Metaverse in architectural design: *Metamodernism* as a new architectural language

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Abstract: The new trend in architectural design and urbanism shapes so-called *postreality* aesthetics in architecture, or *metamodernism*, as a new architectural language that primarily utilizes digital technology. The paper analyzes the emergence of a new architectural language from the perspective of architectural criticism, examining the architectural narrative of the *metaverse* and the architectural trends it promotes. What is the connection between architectural criticism, the history of architecture, architectural archives, and the future of architectural design in a *metaverse*-shaped world? Since existing cultural and historical references shape their elements, Metaverse architectural trends have evolved mainly without severing their connection to architectural history. The focus of the theoretical framework in this paper will be on the interconnection of the notions of *metaverse*, *multispace*, *metamodernism*, *postreality*, *modernity*, and *architectural language*. The analysis of the examples encompasses *metaverse* architectural concepts created by 3D artists and extended-reality architectural studios, as they seek a new architectural language, establish a framework for metaverse architecture, and develop a suitable aesthetic. Additionally, the paper examines the emergence of a new architectural paradigm influenced by the *metaverse* and AI, and its impact on urban development and sustainability.

Keywords: *metaverse*; *metamodernism*; *multispace*; architectural language; architectural criticism; *postreality*

1 *Postreality* versus *modernity*: The concepts of *metaverse and multispace*

There are several, but very similar definitions of what the "metaverse" represents in contemporary digital culture. The term *metaverse* was initially coined by American writer Neal Stephenson, who first mentioned and elaborated on the concept in his science fiction book *Snow Crash* (1992) as a "virtual universe separate from the real one" (Tang & Hou, 2022, p. 445). What is important in the context of the *metaverse* is that in this "simulated world" people create and use their avatars to interact with each other and engage in various activities – such as socializing, playing, trading, and conducting business meetings. However, it is not actually just a virtual (digital) world, separated from the real (physical) one, because without interaction with physical space, the avatars are not truly "alive", and the entire *metaverse* does not actually exist.

The other definition of the *metaverse* is that it is a "massively scaled and interoperable network of real-time rendered 3D virtual worlds and environments which can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence, and with continuity of data, such as identity, history, entitlements, objects, communications, and payments" (Lavdas et. al, 2023, p. 1).

Therefore, the main characteristics of the *metaverse* are: blending physical with digital reality, immersiveness, interactivity, decentralization, continuity, simultaneity, and hybridity. The question is how to contextualize the concept of *metaverse*, or what is the broader context of the *metaverse*?

Since the *metaverse* is initially defined as a virtual (digital) space, the question is how to determine the space between the physical and the digital – one that simultaneously includes both. That type of hybrid space is known as a *multispace*. Hence, *multispace* is the broader context of the *metaverse*. In other words, the *metaverse* is a part of *multispace*. *Multispace* is a space in between, and those who are positioned in a *multispace* occupy both physical and digital spaces simultaneously (Hopkins, 2023). *Multispaces* have different forms and intensities, and the closest medium that can explain the concept of *multispace* is *augmented reality* (AR), where the physical world experience is mediated by different digital tools (phone screens or virtual reality (VR) goggles and cameras) through which virtual objects or layers are inserted into a real-time video (ibid, p. 9).

According to specific contemporary interpretations, the development and omnipresence of the concept of *multispace* can be further explained and contextualized with a new reality paradigm called *Postreality* (Damiani, 2023). As Damiani stated: "Postreality can be viewed as the contemporary iteration of reality that emerges from, and in contradistinction to, modernity" (ibid, p. 41). Whilst modernity represents reality as monolithic (mono-spaces), universal, and consistent, postreality is a paradigm that deconstructed modernity and made reality multiplied and decentralized (ibid). Further, to introduce the notion of *metamodernism*, postreality is believed to be fully realised as *metamodern* and synthetic.

2 Principles and elements of architectural design for *metaverse*

The above-mentioned *metaverse* characteristics, such as immersiveness, interactivity, or simultaneity, participate in formulating principles that lead architectural designers through shaping concepts, aesthetics, and elements of the *metaverse* architectural language. Since the main characteristic of the *metaverse* experience is immersiveness, the architectural design aesthetic must be experienced in dynamic mode, and for the virtual spatial experience to be multisensory. *Metaverse* architects should pay attention to details that will be perceived by first impression, as well as to the creation of emotional connections to *metaverse* spaces. There are also some characteristic elements that, by default, do not exist in physical architecture *as such*, such as *portals* (although there are some simulations of portal experiences in certain projects), but they are necessary transition elements in *multispaces*.

In the context of *metaverse* architecture aesthetic, there are leading opinions that these architectural spaces are too futuristic, cold, distant, inhuman, and they are "lacking human qualities" (Lavdas et. al, 2023, p. 3). The primary reason is that the reference for *metaverse* architecture is predominantly mainstream architecture or the signature style of starchitects. However, the principles of architectural design in the *metaverse* differ from those in reality. Therefore, the *metaverse* aesthetic should not imitate already built and popular works of architecture, nor be their virtual simulacrum or *digital twins*, literally, though it should be guided by its own formulated rules and methodology.

One proposition for the *metaverse* aesthetic is the concept of *objective beauty*, which means that the notion of beauty should be understood in opposition to futuristic aesthetics, but rather as "biologically-based beauty" (ibid, p. 2). *Objective beauty* is defined as an aesthetic that "combines fractals with nested symmetries, together with other sources of biologically-meaningful visual information" (ibid, p. 4). Confirmation that this kind of aesthetic is widely accepted as beautiful, can be found in AI beauty ratings, as well as in the mathematical principles of organic form.

Nevertheless, methodologies for producing metaverse content and environments differ from those for creating realistic 3D textured models and renders. There are some limitations for the complexity of geometry, as well as for the realism of materials and textures, because of the constraints of the metaverse platforms or the transitioning through various software, for example – from the Rhinoceros3D model to the corresponding Metaverse platforms (like Decentraland Builder or MONA Metaverse platform), which are more like a game-like environments (Georgiou et. al, 2022). There must be some optimization strategies due to the geometry size limitations imposed by various *metaverse* platforms, in terms of the number of polygons or voxels, or file sizes, which impose a significant drawback in the workflow (ibid).

2.1 Physical prototypes of *multispaces* in architectural design

To begin with, there is an example believed to be a physical prototype of a *multispace* – the house-museum of the English architect Sir John Soane, in London. Unlike traditional notion of a museum, where the chronological narrative exists and guides the visitor through homogeneous space, "Soane created was a space of multiplicity – of many, sometimes competing references, layers and contexts turned in on themselves, blurring the real and the simulacra to such an extent that there is no meaningful distinction between the two" (Hopkins, 2023, p. 8). This type of heterogeneous space, with a non-linear narrative, resulted from Soane's reconstruction of three small row dwellings at 12-14 Lincoln's Inn Fields (1792-1824). Many years later he re-spatialised his travel memories in his museum's complex. The *multispatial* character of a museum can be best perceived in a 3D scan (ScanLAB, 2016) of Sir John Soane's Museum, as it is the only representational medium of this kind of quality for this museum (Figure 1).

Figure 1 3D scan of Sir John Soane's Museum (ScanLAB), London, 2016
(Source: https://www.soane.org/learning/families)

The *Dome Space* in Sir John Soane's Museum is the best representation of a "multi-planar and multidimensional composition of objects in space" (ibid, p. 9), featuring objects from different layers of historical and cultural contexts (Figure 2).

Figure 2 *Dome Space* in Sir John Soane's Museum
(Source: https://calendar.aiany.org/2023/10/10/travel-to-sir-john-soanes-museum/)

The *Breakfast Room* experience is multisensory, due to the refraction of light, and the superimposition of reflective mirror surfaces, which together create a flow of fragmented effects and poetic optical phenomena (Figure 3). The light penetrates the room through the lantern positioned in the center of the ceiling, as well as laterally from the ceiling structure on the pendants, refracting off the convex mirrors. Trachtenberg interprets perception of these effects in his *Breakfast Parlour* (*Breakfast Room*): "Convex mirrors appear throughout, and they are a key to the room's effects. The solidity of the forms dissolves into line and plane, and these in turn diffuse into shifting, intangible reflections. There are no sure boundaries, only interpenetrating, reflecting planes and edges that offer no resting point for the eye… those fanciful effects which constitute the poetry of architecture" (Trachtenberg & Hyman, 2002, p. 413). Precisely because of the perceptual effects they create in

space, these mirrors of the Breakfast Room could be a physical prototype of a *portal* in *multispace*, which will be discussed later in the paper.

Figure 3 *Breakfast Room* in Sir John Soane's Museum
(Source: https://www.soane.org/our-spaces, author: Celia Rogge)

Another example is the *multispace*, which is in the conceptual phase of the project and is also in the process of construction, namely the *Fungible/Non-Fungible Pavilion*, one of the most revolutionary projects that studio *iheartblob* has physically constructed (Figure 4). The extended-reality (XR) architecture studio *iheartblob*, based in the UK, is creating experimental architecture in form of physical installations, fully immersive digital spaces, and primarily mixed-reality (MR) experiences. Their work examines the concept of *multispace* and *metaverse* architecture from different perspectives, either to encourage interactions between visitors or to decentralize the design process to create inclusive, sustainable, and decentralized community design (Belitskaja, 2023). The *Fungible/Non-Fungible Pavilion* is a puzzle-like, structured pavilion built as the central installation at the Tallinn Architecture Biennale (TAB) 2022 in Estonia. According to the architects, this is the first pavilion in the world designed by the public and using physical versions of NFT (Non-Fungible Token)[1] objects, initially created with an NFT-generative tool. Also, it is co-owned, co-funded, and designed by the community (Crook, 2022). Since this project involves the public/community as the primary designer, the concept of the *Fungible/Non-Fungible Pavilion* offers a new perspective for the architect in *metaverse* design – specifically, "role in articulating the relationship between digital objects and spaces and their physical counterparts" (Belitskaja, 2023, p. 119). It was a continuous, never-ending community project, by its nature, but, since it was an exhibition pavilion, it was permanent, although not constrained in form and size, which continually grew.

[1] "NFTs, or non-fungible tokens, are certificates of authenticity and ownership that exist digitally and can be assigned to both physical and digital assets. Each one is individually recorded, or "minted", on a blockchain similarly to a cryptocurrency transaction, allowing it to be purchased, sold and collected" (Crook, 2022, para. 7).

Figure 4 *Fungible/Non-Fungible Pavilion* (Source: https://www.archdaily.com/994174/2022-tab-announces-record-numbers-and-extension-of-winning-installation-until-2024?ad_medium=gallery, author: Tõnu Tunnel)

2.2 *Metaverse* starchitect's projects: Emotional disconnection and acceleration of social inequity

On the other hand, there are examples of *metaverse* architecture projects designed by starchitects like Patrik Schumacher (Zaha Hadid Architects) and the architectural office Morphosis, which seem to accelerate social inequity (Bucknell, 2023). In physical context, the Free Republic of Liberland exists – it is a sovereign state located within the questioned territory on the western bank of the Danube, between Croatia and Serbia. In 2022, Patrik Schumacher designed its *digital twin* – the online world of Liberland in the form of Liberland's virtual campus (Figure 5). Aesthetic of this virtual campus architecture is futuristic, characterized by parametric curbs, and the multisensory experience cannot provide and emotional attachment with the space – "There is very little in the way of material development or sensuality of the environment. The weather is always sunny and the materials are stark white while various shapes curve around you" (Scavnicky, 2022, para. 5). Besides aesthetics, one of the strongest critiques for this kind of *metaverse* architectural project is that "designing a metaverse space like a built project in order to anticipate the eventual built outcome" isn't sustainable mainly "because the building will never be as useful as its metaverse version" (ibid, para. 4). Although the architects claims that the concept of Liberland Metaverse is decentralized, it functions in the opposite way – "by investing in the 'digital twin' of this micronation through purchasing pixelated plots of land in the metaverse, investors are guaranteed the same plots in the physical territory of Liberland…that if, it actually materialises" (Bucknell, 2023, p. 102).

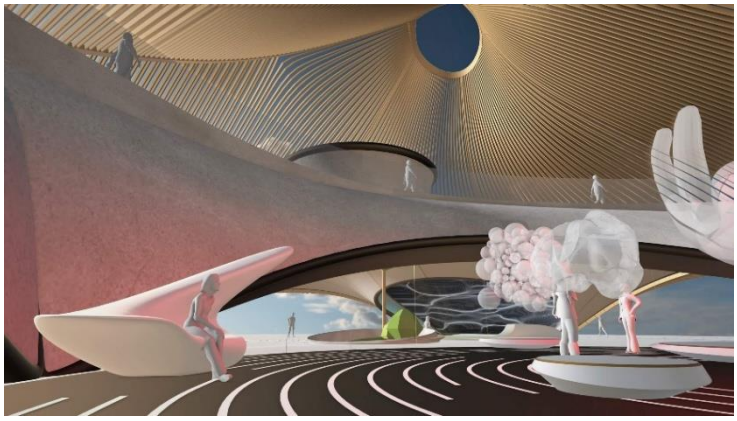

Figure 5 Rendering of the virtual urban city of Liberland Metaverse (ZHA)
(Source: https://www.archdaily.com/978522/zaha-hadid-architects-designs-cyber-urban-metaverse-city?ad_medium=gallery, Courtesy of ZHA)

Another megalomaniac *metaverse* architectural design project is NEOM's high-tech centerpiece, *The Line*, a 100-mile long (160-kilometre) long 'linear city' in Saudi Arabia, designed by the architectural office Morphosis (Figure 6). The volumetric of this structure consists of a horizontal skyscraper with an entirely reflective (mirrored)

façade, including a vertical garden composed of 100 million native trees, glow-in-the-dark beaches, and an artificial moon (Figure 7) (Bucknell, 2023). The NEOM's project, *The Line*, is not proposing any meaningful alternative as an 'eco smart city' to address the climate crisis, yet it is assumed that it will accelerate social inequity and emphasize class division, with its 'techno-solutionist approach to future urban development' (ibid, p. 102). *The Line's* aesthetics, with its mirrored façade and lengthwise structure, appear strange, 'alien', cold, and inhuman, disabling users from emotionally connecting with the space and perceiving it as a natural extension of their identity.

Figure 6 *The Line* with the mirrored façade, positioned across the Arabian Peninsula (Source: https://parametric-architecture.com/saudi-vision-2030-labor-right-concern/)

Figure 7 *The Line* with vertical gardens inside the horizontal skyscraper's mirrored façade structure (Source: https://www.constructionweekonline.com/news/neoms-the-line-documentary-architects-reveal-thoughts-in-45-minute-show)

2.3 Artist as *metaverse* concepts creator: In searching for a new architectural language

Still, the possibilities and potentials of the *metaverse* architecture are most fully realized through artistic utopian/dystopian *metaverse* projects created by extended-reality/*metaverse* architectural studios, or mixed-reality architectural designers and artists. The architectural compositions are more interesting and playful, they are not merely *digital twins* of mainstream architectural works, but original designs made for the *metaverse* world. Those virtual worlds are speculative and experimental, mostly imagined by film directors, game designers, or 3D artists, and created using real-time rendering software such as Unity and Unreal Engine.

The inaugural event of the Metaverse Architecture Biennale 2023, titled *Presence of the Future*, connects the past, present, and future of architectural design innovation and visionary concepts (Mohan, 2023). The name of the *metaverse* opening event originated from the iconic Venice Architecture Biennale's first edition (1980), aptly

titled the *Presence of the Past*. The creators of the exhibition's virtual pavilions and worlds included architectural studios such as Killa Design, LAVA, PLP, ATRIUM, SoomeenHahm Design, Spaces DAO, DA!, Il Prisma, SA lab, iheartblob, OBMI, Mariana Cabuguiera Studios, Untitled, and ILLUSORR. There are some pavilions such as the *Villette-verse*, the *metaverse* pavilion, which serves as a futuristic re-creation of Bernard Tschumi's Parc de la Villette project. These pavilions demonstrate the significance and value of immersive, interactive exhibits in developing new perspectives for architects and designers, as well as new dimensions of experience for space users.

It is surely no coincidence that architects and educators Lara Lesmes and Fredrik Hellberg, the founders of architecture studio Space Popular, have chosen Sir John Soane's Museum as the exhibition location for their findings from a research project called *The Portal Galleries*. This project presents an archive of portals which appeared in a world of fiction and fantasy (books, films, television series and games), that was compiled with more than 900 examples, organised into 18 different categories, archived in period from 2020 to 2022 (Platform 9¾ in Harry Potter, wardrobe in the Narnia books, or rabbit-hole in Alice in Wonderland, to mention some of them). Architecture studio Space Popular developed their own augmented reality (AR) portal, and have installed it in Sir John Soane's Museum exhibition galleries, in 2022, to show the results of their research.[2] Visitors wore VR glasses to see the archive of portals' virtual installation, as an added layer around the real table in room, at which they sit (Figure 8 and 9). The table is tactile because Space Popular believes that "the future of virtual experiences will be about touch" (Buxton, 2022, para. 6), and visitors navigate through the virtual archive VR experience with their hands.

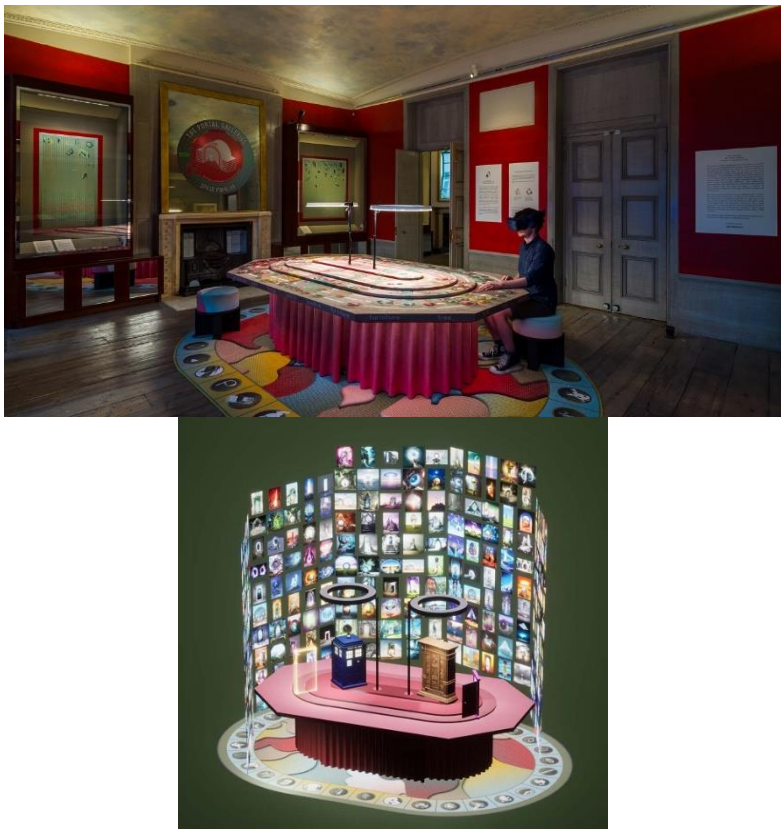

Figure 8 and 9 *The Portal Galleries* augmented reality (AR) installation (left), and virtual archive of portals (right) (Sources: https://www.alcantara.com/space-popular-talk-about-the-portal-galleries-backstage/, Lesmes & Hellberg, 2023, p. 16)

As previously mentioned, in Sir John Soane's Museum, there are several physical prototypes of *portals*, similar to those found in a virtual *multispace*, in the form of "scale shifts, unfolding walls and cleverly placed mirrors" (Lesmes & Hellberg, 2023, p. 17). Space Popular, in collaboration with 3D experiential interior designer and illustrator Rachel Swetnam, created images of these portals, placed in the *Breakfast Room*, the *Picture Room*,

[2] "The exhibition consisted of several parts presenting a cross-media historical study of fictional portals: two immersive films with accompanying furniture pieces that enable a multisensory experience, a 2D film presenting the 18 portal archetypes found in the archive, analytical drawings of portals in Sir John Soane's Museum, and a curated series of drawings from Soane's office representing a diversity of thresholds" (Lesmes & Hellberg, 2023, p. 17).

and the passage from the *South Drawing Room* to the exhibition galleries (Figure 10, 11 and 12). These illustrations represent the characteristics of space elements in the museum that made them elements of transition from one room to another, especially the view from the inside of the ceiling lantern in the *Breakfast Room*, where visitors can get a feeling of being in an upside-down position in the room. Illustrations convey a sense of mystification, as well as a dose of clarity, suggesting that they are some *portals*, without a doubt.

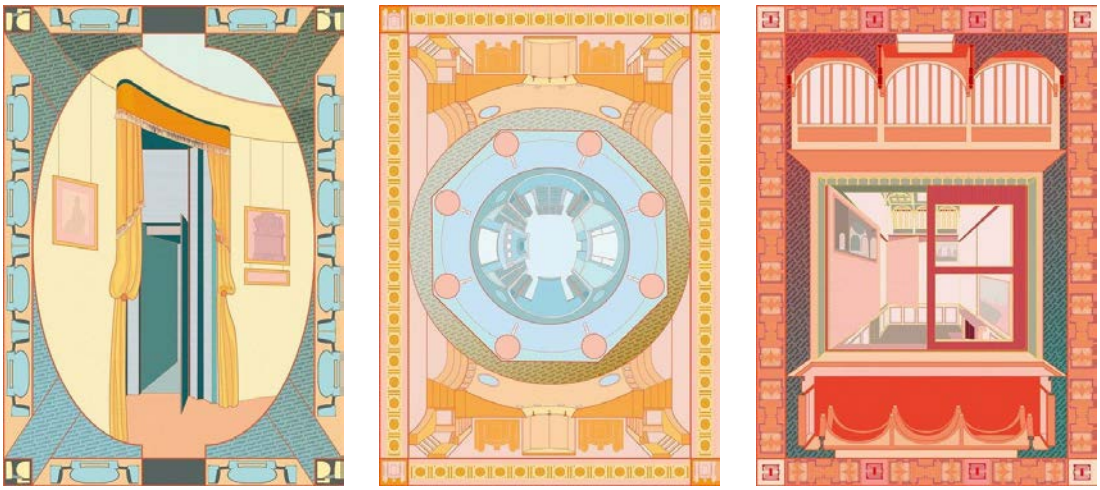

Figure 10, 11 and 12 Illustrations of *portal-like* elements in Sir John Soane's Museum (illustrator Rachel Swetnam)
(Source: https://www.ribaj.com/culture/review-portal-galleries-space-popular-soane)

Architectural interventions by 3D and *metaverse* artists are primarily situated in the domain of speculative architecture, blurring the notions of *utopia* and *dystopia*. The artists are not constrained by budgets, standards, regulations, building codes, clients, or other parameters that limit architectural designers.
An artist, Mari (*MadMaraca*), specialized in voxel (*volumetric pixel*) art and 3D design, which artwork has been displayed on iconic billboards at Times Square in New York, Los Angeles, Brussels, and Shibuya in Tokyo, creates micro worlds/dioramas with knotty details. She combines architecture, culture, and nature in a utopian/dystopian collage of architectural and urbanistic elements (Figure 13). Her primary material for creating a metaverse world is a *voxel* - a cubic 3D 'pixel'. In her portfolio, she features voxel art of Persian houses, temples, cities, and other dioramas.

Figure 13 *Ithakros city* by artist Mari (MadMaraca)
(Source: https://madmaraca.art/projects/mzZ6Ga)

Another example of metaverse architecture created by a 3D artist is the Genesis series – the ROOM series (25x) – made by artist Kirk Finkel (*Untitled, xyz*) in 2022/23 (Figure 14). *ROOMs* – a decentralized extension of the Museum of Crypto Art – represents virtual galleries made to display between 8 and 256 digital artworks. Each artwork is modeled in the form of an architectonic structure inspired by traditional motifs but arranged in a new order of elements. This series is a study that explores and analyzes the possibilities of a new architectural language within the context of the *metaverse*.

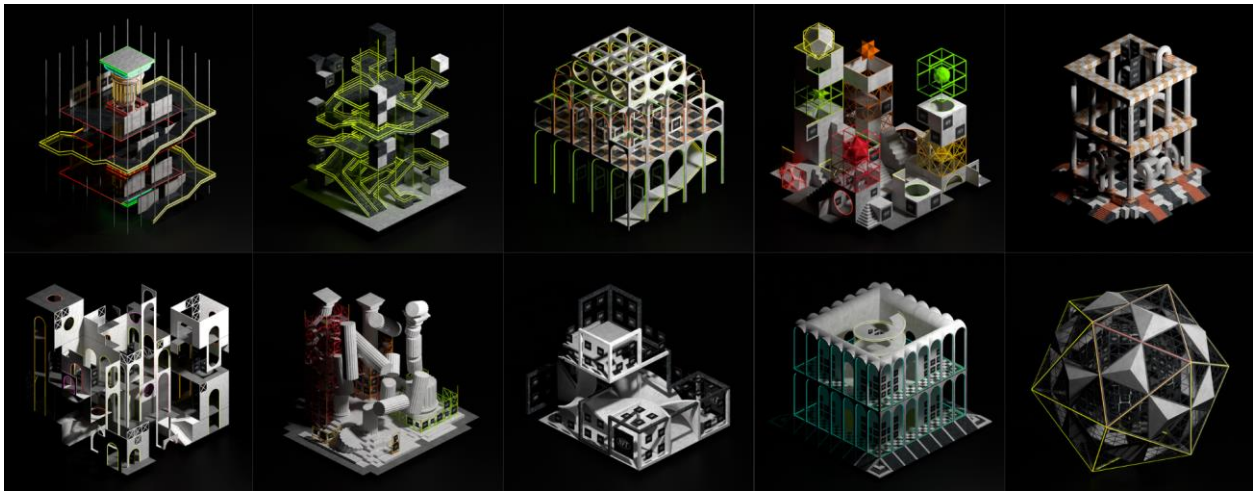

Figure 14 *ROOMs* – a decentralized extension of the Museum of Crypto Art, artist Kirk Finkel (Untitled, xyz) (Source: https://untitled.xyz/rooms)

3 Results and conclusions

A proposed framework for *metaverse* architecture consists of four main elements: spaces, activities, people, and objects (Tang & Hou, 2022). In other words, designers in the *metaverse* create content for avatars to interact with and environments to experience it multisensory. Each of these four principal elements creates a dialogue with the others, and each has its benefits and disadvantages. However, there are some questions that architectural designers should propose as key guides for the design process. They are referred to in the context of metaverse architecture, the architectural requirements for the *metaverse* project task, the aesthetic and style of *metaverse* architecture: the architectural elements of *metaverse* architecture, the user's experience of *metaverse* architecture, and the architectural design strategies for the *metaverse*.

Spatiotemporal context in *metaverse* architecture is a more complex concept than in (physical) architectural design. Since the *metaverse* blends digital and physical elements, they coexist simultaneously, and the *metaverse* cannot exist without a physical context. Without it, avatars would be lifeless, and there would be no interactivity. The only spatiotemporal determinant is *multispace*, with its multi-location concept, but a unique temporal concept.

In formulating the project task for the *metaverse*, the architectural requirements depend on the project's aims, especially the type of experience envisioned for the *metaverse* world. Thus, the plan for spatial communications may be the most important, and the relation between different types of elements, between voids and built parts. The architecture must be simulated in a dynamic, and not a static, mode.

A suggestion for the aesthetic of *metaverse* architecture is to avoid mainstream, pretentious, futuristic, and high-tech styles in architectural design concepts, which can often be perceived as cold, distant, and inhuman. On the contrary, the proposition for the metaverse aesthetic is the concept of *objective beauty*, which can be found in the mathematical principles of organic forms. In the *metaverse*, there are other types of design strategies, such as voxel art, where cubic 3D pixels' are the main architectural elements. Hence, the established architectural rules, like Louis Sullivan's "form follows function", are no longer necessary to be implemented.

Architectural materials for the *metaverse* are also data and holograms. Moreover, there is another type of architectural requirement, such as portals, that does not exist in architectural design *as such*. All of this is important for shaping the metaverse architectural language, but it is also crucial to constantly analyze the *metaverse* architecture in relation to architectural design trends and flows. As it is assumed that most spaces will be hybrid and fluid in the near future, the architectural language of the metaverse will be of great importance in discussion of architectural theory and criticism, representing a new paradigm of significant importance for the development of architectural design.

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