

Perspective

A Look from the Metaverse to the Historical City

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Abstract: The metaverse represents the newest environment where people will be able to live, work, learn, shop, and socialize. This environment has causal powers and is independent of our minds. As Bruno Latour and others have shown, there is no discrete technological object which is purely and totally inhuman or reducible to a purely instrumental neutrality. This is especially important, since the arrangement of physical environments subsequently dictates the social interactions and possibilities of the people they serve, so it is important to analyse current trends, in order to educate for the future. The importance of an increasing virtual socialisation in understanding the life cycle of cities should not be underestimated. This article aims to delve deeper into a framework analysis of the representation of cities in terms of the (re)articulations of the human and the non-human.

Keywords: Metaverse; Heritage Places; Architectural Anthropology; Heritage

1. Introduction

Digital technologies increasingly shape a virtual everyday life, if we understand virtuality as a series of mediations that influence our activities and perceptions in various ways. It is important to recognize that the digital realm is not simply a collection of isolated worlds, discrete nodes, or unrelated communication platforms [1]. Likewise, technological prostheses are not mere accessories or neutral additions; they activate the full relay race of human activity [2]. In this sense, technology has become a kind of "second nature." Every culture, after all, is a technological one, and modern civic sensibility is deeply tied to the tools individuals use to influence others and shape decision-making [2].

The metaverse represents the latest technological prosthesis, an enhancement that enables a digital environment in which people can live, work, learn, shop, and socialize. This paper examines the emerging relationship between the metaverse and historic urban environments, with particular attention to how virtual extensions of cities may transform the ways in which heritage is represented, experienced, and interpreted. While the metaverse is often discussed in relation to smart cities, digital twins, or technologically driven urban innovation, its implications for historic cities remain underexplored. These environments present specific challenges due to their layered cultural meanings, material constraints, and the need to balance preservation with contemporary use while maintaining connections with heritage communities. In this context, the metaverse should not be understood merely as a technological development, but as a socio-technical space capable of reconfiguring spatial experience, social interaction, and cultural value. From this perspective, the technological infrastructures associated with the metaverse can be understood as

“dispositifs” [3], ensembles of technical, institutional, and regulatory mechanisms, that shape how space is produced and interpreted. As Lewellen [4] notes, dispositifs operate as apparatuses of power that enable certain discourses to be applied across different contexts. When applied to historic cities, these mechanisms may facilitate the diffusion of dominant narratives and representational frameworks.

By focusing on historic cities, this paper critically assesses how virtual environments can both extend and support urban heritage, opening new possibilities for engagement while raising important questions regarding authenticity, representation, and continuity.

2. Metaverse-city

The metaverse is increasingly described as an emerging environment. It integrates a range of technologies, including blockchain, the web, social media, online gaming, decentralized finance (DeFi), and advanced hardware systems, which enable it to function as a virtual reflection of conventional social life. However, definitions and ontological frameworks of the metaverse remain diverse and evolving, with layered architectures and hybrid integrations shaping current academic discourse [5].

In this paper, we adopt the definition proposed by Weinberger [6], as it places particular emphasis on the user perspective and conceptualizes the metaverse as possessing causal powers, that is, the capacity to shape user behaviour, interactions, and social relations, and a degree of independence from individual cognition [7].

“The Metaverse is an interconnected web of ubiquitous virtual worlds partly overlapping with and enhancing the physical world. These virtual worlds enable users represented by avatars to connect and interact with each other, to experience and consume user-generated content in an immersive, scalable, synchronous and persistent environment.” [6].

This definition reveals a significant parallel with classical understandings of the city as a socio-spatial construct. As Georg Simmel (quoted in [8]) argued in the early twentieth century, the city is not merely a physical setting, but a complex network of social interactions, mediated experiences, and forms of association shaped by its spatial and technological conditions. This perspective is further developed by Henri Lefebvre [9], who conceptualizes space as socially produced through the interplay of practices, representations, and lived experience. In this sense, the metaverse can be understood not simply as a digital replica of urban space, but as a socio-technical environment in which new forms of spatial production and social organization emerge. Furthermore, as Bruno Latour [10] and others have argued, there is no purely neutral or wholly “inhuman” technological object; every technology carries social meaning. This matters because both physical and virtual environments shape human interactions and possibilities. Therefore, understanding current technological trends is key to reflecting on historical cities and how they can evolve alongside these new environments in ways that mutually support one another. Major technological shifts also mean redefining citizenship, its tools, priorities, and directions, as well as the arena in which civic life is enacted. Virtual reality opens up dynamic opportunities for experiencing historical environments and urban life, reflecting new ways we work, socialize, and engage with cities [11].

Current evidence suggests that the urban metaverse is moving beyond a purely speculative concept and is increasingly taking shape through a range of documented, real-world applications. A growing number of cases show how metaverse-related technologies are already being deployed in urban contexts, although at different

levels of maturity. Initiatives range from fully operational “cityverse” platforms, such as Seoul’s Metaverse Seoul [12], which delivers a wide array of public services including tax counselling, business support, civic engagement, and immersive social interaction, to high-fidelity digital twins, such as those developed in Helsinki and Singapore [13], which enable virtual tourism, infrastructure optimisation, and scenario-based urban planning. Other cities, including Dubai, London, New York, Shanghai, and Spain-region cases such as Benidorm (Alicante) and Catalonia, are integrating metaverse-aligned systems into smart city strategies, focusing on real-time data integration, mobility management, and enhanced public services [13]. On the other hand, experimental and hybrid approaches, such as participatory planning initiatives in Boston [14] or Barbados’ metaverse embassy [13], further extend these applications into domains of governance, diplomacy, and civic participation. In parallel, platform-based ecosystems such as Decentraland and Roblox [15] illustrate how user-generated environments contribute to the formation of urban-like social, cultural, and economic dynamics in virtual space.

Taken together, these cases suggest that technologies associated with the urban metaverse are increasingly taking on roles and functions that were once confined to the physical city, from service delivery to social and economic interaction, and are now being shared between tangible and virtual environments. However, historic cities, characterised by layered cultural meanings, heritage sites, regulatory constraints, and material authenticity, remain relatively underexplored as a distinct field of application, thereby overlooking the complex tensions between preservation, accessibility, and evolution that define historic urban landscapes. Moreover, there are a lack of conceptual frameworks capable of assessing how metaverse environments may mediate authenticity, spatial experience, and cultural value in historical contexts. This gap is especially critical given that the metaverse enables the construction of imagined spaces that are grounded in real urban environments while simultaneously allowing experiences that transcend physical, regulatory, and the limitations of everyday life. Addressing this gap requires moving beyond generalised claims about technological potential and developing context-sensitive approaches that critically examine how virtual extensions of historic cities can support new forms of engagement, interpretation, and use, while maintaining the integrity and significance of their material and intangible heritage. In this context, the metaverse offers a unique capacity to construct imagined spaces that are rooted in these real urban contexts while simultaneously enabling experiences that transcend the physical and regulatory limitations of heritage environments. This opens a line of investigation into how virtual extensions of historic cities may support new forms of engagement, interpretation, and use, while also enabling alternative modes of inhabitation and participation in contexts where processes of urban commodification displace local communities.

In this sense, these should be understood not merely as representational layers, but as socio-technical environments in which new forms of spatiality and presence are enacted. Space, including virtual space, is not a neutral container but a relational construct shaped through practice, perception, and meaning-making [9,16]. Within the metaverse, this relationality is reconfigured: presence is no longer tied exclusively to physical co-location but emerges through mediated interaction, embodiment via avatars, and synchronized participation in persistent environments.

This shift raises important ontological questions regarding the status of virtual space and the forms of life it may sustain. From a digital anthropological perspective,

virtual worlds can be understood as sites of “real” sociality, where identities, relationships, and systems of value are actively constructed and experienced, even in the absence of material instantiation [17]. Framed in this way, virtual environments are not neutral or empty containers, but socio-cultural spaces that, like physical environments, can embody and transmit values, histories, and collective meanings. This becomes particularly relevant when considered in relation to heritage contexts, where individuals’ connections to place are not only experiential but also constitutive of identity, emerging through the interplay between lived environments and inherited pasts. Heritage environments function as frameworks for cultural continuity, providing symbolic references through which individuals situate themselves within broader temporal narratives [18,19]. Moreover, the forms and images of these environments generate what has been described as ontological security, a sense of trust grounded in the perceived continuity of past, present, and future, and sustained through everyday social practices [20].

From this perspective, both physical and virtual environments can be understood as complex carriers of meaning, capable of transmitting beliefs, values, and practices as part of an extended cognitive and cultural system [21]. Virtual beings, whether human-controlled avatars or autonomous agents, thus participate in meaningful social worlds that may reproduce, reinterpret, or transform these inherited structures of meaning, challenging conventional distinctions between the physical and the virtual. It anchors users’ social identities, providing people with the ability to imagine alternative ways of living within historical cities.

However, such environments remain shaped by technical architectures and platform logics, which delimit the scope of action and agency, as well as the extent to which these values and symbolism can be meaningfully enacted or sustained. As a consequence, immersive virtual experiences are fundamentally conditioned by the underlying technological systems that enable them, and are increasingly enhanced by emerging technologies such as sensors, wearable haptics, AI, cameras, and next-generation user interfaces. These tools not only enable but also directly influence how users perceive time and space within virtual environments.

However, virtual reality carries risks: a detachment from authentic experiences in education, work, and society, what Baudrillard [22] called the simulacrum [23]. In this context, the relationship between the physical city and its virtual counterpart should be understood not as a simple duplication, but as a dynamic and co-constitutive assemblage. Virtual cities do not merely reproduce urban space; they reinterpret, augment, and, in some cases, redefine its social, symbolic, and functional dimensions. This makes it necessary to critically examine how urban realities are translated into the metaverse, what forms of presence and interaction they enable, and what kinds of value, social, cultural, or experiential, are produced within these hybrid spatial configurations. This means identifying the core concepts behind those representations and exploring their significance within our hybrid physical-digital realities.

3. Virtuality and Perception

When addressing historical cities, it is essential to recognize that territories are not only materially or geographically produced but also socially constructed through ideologies and cultural representations. Urban imagery not only inspires fictional virtual environments but can also strategically reshape public perceptions of existing places [24]. Far from being passive backdrops, historic cities are increasingly

becoming virtualized territories in which identity and brand perception are mediated through situated, curated, and personalized experiences. This indicates that virtual representations can act as powerful agents of change, capable of promoting specific sociopolitical agendas, historical narratives, and power structures.

Within this context, the metaverse may play a significant role in cultural preservation and transmission, as culture and technology co-evolve in a mutually dependent relationship. Safeguarding urban heritage requires acknowledging the inseparability of tangible and intangible cultural elements, since cities embody specific ways of living and acting, shaped by time and context [25].

For virtual representations of historical cities to be recognizable and capable of exerting influence, they must rely on shared conventions and reference systems that resonate with collective memory. Accordingly, the design of these historical environments should present selective and intentional interpretations of heritage landmarks rather than literal reproductions [26,27]. This aligns with what Westin and Hedlund [27] describe as a polychronic approach, engaging perception systems beyond just the visual. Indeed, an excessive reliance on purely visual, ocular-centric representations can reduce immersion and weaken the experiential quality of virtual environments [28].

Consequently, perception in metaverse representations of historical cities must extend beyond visual accuracy to include natural interaction with objects, avatars, and environments, as well as a sense of embodied presence in which the avatar is experienced as an extension of the physical self. A meaningful alignment between virtual environments and their real-world counterparts is therefore essential to support recognition and engagement [29].

Achieving this requires multimodal integration systems capable of encoding complex sensory experiences, including tactile-visual, tactile-auditory, and visual-auditory interactions. In physical environments, perception emerges from the simultaneous processing of multiple sensory inputs, and our understanding of space is fundamentally shaped by this integration [30]. As such, examining how multisensory perception operates in virtual contexts, and how it can be effectively translated into design strategies, becomes a critical step in the development of metaverse environments that meaningfully represent historical cities.

In design terms, the representation of historic cities in the metaverse requires moving beyond purely visual reconstruction toward integrated multisensory strategies that can evoke culturally embedded ways of perceiving and inhabiting space. This involves identifying sensory patterns, symbolic elements, and spatial practices that are meaningful within specific historical and cultural contexts [31]. Importantly, these frameworks are not universal but vary across communities and user groups, making the design of heritage-oriented metaverse environments a fundamentally interpretative and context-dependent process. Understanding these sensory and cultural dimensions is therefore essential for developing virtual representations that do not merely reproduce historic cities, but meaningfully re-articulate their experiential and symbolic complexity.

But as noted above, the capabilities and limitations of the metaverse are fundamentally conditioned by its underlying technical architectures, which actively shape its functional, social, and spatial dimensions[32]. At the functional level, rendering systems must not only ensure visual fidelity and real-time responsiveness but also support selective and intentional interpretations of historical accuracy, material detail, and atmospheric coherence. This is particularly demanding in contexts

where recognition and perceived realism are critical. Multi-GPU rendering pipelines and advanced simulation techniques enable increasingly detailed reconstructions, yet they also introduce trade-offs between fidelity and scalability, especially in large, historically complex urban environments [33].

Spatial computing frameworks, often integrated with digital twins and geospatial data, play a key role in synchronizing physical and virtual representations of historic urban areas. However, historic cities are not static entities, but layered constructs shaped by temporal stratification, cultural interpretation, and contested narratives. As such, digital twins in heritage contexts must negotiate not only spatial accuracy but also decisions about which historical period, version, or interpretation of the city is being represented [34,35]. XR interfaces further shape how users perceive and experience these environments, influencing the degree of immersion and embodiment, but also raise questions about how multisensory cues, such as soundscapes, material tactility, and environmental conditions, can be meaningfully reconstructed in historically grounded ways.

At the social level, these architectures also condition how users engage with historic urban environments. XR-driven embodiment enables forms of co-presence and interaction within reconstructed heritage spaces, potentially supporting education, tourism, and participatory interpretation. However, the use of blockchain-based identity and ownership systems in such contexts introduces tensions between commodification and cultural value, particularly when heritage assets are transformed into tradable digital entities [36,37]. Interoperability remains a critical challenge, as the fragmentation of platforms limits the continuity of cultural narratives and the persistence of shared experiences across different virtual environments [38].

Spatially, the combination of real-time rendering and geospatial infrastructures enables both high-fidelity replicas of historic environments and speculative reconstructions of past urban forms. Yet, this capacity also introduces epistemological challenges: virtual reconstructions may blur the distinction between documented history and interpretative simulation, potentially reshaping users' perception of authenticity and historical truth. Digital twins and data-driven environments can support conservation, monitoring, and scenario testing, but they also require careful calibration to avoid reducing complex cultural landscapes to purely technical models [39].

All these challenges are compounded by technical constraints. Latency and bandwidth limitations affect the seamless exploration of detailed historic environments, while interoperability gaps result in fragmented representations and discontinuous user experiences [32,40]. Blockchain scalability issues and governance limitations further complicate the management of heritage-related digital assets [41], and XR technologies raise significant concerns regarding accessibility, inclusivity, and user well-being, including cybersickness and device dependency [36,42].

4. Reflections on Historical Cities in the Metaverse

This article acknowledges that historical virtual cities must be analyzed based on their capacity to re-realize and re-localize, rather than merely as spaces of disconnection or dislocation[18]. However, the metaverse, as a fully realized, shared virtual world where users interact in real time through avatars, is not yet consolidated.

Within the metaverse, cities can range from speculative and recreational environments to highly detailed digital replicas. However, when applied to historic cities, this variability raises critical questions regarding recognition, perceived realism,

and continuity between virtual representations and their physical counterparts. Digital twins and related technologies offer tools for simulating urban form and behaviour, yet their application to heritage contexts requires more than functional replication. Historic urban environments are shaped by temporal layering, cultural meaning, and collective memory, which are not easily reducible to data-driven models.

Videogames constitute one of the most developed technological domains engaging with the virtual representation of historical cities. Titles such as *Assassin's Creed* have recreated past urban settings with a high degree of visual detail. However, these representations are typically anchored in specific historical periods and do not correspond to the contemporary identity of these cities. As a result, users may experience a disconnection between the virtual environment and its present-day physical counterpart, limiting processes of recognition and weakening the potential for re-localization [43].

Similarly, while other virtual environments incorporate references to historical architecture or urban forms, they often prioritize aesthetic or narrative functions over spatial accuracy and social interaction. This can result in environments that provide only superficial recognition without fostering a deeper sense of place or cultural continuity.

In this context, perceived realism becomes a central issue. It is not sufficient for virtual environments to reproduce visual characteristics; they must also support meaningful forms of interaction, embodiment, and multisensory engagement that allow users to relate virtual spaces to lived urban experience [44]. This is particularly relevant in historic cities, where identity is constructed through the interplay of material form, sensory perception, and cultural practice.

Consequently, the representation of historic urban environments in the metaverse should be understood not as a process of simple digital replication, but as a selective and interpretative act that shapes how heritage is perceived, experienced, and transmitted [45]. This requires a critical awareness of how virtual environments re-articulate spatial meaning and cultural narratives, as well as the limitations inherent in current technological and design approaches. This integration holds the potential for a Kuhnian paradigm shift[46], offering a powerful response to the challenge of establishing a meaningful connection between the physical city and its virtual counterpart, an exercise which will require careful analysis of the city's sensory content and the associated symbolic meanings which define it.

In this early stage of development, analysing how historic cities are represented into the metaverse, and how human and non-human elements are re-articulated within these environments, is essential. As the digital realm becomes a new informational layer in urban experience, professionals in architecture and urbanism must engage critically with its implications, ensuring that the representation of heritage remains grounded in cultural specificity, experiential depth, and spatial coherence.

To move beyond descriptive accounts and fragmented implementations, it becomes necessary to outline a set of preliminary directions for evaluating the representation of historic cities within the metaverse. First, recognitional coherence appears essential: virtual environments should enable users to meaningfully identify and relate the digital representation to its physical counterpart, not only through visual resemblance but through spatial logic and culturally embedded cues. Second, temporal intelligibility should be considered, ensuring that the historical layers embedded in urban form are not reduced to a single, decontextualized moment, but are instead communicated as part of an evolving narrative. Third, experiential depth

emerges as a key dimension, involving multisensory and interactive qualities that reflect how heritage is lived and perceived, rather than merely observed. Fourth, cultural specificity should guide design decisions, acknowledging that heritage is shaped by localized practices, meanings, and collective memory, which resist universal standardization. Finally, interpretative transparency becomes particularly relevant, making explicit the assumptions, selections, and omissions involved in constructing virtual environments, especially when dealing with partial or contested historical knowledge.

These preliminary directions suggest that the representation of historic cities in the metaverse is not solely a technical challenge but also an epistemological and cultural one. Addressing this complexity requires an interdisciplinary approach capable of integrating technological development with architectural, anthropological, and heritage-based perspectives, to ensure that virtual environments contribute meaningfully to the understanding and transmission of urban heritage.

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