal facial expression?

Thus, we consider the factor of architectural recognizability as facial expressions of architecture. The work of Zaini et al. (2022) has discussed a similar idea of how far the artefactual tension sensed through the architectural level of details would impact recognizability in VR. According to the study, environments with non-monochromatic colours may help enhance building form recognition while environments with higher geometrical characteristics may encourage better recognition of building use and symbolic significance. The work primarily defined this based on Appleyard's (1969) dimensions namely building form (movements around buildings & clarity of details), building visibility and symbolic significance. Based on this, Table 2 breaks down the recognizable architectural components that are reduced to familiarity variables for architectural avatars in the metaverse. While recognizability discusses the 'after-the-fact' real-world elements, familiarity reduced it to the primitive and socially perceivable variables that may intertwine across the recognizability variables, as this study is inclined towards framing it to be of pre-designing decisions in this constraint-free world.

Table 2. The Familiarity Variables of Architectural Avatar in the Metaverse based on Recognizability

Recognizability Variables	Details	Familiarity Variables
Building Form	• Movements around Buildings	• Exterior Spaces • Interior Spaces • Dimensions • Proportions • Envelop • Architectural Components
	• Clarity of Details	
Building Visibility		
Symbolic Significance		

Although the term avatar can exclusively refer to the human agencies in the virtual world, it is appropriate to look at architecture in the metaverse in a similar light. There are some criteria that we believe why architecture in the metaverse could be recognized as an avatar:

1. The appeal of architecture in the metaverse is the rejection of orthodoxies and restrictive design considerations. The architecture here can be a result of gratifying otherwise unachievable architectural dreams that are restricted by the real world.
2. The appeal of any virtual avatar stems from the artistic ability to construct synthetic but familiar representations. In this case, being familiar does not necessarily mean being real.
3. The tensions presented in the metaverse architecture are representational rather than purposeful. It projects a sense of identity, instead of being a useful typology that is not necessarily being projected through its identity.

Similar to the works of fiction, limitations are set in this world to somehow guide the imagination before it loses touch with historical representations of reality. Thus, internal logic is introduced, justifying the

law of physics of a fictional world and in that world only. The metaverse is based on the integration of various social experiences that go beyond the boundaries of what we typically consider to be the real world, and it may be crucial for a range of social activities and economic transactions (Seidel et al., 2022). The metaverse's internal logic could differ from one platform to another, and it is purposefully done so that different providers may benefit from different degrees of infrastructural freedom. Popular metaverse platforms such as Second Life, Sandbox, Voxels and Decentraland allow participants to navigate by walking and jumping around the world analogous to the real world, but at the same time could teleport an avatar to other real estates within seconds.

2.3. Design Dictum – Form Follows Familiarity

Meanwhile, the design principle 'form follows function' which was introduced by Louis Sullivan is echoed by many architects these days. Although arguably the functionalist approach to design may not be agreeable to some, we must emphasize that it has received various reinterpretations that try to negotiate the utopianism and utilitarianism facets of architecture. Many playful, reactive and some are bastardized even, versions of 'form follows function' have impacted architecture in many ways. Our proposal is yet another response to this. The 'form follows function' is appropriate to serve as the thesis for our proposed anti-thesis as it solely focuses on utilitarianism, which cannot be the case for the utopian metaverse world. As the architecture in the metaverse would not assume the conventional wisdom of functionality aspired by the dictum, what factor would a form follow, if functions were not specifically defined? Even if this was to be imposed, the metaverse could end up being insular to the proliferating nature of this world.

If a design paradigm for the metaverse cannot be based on function, enacting it based on familiarity is appropriate, as familiarity introduces internal logic that grounds architecture to the metaverse. So, we modify this traditional maxim with the one previously mentioned in a work by Auger (2014), which proposes 'form follows familiarity', a concept of adaptation that accepts design according to how they appear to fit with the existing landscape. In that context, it describes how to make robots migrate to our homes comfortably, therefore their alien appearance needs to be rendered familiar to our acceptance. A rather fitting paradigm to be adapted for architecture in the metaverse, as the 'alien appearance' of our non-identifiable architectural representations ought to be made familiar for us to accept it, achieved by replicating some aspects of reality that we are so accustomed to. The 'form follows familiarity' is laid out as the theme throughout the following discussions.

3. Methodology

This study carries on employing two main visual surveys within different blockchain-era metaverse platforms which are 'Decentraland' and 'Voxels'. We must highlight that 'Second Life', a popular case mentioned in many studies, is not used in ours as this platform puts focus on highly realistic representations which imply full recognizability, which may not serve our study enough which assesses familiarity. Likewise, this study stays away from two-dimensional metaverse platforms such as 'Gather' as they do not fit into the idealistic notion of the three-dimensional metaverse world advocated in our study. We also use the term 'architecture', 'space' and 'building' from this point onward to refer to artefactual specimens resembling architecture, although we have established earlier on that it is still debatable to call them such in the metaverse, following the practice of bracketing. A bracketing approach, as mentioned by Given (2008) is a phenomenological reduction that may result in the most accurate characterization and comprehension of the fundamental principles underlying the phenomenon under study. Our case selection criteria are based on architectural conformity. First, is an exaggerated caricature of an environment as represented in Decentraland. Second, is a reduced geometric environment as represented in Voxels. These varying architectural conformities can arouse our view on familiarity based on the contrasting hierarchy, suspended from the highly realistic phenomena often observed in traditional virtual environments. The visual surveys are focusing on the qualitative aspects brought about by the exterior and interior spaces, built-form, proportion/ dimension, and architectural components.

4. Result and Discussion

4.1. Decentraland

The environment represented in Decentraland is to many extents reliant on the familiar perceptions of space and architecture. For one, the envelops of buildings are of conspicuous architectural caricature but obey some spatial and site planning rules of sizes, height and dimensions adhering to the conventional standards. This goes insofar to the introduction of small nuances of common everyday familiarities such as a welcoming mat at the entrance, a stretch of railings, the presence of staircases, doors and down to the level of window mullions. NFT arts are displayed on the walls emulating how one would expect arts to be displayed in the real world. An entrance tends to be designed in grandeur for attracting participants to enter, similar to how it would lead someone in the real world. Placements of signages are appropriate and common, as envelops alone could not describe their symbolic significance. Although we must mention that the infrastructure of Decentraland could assume any form, the tendency to attend to familiarity is observed consistently throughout different properties or real estates.

The aspects that are liberated from the conventional settings, we observed, are brought about by the components defying the law of physics such as the floating staircases, penetrable walls and animated surfaces and textures. Although in most cases, vertical and horizontal planes are observed to be collisional objects that one could not pass through. In some cases, components such as ceilings, walls, floor slabs and openings are present without the presence of columns, lintels and beams usually necessitated by gravity pulls, while openings are free to be of various sizes agnostic of privacy or environmental concerns. All spaces seem to be properly lit without any help from lighting fixtures. Space configuration, however, is unstructured and seems not to be heavily motivated by conventional spatial logic by how unpredictable the spaces are in tandem with one another. This familiarity is present but of varying degrees, apparently driven by the motivation of making it navigable and attractive, designed for experiential encounters rather than solving specific spatial problems. Figure 2 to Figure 5 show some visual evidence of these encounters.

Figure 2. An exterior of a building with a grand entrance with huge signage, echoes similar conventions of the real world. (Source: Decentraland.org).

Figure 3. A lobby of a gallery that contains highly familiar encounters would expect from a real gallery (Source: Decentraland.org)

Figure 4. An interior space of an NFT arts gallery leading upstairs using steps despite the world is not navigated through normal motoric movements. (Source: Decentraland.org)

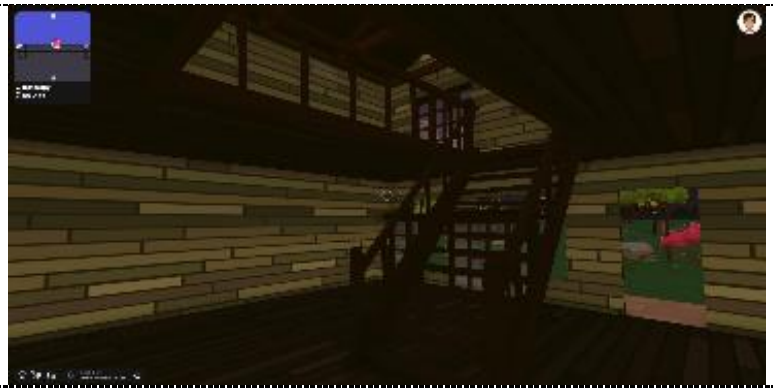

Figure 5. Spaces are mostly proportionally fitting for the human body and dimensions (Source: Decentraland.org)

4.2. Voxels

In Voxels, environments are of boxy aesthetics, or so-called 'voxels', which are of varying sizes that work as modules, similar to how pixel arts are often presented in the two-dimensional interface. With this in mind, we could suppose that architectural envelops here are achieved similar to how Lego bricks are used to generate forms. But unlike Lego, the architectures are, again, not conformed to the law of physics in which buildings are freed from structural requirements. This is emphasized, as many of the components do resemble structural elements although they are not. Compared to Decentraland, architectural artefacts in Voxels are projected in greater novelty appearance thanks to the limitation set by the block modules that force architecture to be more sculptural. While Decentraland seems to appear more governed and abstain itself from chaotic geometry, Voxels architecture seems to be more explorative. When it comes to the aspects of dimensions and proportions, the sense of familiarity is similar to how buildings in Decentraland are perceived. Some properties would go as far as sculpting its forms to the highest degree of familiarity. Figure 6 to Figure 9 show these encounters.

Figure 6. Exterior spaces are defined based on the grid surface plotted with buildings and objects. Buildings are often of insular styles and forms. Some could go as far as imitating popular formal styles. (Source: Voxels.com)

Figure 7. A building sculpted in a familiar form resembling a Chinese pagoda. (Source: Voxels.com)

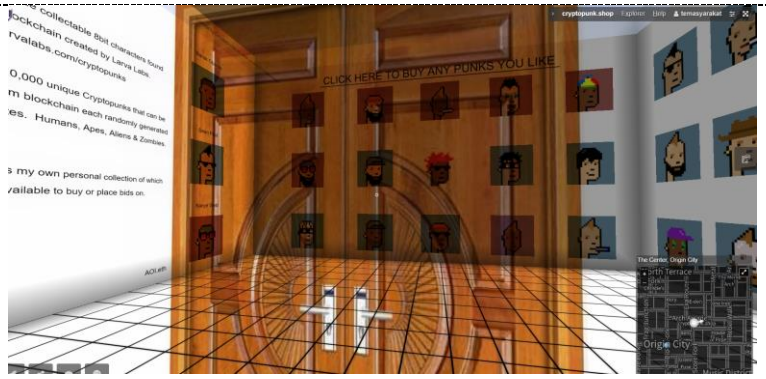

Figure 8. An entrance is defined with a familiar component such as a simple door plane. (Source: Voxels.com)

Figure 9. Familiar structural components such as these roof trusses do not serve any functional purpose. (Source: Voxels.com)

4.3. Form Follows Familiarity

We observed that architectures in the metaverse are enveloping shells resulting from the juxtaposition of solids, planes, and paths independent from architectural conscience but rather shaped by familiar forms. It is clear that the sense of familiarity has a major impact on these. The tendencies have at least confirmed this to be the design paradigm of the designers of the environment whether with technical or non-technical backgrounds, intentionally or unintentionally done so. Alas, 'form follows familiarity' in the metaverse could be deduced at least to be constantly noticeable but with a lack of architectural conscience. Although it is also technically difficult to quantify how much of this design decision-making precedence from familiar forms, this paradigm is deliberately being practised regardless of the intention. We summarize these findings from the visual surveys in Table 3.

Table 3. The Constant 'Form Follows Familiarity' Attributes in the Metaverse

Familiarity Variable	Description
Exterior Spaces	• Enticing movement from one property to another along streets and open spaces with appropriate distance. • Paths are populated with landscape elements.
Interior Spaces	• Encapsulating planes (although some are penetrable) act to define inside and outside; above and below. • Spaces are properly lit to suit the purpose.
Dimensions/ Proportions	• Following the familiar sizes such as openings, corridors, height, clearance, width and length anchored to the human body.
Envelops	• Buildings are distinguished by texture, geometric forms, and salient characteristics such as signages and grand entrances. • Some buildings are subscribing to forms belonging to certain formal styles.
Architectural Components	• Structural and architectural components are constantly present throughout most properties although are non-functional. • Surfaces and planes with familiar textures.

5. Conclusion

When we reach the level where ownership, economic scarcity and authenticity come into the virtual world, it breaks the fourth wall between reality and imagination. We can agree that architecture could enjoy its status of authenticity in the metaverse sooner or later. But at this current stage, architects ought to reposition various design paradigms to be properly understood. 'Form follows familiarity' is not just a dictum but it carries with it the philosophical agenda of understanding architecture in a different world. Although we must reiterate that, despite it is not uncommon for architectural representations in virtual environments to take precedence from their real-world counterparts, recognizing this as a design paradigm for the metaverse has a much bigger implication.

For one, it could lead to reciprocal understandings of both worlds that share similarities in terms of economic and social values. Secondly, 'form follows familiarity' is not specified to be an explicit rule on what should follow to build architecture for the metaverse, but it speaks about the humans' yearning. Despite how far apart these two worlds are, architectural wisdom could only go so far within familiar boundaries. But this could also be challenged in the next or near future, that familiarity could also just be an ephemeral phase, that a total utopian architecture in the metaverse could also soon just be indifferent to the real-world architecture in total. That would possibly change our design paradigm entirely.

6. References

[1] Appleyard, D. (1969). Why Buildings Are Known. *Environment and Behavior, 1*(2), 131–156. https://doi.org/10.1177/001391656900100202

[2] Given, L. M. (2008). The Sage Encyclopedia of Qualitative Research Methods. In *The Sage encyclopedia of qualitative research methods*.

[3] Ibáñez, L. A. H., & Naya, V. B. (2012). Cyberarchitecture: A Vitruvian Approach.

Proceedings of the 2012 International Conference on Cyberworlds, Cyberworlds 2012, *September*, 283–289. https://doi.org/10.1109/CW.2012.48

[4] Moneta, A. (2020). Architecture, Heritage and Metaverse: New Approaches and Methods for the Digital Built Environment. *Traditional Dwellings and Settlements Review*, *32*(2), 37–49.

[5] Narin, N. G. (2021). A Content Analysis of the Metaverse Articles. *Journal of Metaverse* , *1*(1), 17–24. www.secondlife.com

[6] Park, S., Kim, S. P., & Whang, M. (2021). Individual's social perception of virtual avatars embodied with their habitual facial expressions and facial appearance. *Sensors*, *21*(17). https://doi.org/10.3390/s21175986

[7] Park, S. M., & Kim, Y. G. (2022). A Metaverse: Taxonomy, Components, Applications, and Open Challenges. *IEEE Access*, *10*, 4209–4251. https://doi.org/10.1109/ACCESS.2021.3140175

[8] SCMP Editorial. (2022). *Metaverse and NFTs in China: A Different Tale*.

[9] Seidel, S., Berente, N., Nickerson, J., & Yepes, G. (2022). Designing the Metaverse. *Proceedings of the 55th Hawaii International Conference on System Sciences*, *7*, 6699–6708. https://doi.org/10.24251/hicss.2022.811

[10] Tang, S. K., & Hou, J.-H. (2022). Designing a Framework for Metaverse Architecture. *Proceedings of the 27th CAADRIA Conference*, *2*, 445–454. http://papers.cumincad.org/cgi-bin/works/paper/caadria2022_493

[11] Wang, Y., Su, Z., Zhang, N., Liu, D., Xing, R., Luan, T. H., & Shen, X. (2022). *A Survey on Metaverse: Fundamentals, Security, and Privacy*. 0–31. https://doi.org/10.36227/techrxiv.19255058.v2

[12] Zaini, A. I., Yazit, R. N. S. R., Goh, N. A., Gregory, Z. A. A., & Embi, M. R. (2022). Analysis on Recognizability and Legibility of Urban Virtual Environment in Virtual Reality Through Cognitive Maps. *Lecture Notes in Civil Engineering*, *223*(January), 23–30. https://doi.org/10.1007/978-981-16-8667-2_4