

ARCHITECTURE, HERITAGE AND METAVERSE: NEW APPROACHES AND METHODS FOR THE DIGITAL BUILT ENVIRONMENT

The paper reviews the author's professional work and academic research as an architect and scenographer on the Metaverse of Second Life, known as a collective virtual shared space, with the aim to establish the role of architecture and heritage in the digital built environment. The research utilised a design methodology that considers historical archetypes of architecture as 'elements' individually characterized, which can interact with each other -as in a language- generating new elements. Case studies illustrate these new architectures derived from a critical interpretation of heritage architecture, which developed the sense of memory in the virtual world.

INTRODUCTION

We live in an *extended* world that includes the coexistence of real and virtual places, which determine our real life and virtual life. At the same time, the world of communication, dominated by the culture of image, is shifting into the world of interaction within a digitally driven society.

Metaverse (i.e. beyond universe), is a term used to describe the concept of a future iteration of the internet, made up of persistent, shared, 3D virtual spaces linked into a perceived virtual universe. Also called generically a collective virtual shared space¹, Metaverse is considered the next version of internet, which includes all Virtual Worlds. This study is focused on Virtual World environments and, specifically, on Second Life (SL) a Multiuser Virtual Environment (MUVE), where users create 3D environments and objects, and move through them with their own avatars, engaging with other users in real time. The aim is to introduce the role of memory and heritage in the digital built environment through architectural composition and history; more specifically, applying principles of *Architecture by Elements*, Gianfranco Moneta's architectural theoretical methodology.²

The paper is then aimed at answering the following research question: Can the role of architect and architecture improve the physical quality and experience of Virtual Worlds? Can the principles and methods of *Architecture by Elements* be applied in a digital built environment, and in doing so, producing new architectures as a critical interpretation of heritage architecture?

The paper reviews the existing body of knowledge about architectural design on Virtual World (VW), and the author's professional work and academic research as a digital architect and Higher Education academic on the Metaverse of SL. Case studies on SL illustrate the varied outcomes of the research, while considering the Metaverse as an opportunity to transform how we design and experience architecture in both the real and virtual world.

ARCHITECTURAL DESIGN THEORY AND VIRTUAL WORLDS

Research in Architectural design included its development in the cyberspace since the 1990's.³ In the early years, architecture started to merge its boundaries into cyberspace, also due to a number of inspired designers (from Archigram to Asymptote) and theoretical contributions. Later on, digital incursion in this field had been mainly developed into parametric architecture, form-based design and gaming.

In the meanwhile, architecture of RW had been influenced by post-capitalism and globalization, the fall of the values of the past, the loss of stable references.⁴ Major advances in automation, information technology and the fourth industrial revolution have further developed the globalisation of architecture, eradicating the character of a place and cultural identity⁵.

Urban designers and architects like Koolhaas, Libeskind, Hadid and Gehry rejected formal design orthodoxies and principles, experimenting with new designs that fuelled bold, dramatic statements within the urban environment⁶. These Post Urbanism designs and architectures are sensational, designed to impress the audience and celebrate the client's magnificence, but often at the expenses of the human scale and the relationship with the context and its history. Among others, Rem Koolhaas' concept of 'Bigness'⁷ had a great impact on the last generation of architects and architecture schools, that now consider the architectural principles (composition, scale, proportion, hierarchy) and the lesson of history, as surpassed 'chains' of an old fashioned approach to the discipline. As a result, this generalized globalization of means and methods generated Atopia, an indifference to the place, demolishing local identity, Genius Loci and social purpose. Architectural design in VW is mirroring this tendency.

However, the nature of space in VW is fundamentally different from the nature of RW; consequently, the architecture of VW needs his own theory and practice.⁸ This is why VW became the place of research and experimentation aimed at (re)establishing the founding role of architecture through the application of principles of functional organization within the digital environment.⁹ Not surprisingly, these design principles had been inspired not by the latest, 'icastic' generation of architects, but by the theories of architects and urbanists of the past. The application of utopian and visionary urban planning of Le Corbusier, for example, with his highly centralised and structured model, was key to help design virtual environments which could be easy to navigate through; Frank Lloyd Wright's opposite approach, which was aimed at the dissolution of the city in favour of more widespread, decentralised communities, helped virtual cities to grow organically.¹⁰ Kevin Lynch's findings on the perceptual form of urban environments¹¹, and specifically, the fact that users understand their surroundings in consistent and predictable ways forming mental maps, was key to solve the important task of navigation and orientation in virtual environments, enhancing the users' spatial awareness.¹² Lynch introduced the term 'way-finding' to define 'a consistent use and organization of definite sensory cues from the external environment' and the five main elements that people use to orient themselves with a mental map: Paths, Edges, Districts, Nodes and Landmarks. These elements, and their mutual interactions, had been extensively used to define principles of architectural design of virtual environments in academic research on the subject.¹³ Another important contribution comes from Christopher Alexander, that long before his famous 1977 book *A Pattern Language*, used computation and structure to develop tools to improve town or to design a house. This was in opposition to the traditional urban planning approach in which preconceived grids, zones, roads, and buildings are imposed on human activity.¹⁴ His methodology has been used for the development of Object-Oriented programming, Interaction Design, and new software technology called 'design patterns' used in Macs, iPhones, many other computer systems and video games.¹⁵ *A Pattern Language* also inspired *The Sims (2000)*, one of the best-selling video game series of all time.¹⁶ Strange to say, despite the 4th Industrial Revolution, most of the architectural design theory in cyberspace is almost 30 years old; was in 1993, in fact, when Marcos Novak introduced his 'liquid

architecture' and 'transarchitectures', a design thinking that explored the integration of physical and virtual spaces in navigable digital environments.¹⁷

In recent years, Pattern Design had been developed into Generative Design (GD), another method that utilises computational process to design in VW, but that is supported by the application of a *grammar* aimed at formally defining *design languages* for VW.¹⁸ GD's grammar is based on a set of rules that describe an architectural 'style'. Unfortunately, the overall formal result of the GD forms is more a phantasmagoria than architecture, a plurality of combinations of fantastic, bizarre, complex imagery. An interesting recent development in the field is the work of two different teams of architects, engineers, academics and scientist collectively grouped under the names of *Digital Architectonics* and *Discrete Architecture*. They both aim to reappraise the digital in architecture as a step to reappraising architecture as a driving cultural force in the 21st century.

Digital Architectonics was founded by prof. Ludger Hovestadt of ETH Zurich (Swiss Federal Institute of Technology in Zurich); active since 2009, his Chair for Computer Aided Architectural Design masters strategies and theoretical approaches to methodology and abstraction in Computational Design and Digital Modelling, called Digital Architectonics.¹⁹ The term *Architectonics* derives from Kant's *Architektonik*, a concept that acknowledges architecture as something unstable (as in VW and games) in opposition to traditional, solid and concrete architecture of RW.²⁰ One of the researches of Hovestadt's team involved the systematic arrangement of the pillars derived from Vitruvius' *De Architectura* to Classicism, in order to produce construction instructions that can be used in GD.

Discrete Architecture theory utilizes Mereology (the study of a whole through the relationship between its parts), gathering techniques of bonding, joining, interlocking entangling and overlapping of architecture parts.²¹ Both approaches demonstrate a tendency to experiment with the basic building blocks and rules of architecture using computation.

This paper constitutes a further exploration of GD innovative direction, through the application of the theory of Architecture by Elements (ABE) to the VW of SL.

GAMING AND VIRTUAL WORLDS

VW can be considered as a brand new digital built environment, an extension of our Real World (RW) that includes not just a physical appearance, but also cultural and social interaction, aesthetic and philosophical arguments. These crucial instances are part of the design training in architecture, but they are generally not included in the education of those who actually design and build VW, i.e. game designers, programmers and users. As a consequence of this lack of knowledge, architectures in gaming's VW could be broadly described as sort of film sets, characterised by a fairy-tale naivety²², generally aimed at reproducing RW environments.

After thirty years since their blast in the entertainment industry, video games are starting to look the same, and play the same. Despite the recent massive improvement of internet speed and IT devices, the novelty factor of games that had been developed in the last 15 years has reached its lowest point²³.

Developers nowadays are spending great resources trying to turn games into movies, to improve their look and 'appeal'. We could argue that this situation is the consequence of a lack of architects in the VW. Without architects, there is only scenography as *imitation of architecture*. Absurdly, in the VW where everything is unlimited, architecture is limited.

There is a need to go beyond realism in virtual environments, and set the basis for a full development of VW's creative and artistic potential. To realise a *digital spatial revolution*, Games and VW need to abandon the depiction of reality, and develop an understanding and application of architectural concepts and theories, giving life to truly utopian designs, to make the impossible possible.

To do so, it is fundamentally important to consider the main difference between buildings in RW and VW; in the first realm they are fixed and not generally transformable, while in the digital realm they can change and quickly re-configure as performing architectures, in a dynamic interactive process with the user.²⁴ VW are also a place for action and functionality, where gamers use architecture with a specific purpose, as a parkour athlete use buildings. Applying architecture principles to VW is a way more complex operation that should also include historical and contextual instances. All elements that play an important role in the design process, although bringing history in VW may appear as a nonsense. VW in

fact, are commonly considered timeless, without a chronological history; they usually ‘borrow’ specific period of our real past history as games’ main themes (Middle Ages, WWII, etc.). But if we consider history as a process, and utilise the historical archetypes of architecture as ‘elements’ of a language, we can open up new territories for architecture and, at the same time, enhance the quality of the digital built environment, including Game Design.

Since the 80’s, when VW started to appear in Gaming, a digital built environment has been created from scratch by software developers, conceptual artists, 3D modelers, game designers and, on specific platforms and conditions, also by users (game players) giving them the possibility to modify and/or further create physical content in a VW.

Game designers are currently trained to be proficient with IT skills, but also to create 2D and 3D art. Depending on the role and level (junior, senior) a game designer is trained to design and realise characters, objects and environments, to create textures, and to visualise them through digital and non-digital sketches and animations. Skills include concept artwork, computer modelling and animation in both 2D and 3D. Game designer’s training includes both visual art and technology but doesn’t include any architectural, landscape, urban planning design skills; as a consequence, VW are currently created by a legion of non-architects (I will call them *designers of architectures*) which also cover the role of architects, landscape designers, urban planners and interior designers. Designing architecture on the Metaverse is a challenging task even for experienced architects, let alone for those who do not have their cultural and technical background. Freed from spatial, economic and technical limitations, without a natural environment and an anthropic history, *designers of architectures* could be easily lost in the digital magic domain where everything is possible and potentially huge.

VW are not isolated from RW, they extend into each other and mutually influence.²⁵ *Minecraft* (2009), the most popular game in history, which acts as a form of ‘digital LEGO’ for players, had been successfully utilised to facilitate engagement and participation in architecture processes and urban planning. RW can influence the WV on an *imaginary level*, which is produced by other imaginary worlds: books, movies, television, role-playing games and religion. All these worlds are producing a

powerful background that inspires and guide designers in the definition of characters, storytelling and physical spaces. This is why many games are related to old myths, famous novels, fantasy books, and their architectures reflects a sort of fairy tale expressionism.

RW can also influence the VW on a factual, more *objective level*, which is produced by our past and recent history and generates the historical landscapes that we can see in many VW and games. History is not tangible though, it lives within individual memories that produce over the time cultural memory, and that involves the collective memory. Individuals are able to express their identity linking their culture to a common shared culture that is based upon a set of memories of the past.

VW can record and display our cultural memory through the physical appearance, with the aim to link the past with the present enhancing the users' connection with a specific environment and architecture.²⁶

There is a need to evolve the skills and knowledge of *designers of architectures* into the more solid array of competences that only architecture can offer; at the same time, we need to *extend* the role of architect into the VW, understanding the functional aspects of gaming and storytelling. What is really needed, is a constructive dialogue between the disciplines of architecture and gaming.

This is even more necessary when VW design involves the reproduction of historical environments and their architectures. Most of the time, this reproduction follows controversial philological approaches and methods. As an example, for the development of video game *Assassin's Creed II*, game industry's giant Ubisoft created a detailed virtual replica of Florence during the Renaissance and, to achieve historical accuracy, employed a young Professor of architectural history and theory, Maria Elisa Navarro, as historical consultant for the game. The result is a movie-like, impressive detailed reproduction of period costume and architectures, but with major 'adjustments', like the increased total height of the buildings to improve climbing movements, and the curved streets of a totally reinvented map of Florence, to enhance the movement of players.²⁷

Context is another important aspects to consider. Architects are trained to analyse and understand the environment in which they design, its tangible and intangible elements inherited from the past; these elements include the anthropic history, the landscape and natural environment, the past use of the place,

and the memory of the inhabitants. Good architects usually start designing from pre-existing elements, which they re-interpret through their own cultural background and cognitive and professional experiences.

All of this does not exist in the VW. Direct emotional exchanges are mediated through a user interface and/or an avatar; gamers are alone but at the same time sharing the experience of a virtual space with other people, a meta-space in which there is no weight, there are no smells, nothing could be physically touched, and there is no memory except that which is (re)created specifically to create the period of the Metaverse.²⁸

SECOND LIFE AS A DESIGNER'S SANDBOX

Second Life (SL) is still in activity after more than 15 years, along period of time for a game, because it is not just a game, but a place for creativity across Internet and real world culture. SL in fact, is a user-generated content platform, which regularly produces engaging content: from art performances to political campaign, from land auction to adult entertainment. Unlike games that are fixed environments, Second Life was built as an empty space, designed to be filled with contents generated by the users, a feature that naturally attracted architects and urban planners. SL was born in 2003 and now it looks terribly dated, if compared to other platforms as *Fortnite* by Epic Games, which is going to lead the Metaverse as the possible future of the internet.²⁹ But during the last seventeen years of activity SL has been constantly changing, because users are not guests: they are residents that build their home, car, and any other weird stuff using a basic 3D modelling software embedded in the platform.

SL is still relevant today for the many possibilities of interaction and creative experimentation that it offers to several disciplines, including theatre, performing arts, architecture, urban planning, fashion design, social sciences, psychology; furthermore, it is an ideal platform for distance learning, and an ideal shared space for research in the intersection between architecture and gaming.

Approaching architecture on SL, as happens in any VW, the initial aspect to consider could apparently be the architectural function of the building, to allow avatars to move around and truly experience the

spaces, enjoying aesthetics beyond functionality; SL in fact, allows the user to engage in a virtual reality experience without the need of a headset. This virtual interaction creates, as contradictory as it may seem, places that are *real* to the extent that they are experienced, built and modified; in this shared experience, place is not anymore just defined as a space with a *character*, but also as a space that is actually *happening*.

A NEW METHODOLOGY FOR METAVERSE: ARCHITECTURE BY ELEMENTS

Language can be considered as a set of language games: it is comparable to a city, built at different times, made of buildings with different purposes and functions.

L. Wittgenstein, Philosophical Researches, 1953³⁰

The methodology used in the present paper is an application of *Architecture by Elements* (ABE) to the Metaverse of SL, an architectural theory introduced by Gianfranco Moneta in *Logica e Complessità dell'Architettura* (2002), and successfully applied in RW during his longstanding career as a professional architect and academic in Italy. ABE's research involved the inner processes of architecture and its mechanisms of configuration, a research to which the author participated between 1997 and 2005 at the Faculty of Architecture of University of Rome La Sapienza. The ABE methodology is aimed at restoring the identity of architecture as a intertwining not just of art and technique, but also thought and ideology, being inspired by the works of philosophers Husserl and Paci (phenomenology), Heidegger (existentialism), and Wittgenstein (philosophy of language).

This paper is thus aimed at extending and testing ABE research into VW and, specifically, to explore and improve the design possibilities of the *empty space* of SL using the language of architecture.

History plays a fundamental role for ABE: it guides the architectural design process through the selection of a reference language from the past and the historical/morphological reading of phenomena related to it. ABE in fact, considers 'design' any historical development that could be critically read as a process.

History as a *process* is here intended not just as past activities that interact to produce a further result, but

as an *evolutionary realization*. Considering ‘the past as a friend’, designers can freely choose from an endless source of form and compositional principles.

One of the key elements of ABE is also the analogy with the principles of linguistics and, more specifically to Ludwig Wittgenstein’s theory of ‘language-games’³¹, used here to describe parts of language that contain both the language and the actions in it. Wittgenstein also used the term ‘language-game’ when comparing language to a city, built at different times, made of buildings with different purposes and functions.

Applying his philosophical concept of language to architecture, we can assume that language of architecture, as a whole, is composed by different language-games, each of them containing its own language parts and rules. ABE could be considered as a language-game, considering the architectural lexicon as a set of parts to associate or to contrast in a complex language-game unit; as a result, this architecture unit, organized and defined, can compose a simple or complex sentence, in the form of a new architecture.

This methodological approach first and foremost needs to define its components: the lexicon, the syntax and the semantics. To do so, we can use the work and theory of architect Louis Isadore Kahn, known for combining Modernism with the weight and dignity of ancient monuments. Moreover, ABE methodology has been inspired by Kahn’s monumental architecture that utilises complex organisation of single independent units (Elements), an approach that derives from Kahn’s understanding and application of Greek and Ancient Roman architecture as language-games.

It has been previously introduced in this paper that the compositional activity of designing architectures on VW is mainly limited to the imitation of the RW. Despite this mimetic process, designers cannot deny their own cultural background and the reference to real architecture, taking their personal interpretation of history and architecture in the VW; in doing so, designers realise an *act of knowledge* that starts with an initial synthesis that includes: 1) the choice of the reference lexicon (the list of forms); 2) the selection of the interrelation criteria between the different words of the lexicon (syntax); 3) the taking of meaning of the selected material; then, the form that hosts the function (semantics).

This approach follows Louis Kahn' paradigm shift from modernist architecture ideology of the 'form follows function', towards the revolutionary idea of being the 'form that generates the function'.

This *act of knowledge* implies the question: What is the reference lexicon that a designer can use?

For Louis Kahn, lexicon and syntax are freely chosen from both present time and the past, an endless source of form and compositional principles. Past also includes a shared cultural heritage, a collective and universal memory without specificity of time and place.

The ABE theory further develop this approach, considering the coexistence of both 'known' forms taken from the history of architecture, and 'new' forms, where different lexicons and syntax coexist in the same organism. The use of the past is not a mere stylistic resumption then, but a reinterpretation of archetypal symbols, that constitutes an important reappraising process of architecture.

Furthermore, ABE considers archetypes as internal parts of the historical process, subject to a constant transformation derived from their reuse. The overlap of historical buildings over time gives rise to extraordinary architectural figures, from which it is possible to identify fundamental architectural principles (Fig. 1).

Architecture, through its symbolic nature, can access the domain of the unconscious, giving shape to archetypes that produce - through the forms - the deep structures derived from history or nature.

In some cases, the forms coincide with the archetypes, but most importantly, archetypes are the principles of the forms and can be reutilised in the architectural design process. Hence, the *form* takes on a profound meaning that goes beyond its aesthetic value, and becomes *form-principle*.³²

This interpretation follows the Aristotelian definition of *form*, considered as *the arrangement or organization of elements, as the result of which they have become the thing which they have. As matter they are potentially anything that they can become; it is the form which determines what they actually become*³³. This definition is utilised by Louis Kahn in his work when introduces the *Elements* and their organisation; a notion that is also included in the ABE theory, that considers *Elements* of architecture as individually characterized and interacting with each other as a language; *Elements*, therefore, with semantic values and constituting a syntactic system.

The ABE theory re-establish the importance of the *form as a principle* derived from the archetypes of past architecture, and is aimed at reusing this strong compositional principle, which allows to design architecture putting Elements in relation to each other following their own lexicon.

The result of this compositional principle are new combinations and associations of Elements, which allow to obtain figures with greater complexity, linguistic *sentences* that possess absolutely innovative characters. The reuse of elements derived from history guarantees the historical continuity of the new architectural design, incorporating time into design. At the same time, innovation is guaranteed by the reuse of elements in a different context, decontextualizing its figurative role, up to rebuild a totally different context. Representing time and context in the architectural design in fact, are key aspects that play an important role when designing on VW and, specifically, on the blank space of SL.

In ABE, the Elements are following three organizational methods: 1) *Juxtaposition*; 2) *Interpenetration*; 3) *Translation, Rotation, Subtraction*.³⁴ With *Juxtaposition*, when an Element approaches other Elements, an interdependence, a bond, and therefore a relationship in the form of a linguistic principle is established. This organisational method utilises strong structuring axes, to achieve formal stability (example: the terrace house). With *Interpenetration*, the Elements are organised in infinite combinations following non-parallel axis; here, Elements are able to intersect and overlap each other, realising a complex organisational form. In the resulting new unit, each Element retains its identity and at the same time, contributes to creating a higher-rank unit: the language *sentence*. With *Translation, Rotation, Subtraction*, Elements yield their own parts to the advantage of other Elements which thus build stronger structures than the former; this subtraction process generates a controlled break-up of the Elements, their *deconstruction*.

To explore design on VW the author co-created *Weretomato*, an architectural design company dedicated to SL, together with other three Italian architects, Maurizio Crocco, Mario Leante and Luigi Nappi, members of *Archabout*, a transdisciplinary lab dedicated to cultural production, research and education in the artistic fields of architecture, theatre and visual arts.

Weretomato designers used Second Life as a research platform to apply ABE's methodology, developing innovative architectural environments, interactive content and immersive experiences for SL residents and private institutions.

CASE STUDY 1: HADRIAN'S VILLA ISLAND ON SL

As a necessary premise, we must underline the frustration of having to represent designs on VW using two-dimensional b/w images and text on a centuries-old technology such as printed paper. Academic research in VW would greatly benefit of alternative forms of medium for dissemination.

Weretomato team realised, as a collective design on SL, Hadrian's Villa (HV) on a Private Region (Island) of 65,536 sqm, as a Manifesto of architecture on SL, based on the Ancient Roman architecture landmark using the theoretical principles of ABE. The aim was not just to reproduce the famous building designed by the Roman emperor Hadrian in Tivoli, but to develop a critical interpretation of it, researching into the founding principles of its space. HV is a perfect historical example of ABE's principles, the same ones that guided the design process on SL. Choosing this complex was the first step of ABE's *act of knowledge*, setting an example of Ancient Roman architecture as the reference lexicon with its *forms, syntax* and *semantics*.

HV architecture has been also chosen to explore the role of *reuse as a process*, where new designs become part of the temporal development of architecture, including time in the project. HV has been 'recreated' on a SL blank island as a linguistic *sentence*, reusing the complexity of its single Elements in a different context, decontextualizing its figurative role, with the aim to generate a different context in the VW. This follows the history of original HV, that was built in different phases reusing an existing older republican villa³⁵. The planometric design composition of the HV on SL accomplished its original syntax, using a disposition centred on several vanishing points, within which both old and new Elements are intervened using rotations, changes of positions, fractures, and dissonances. This approach developed a formal coherence of the whole using two of the organisational composition's principles of ABE: #1 *Juxtaposition*, and #3 *Translation, Rotation, Subtraction*.

The design included the scaling of HV floor plan into the Island of SL and the selection of buildings to be included, in order to maintain the overall proportions of all Elements and their organising axes. A scaled 3D model of Hadrian's Villa was also built to help the team to discuss in real-time all design choices during the realisation of the complex; using avatars, design meetings had been held 'in the air' flying over the Island utilising the aerial view of the building site (Fig. 2). The design didn't include some eastern peripheral buildings, the Academy and Canopo, in order to fit the SL Island and realise a more compact floor plan, leaving space for additional buildings and further functions (Fig. 3) with a focus on cultural and educational activities:

F - *LumesArch – Telematic University*, a space designed to deliver e-learning educational activities on SL, including architectural design, theatre design and Generative Design architecture;

E - *Scenography Sandbox*, a place to experiment and create set design and live performances for students and tutors of BA Architecture and Scenography courses of University of Rome La Sapienza;

- *The Maritime Theatre*, a place for temporary exhibitions, performances and cultural events;

D - *WAM-Web Art Mouseum*, a museum-laboratory dedicated to Web Art;

G - *Contemporary Art Gallery* curated by Footprint;

B, C - *15 studio spaces* of different sizes to be rented for representative and commercial functions;

A, H - *20 apartments* to be rented with the possibility to have a personalised interior design;

ABE allowed to design these 'new' buildings and their different functions within the HV architectures; incorporating new Elements into his original structure, generating new *sentences*, thus realising an innovative dialogue between old and new architectures. The Ancient Roman architecture, with its own peculiar Elements and disposition (columns, arches, septum etc.), facilitated the process of this development, allowing contemporary architectures to become part of the Hadrian's complex, respecting the form and syntax of Roman architecture. The dichotomy between old and new is here transformed in non-duality, being *oneness* a fundamental outcome of the ABE methodology, which includes process and time in the design project.

The result of the design process of HV Island is a multifaceted, kaleidoscope of dynamic architectures, which are able to transform themselves within the historical framework of the Roman ‘ruins’ of the villa, following new uses and needs of the island on SL. The architectural Elements of HV, with the establishment of a specific lexicon, will also guide further development of new architectures on the island, as new *sentences* that are compatible with the historical pre-existence; these new Elements will form an integral part of it, as an open conversation with the past.

The relationship with history, in fact, is intended here not as a simple withdrawal of forms; instead, it is considered as a process; memory gives us the forms and the principles, history teaches us to operate within an unceasing process of mutations and transformations.

The impact of HV Island has been successfully validated through different outputs: as a distance learning platform, as a performative space and as an exhibition space. In the first case, the Island has been used as an online platform of the Module of Scenography of the University of Rome La Sapienza, where the author’s students could experiment their set design projects. Using avatars that can move and talk, SL in fact, gives tutors the possibility to interact in real time with the students, and to directly intervene in the design process during its development. Students’ positive feedback received included ‘an engaging tutorial experience’ and ‘it enhances design interactivity’; the coexistence of tutor and students in the same virtual space in fact, developed a pedagogic connection between the teacher, the student and the design process in a live, engaging and interactive experience; moreover, the tutorials were happening not through the review of 2D or 3D images, but through the direct experience of the 3D design model from inside, outside, and even flying over it (Fig. 4).

As another output, HV Island has been used for live theatre performances through the participation of Scenography students, professional designers and audience in the form of avatars. ‘@nts’ was a multidimensional performance freely adapted from the novel ‘*The Electric Ant*’ by Philip K. Dick and staged simultaneously in the Maritime Theatre of HV Island on SL, and in the RW of the studio theatre of the Faculty of Architecture, University of Rome La Sapienza.

The scenography of '@nts' was conceived as a mutating organism in which the main character, a cyborg, is represented as a physically abstract entity of our reality that experiences parallel universes (virtual and real). The performance showed its perceptions of both worlds, a reality that is beyond time and space. The two set designs have been extended to the whole theatre space, allowing the action to take place between the audience, eliminating the separation between actor and spectator. The audiences in VW and RW were immersed in sensorial and changing organism, which communicated through sound, light, music and video projections on a large Cube. Video projections on the Cube acted as CCTV views of the other world, realising a real-time visual connection between the performances on SL and RW (Fig. 5, 6). The digital connection created an interference between the two worlds, realising a space-time short circuit, a multi-dimensional space for the performance. Post-show audience feedback highlighted not just the quality of the performance and the overall experience, but also described the events as 'a new way to engage with digital technology', 'both performances had an emotional impact on me', 'the performance linked real and virtual worlds'³⁶.

As a third output, HV was used an exhibition space for *WAM-Web Art Mouseum*, a museum dedicated to Web Art. The space has been designed to host a series of events with the aim to disclose and disseminate digital art. Through the production of digital artists from around the world, the exhibition's spaces facilitated the aesthetic innovations derived from the use of digital technology as an instrument of artistic creation and communication. Positive feedback from audience had been collected during the exhibition and the WAM launch event in RW of Rome, San Lorenzo district, an event that also included multimedia installations and performances.

CASE STUDY 2: TEMPLE UNIVERSITY CAMPUS ON SECOND LIFE

The project of the Virtual Campus on Second Life for Temple University has been a further verification of ABE methodology's effectiveness to face the challenges of designing architecture in a virtual world. The initial request of the client was to faithfully reproduce a part of the University campus in Philadelphia. The design brief in fact, requested a series of specific environments for e-learning, in which

tutors could simulate scientific experiments and potentially risky activities, without exposing students to any dangers and, at the same time, training them for risk assessment. The size of the space of an island on SL (256 x 256 mt.) was not big enough to enclose the area to be reproduced; therefore, *Weretomato* designers had to make a choice: to scale and adapt the buildings to fit the smaller space on the SL island or, to create a totally different space. The design team opted for this second hypothesis, exploring possible specific characteristics of this new version of the Campus in a virtual reality.

No longer having the direct reference of the RW campus' buildings, designers applied ABE methodology to realise a complete new environment that could retain a connection with the city of Philadelphia, where Temple University resides, and yet to explore what specific characteristics of this new blank built environment should and could be.

ABE's initial step to design Temple University Campus, the *act of knowledge*, was choosing a different *reference lexicon*, which no longer had direct reference to the real world of the campus. This issue was answered using the city of Philadelphia's grid street plan, and adding to it an iconic architectural complex that could be used as a *linguistic game's* reference for the design, so to realise an architectural dialogue between them. The design has been then focused on the following two reference *Elements*:

1) *Philadelphia's grid plan*, which could be adapted to the modular frame of the virtual space on SL being the latter a square island. The grid served as an urban network to connect the different parts of the Campus in an organic composition on which superimposing other architectures.

2) *The National Parliament House in Dhaka, Bangladesh*, designed by one of most famous citizens of Philadelphia's recent past, Louis Isadore Kahn, an architect which has already been introduced in this paper as a relevant *trait d'union* with ABE methodology. The architectural style of Louis Kahn, with its characteristic formal coherence and articulation, is almost absent in digital environments, as it does not reflect the contemporary architecture, widespread in RW, based on single episodes, conceptual and iconic forms. As mentioned earlier, ABE methodology refuses this self-referential tendency of contemporary architecture, which is only aimed at realising radical new identities disconnected from the context. Kahn's masterwork represents one of the best example of his peculiar *architecture of totality*

that incorporates and deliver a strong and unitary space; his work in Dhaka can be considered as the architecture of articulation, of autonomous elements that are accosted, interpenetrated, rotated and then integrated together; these characteristics of ABE are derived from Ancient Roman architectural complex, such as the Baths of Caracalla and Trajan's Market in Rome. Again, choosing Kahn's architecture was not to make a copy of it, but to interpret it as a sort of pre-existence, therefore with the dignity of memory.

To fit the given space on SL Island, the floor plan of Dhaka's complex has been scaled down following the same approach of Hadrian's Villa. During this process Kahn's architecture undertook a sort of ageing process, with the aim to turn it into a ruin of a glorious past architecture (Fig. 7, 8).

Using brickwork textures, lowering the walls to different heights, removing the roofs of buildings, *Weretomato* designers created a sort of 'modern ruin' extracting the structuring force from Kahn's Elements, in order to articulate the grid of the new campus. Again, with this project for Temple University's virtual Campus, the objective was to create a past within the virtual world of SL, to inhabit this virtual space as an expression of a previous civilization that interferes and influences the creation of the virtual Campus.

Diamond Island positive impact has been measured not just by the sustained avatar 'traffic' registered over a period of time on the Island, but also and foremost by enthusiastic response of the client and the feedback of Temple University's students and tutors. The design in fact, provided the users with playful and articulated spaces, allowing users to simulate their scientific experiments and potentially risky activities in a safe environment, and to deliver different learning activities. Students and tutors' positive feedback included 'an engaging Virtual Campus' spaces', 'an easy to use virtual environment'.

The overall architectural design's outcome has been probably partially achieved though, not because it was unsuitable and unrealistic, but because it was incomplete. In some parts of the island the Kahn's 'ruin' prevailed over everything else, because it was not 'inhabited' by the new Campus. In other areas of the island the ruin was reduced to a few broken walls detached from the whole. However, the validity of

the idea and the structuring capacity of the architectural system created on Diamond remains as a solid framework for further experimentation and research on SL and VW.

CONCLUSION: TOWARDS A POST-DIGITAL SPATIAL REVOLUTION

After decades of experimentation, *the digital revolution is over*, as Nicholas Negroponte declared in his book *Beyond Digital* (1998); we currently live in the post-digital era, and it is now quite difficult to draw a line between the digital and the non-digital. The post-digital in fact, acknowledging the computational hegemony, is focused on the outcome of the computer age in our life and society.³⁷ While the digital revolution enhanced architecture with CAD and VR, the post-digital paradigm realises an opportunity for architects and *designers of architectures* to better understand the effects that computer age had on our contemporary built environment, the latter intended as expression of oneness of the digital and the non-digital. Paraphrasing Mel Alexenberg, we need to consider post-digital architecture as architecture that ‘address the humanization of digital technologies through interplay between digital, biological, cultural, and spiritual systems, between cyberspace and real space, between embodied media and mixed reality in social and physical communication, between visual, haptic, auditory, and kinaesthetic media experiences, between virtual and augmented reality’.³⁸

As predicted by Guy Debord in his *The Society of the Spectacle* (1967), our society is replacing authentic social life with its representation. Being the built environment an aspect of social life, it is constantly shaped by social interactions and, at the same time, it also shapes those interactions.³⁹ Consequently, we need to acknowledge that VW are becoming a wider expression of our personal and collective space, an interactive spatial dimension where, in the very same moment we shape its space, it shapes us.

This revolutionary ongoing process had, as a major consequence on architecture, the loss of permanence, one of its principal characteristic. Not anymore an expression of immortality, for the first time the millennial discipline is shifting its essence from tangible artefacts to ephemeral places. Architecture of VW in fact, evades permanency being a function of time, integrating space and time; this architecture is an expression of the fluid, instable, ever changing digital environment of VW.⁴⁰

Generative Design (GD), the latest field of architecture research that works with artificial intelligence, inspired an emerging generation of architects, educators and theorists (*Discrete Architecture, Digital Architectonics*), that started to question the anachronistic formal continuity between RW and VW architectural design. Their approach is focused on exploring a truly computational architecture based on parts and rules that are driven-by, or totally free from human-imposed parameters. In this revolutionary approach, architects don't design the forms anymore, they design the process that generate the forms; this is in analogy with nature, that generates the form of a tree, of a fish, of a flower through a specific algorithm. In this new role, architects become 'orchestrators' of the processes (Michael Hansmeyer, TED Talk 2012).

Applying ABE to VW, the paper tried to shed some light on how the correct application of architecture theory to GD can contribute to the physical quality and complexity of VW. ABE in fact, demonstrated that the role of memory and heritage in the current development of Virtual architecture is vital, as long as we consider history as a *process*, an evolutionary realization of what is not just different from the RW, but also improved. Applying the principles and methods of ABE on SL, it has been possible to produce architectures through a combinatory process that realizes a meaningful spatial awareness for the users, through the semantic values derived by a critical interpretation of heritage architecture. Using ABE methodology, designers can freely choose from an endless source of forms and compositional principles from the past, in order to create architecture in VW that possess aesthetic values but that are not copies of previous architectures. These architectures are *different* from what we normally see in contemporary RW and VW, because they are embedded with the lexicon and syntax of a language derived from memories of the past. These architectures, as *language games*, guarantee a continuity across new designs, incorporating time into the design process.

Last but not least, case studies on SL confirmed the validity of VW as distance learning tool not just to teach and research single disciplines, but also to contribute to the hybridization of architecture, theatre and gaming.

The Covid-19 pandemic accelerated the development of a more tangible, actualized Internet, under the need of safer places to interact and live.⁴¹ Metaverse as a persistent, shared, 3D virtual space linked into a perceived virtual universe, is now seen as a possible futuristic evolution of the ‘new normal’, where the VW will fulfill our RW needs and activities with engaging online experiences.

Considering the scale and impact that this revolutionary virtualisation process will have on our lives in the next two decades, architects should embrace this challenge, offering their competencies to support this *post-digital spatial revolution*, provided that their contribution does not disregard the role of memory, history and architectural heritage.

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FIGURES AND ILLUSTRATIONS

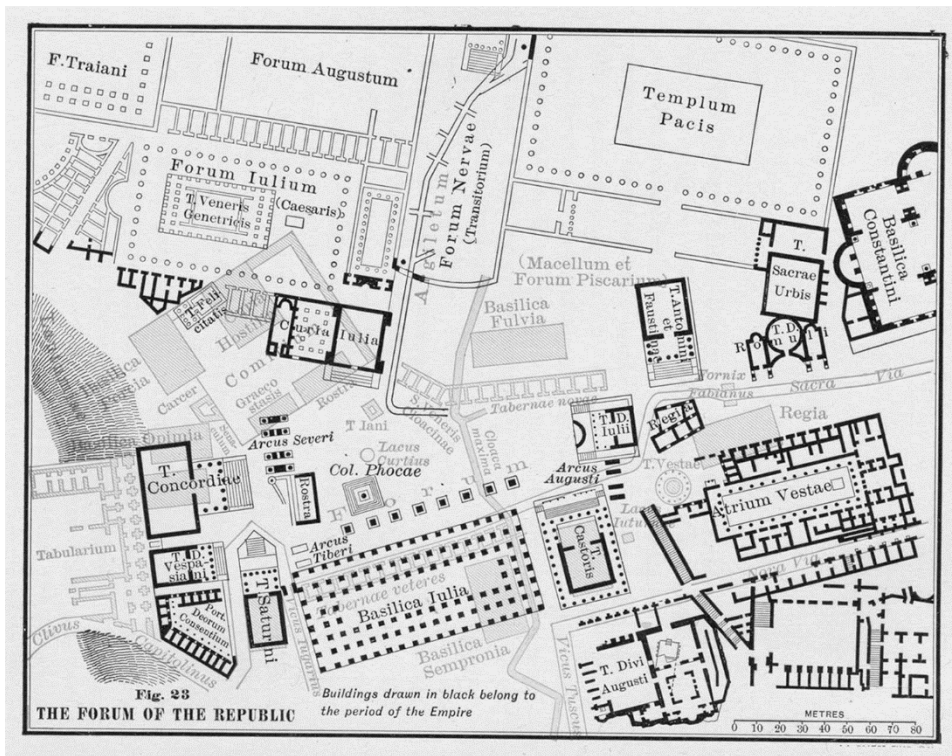


Fig. 1: The Roman Forum during Republican and Imperial era. The overlap of historical buildings over time gives rise to the extraordinary architectural figures of the Forum, from which it is possible to identify fundamental architectural principles and archetypes. Archetypes are not immutable: being internal parts of the historical process, are subject to a constant transformation derived from their reuse. Source: Samuel Ball Platner, *The Topography and Monuments of Ancient Rome* (Boston: Allyn and Bacon, 1904). Public domain;



Fig. 2: Weretomato Designers' meeting, flying over the building site of SL with Hadrian's Villa scale 3d model. This digital in-presence meeting allowed the designers to work together, building and testing the architectural design options and results in real time.
(Source: personal archive).

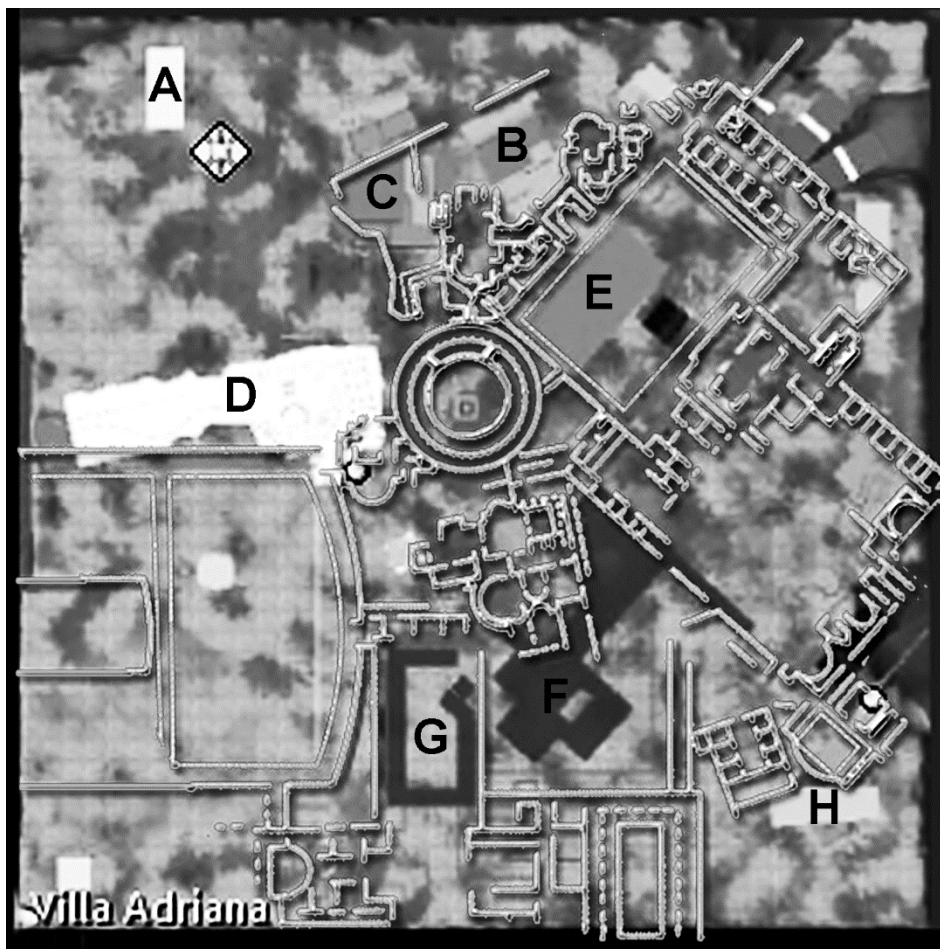


Fig. 3: Hadrian's Villa floor plan of Second Life Island; the original building's walls had been scaled down and selected to fit the square size of the island and to accommodate further new buildings (represented with letters).
(Source: personal archive)

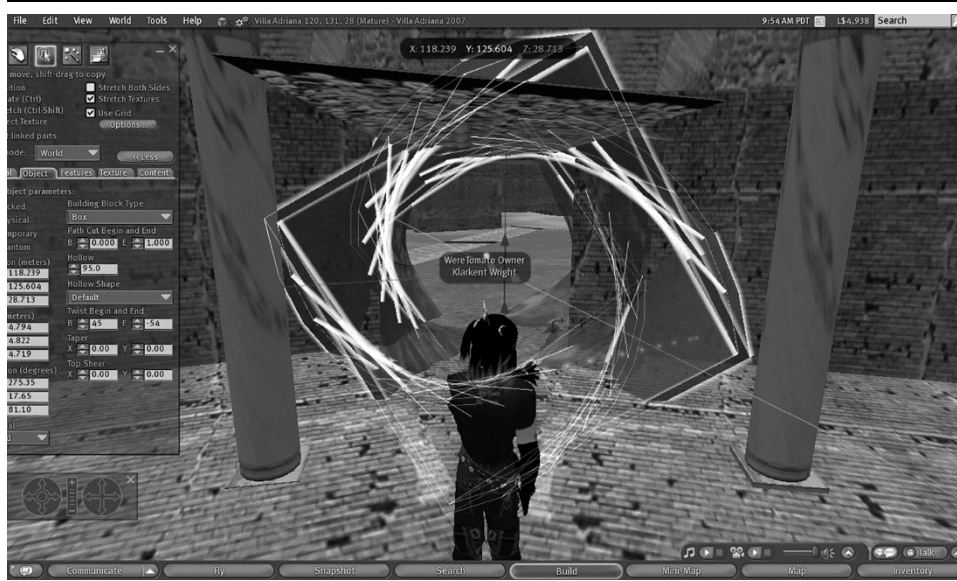


Fig. 4: Distant Learning on Second Life with Hadrian's Villa Island: the Scenography student's avatar introduces and modifies her set design during online tutorials using Object Creation Tool of SL. (Source: personal archive).



Fig. 5: Multidimensional performance '@nts': RW version at the Studio Theatre of the Faculty of Architecture Vallegiulia, University of Rome La Sapienza. The physical 'cube' is also used to create a visual connection in real time with the VW version on SL.
(Source: personal archive).

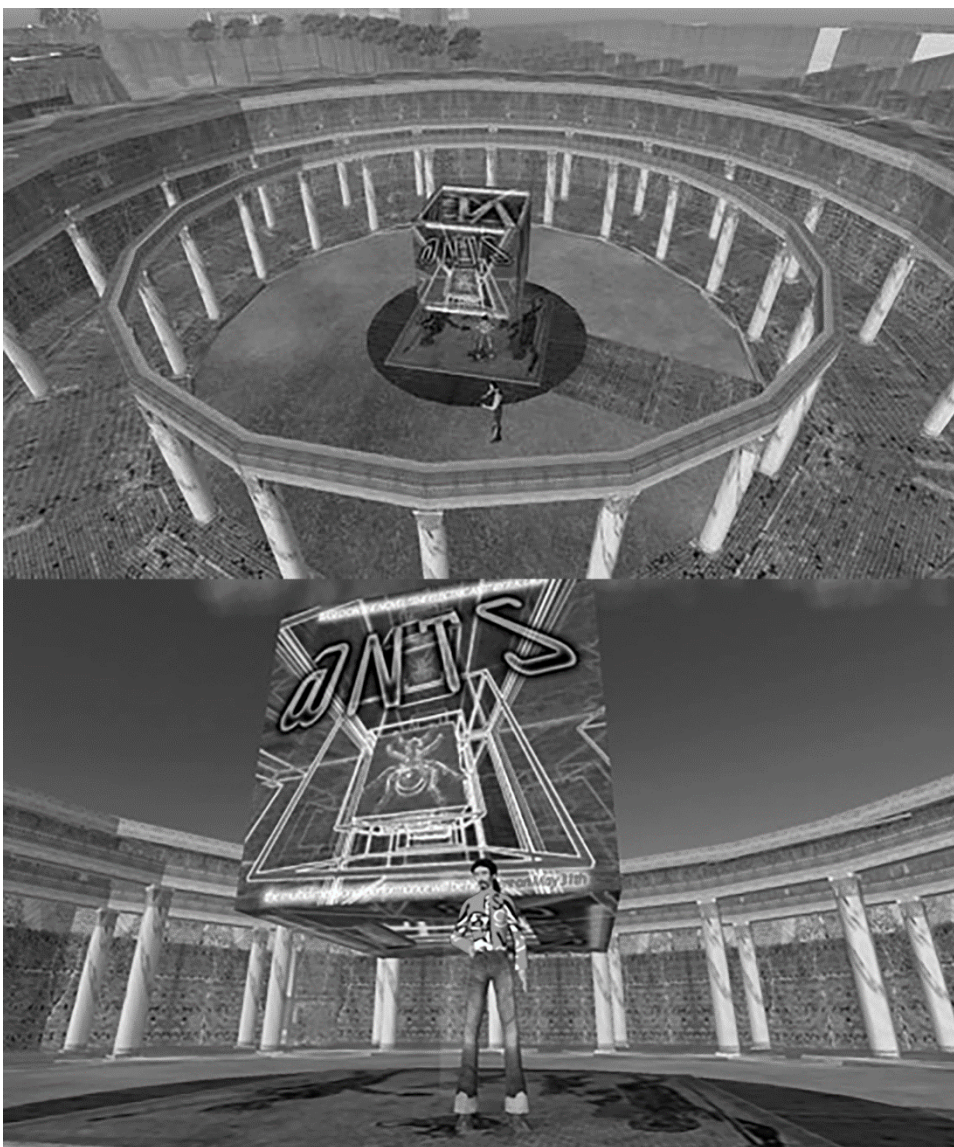


Fig. 6: Multidimensional performance '@nts': VW version in the Maritime Theatre of Second Life. The digital 'cube' is also used to create a visual connection in real time with the RW version in the Studio Theatre of the Faculty of Architecture.
(Source: personal archive).

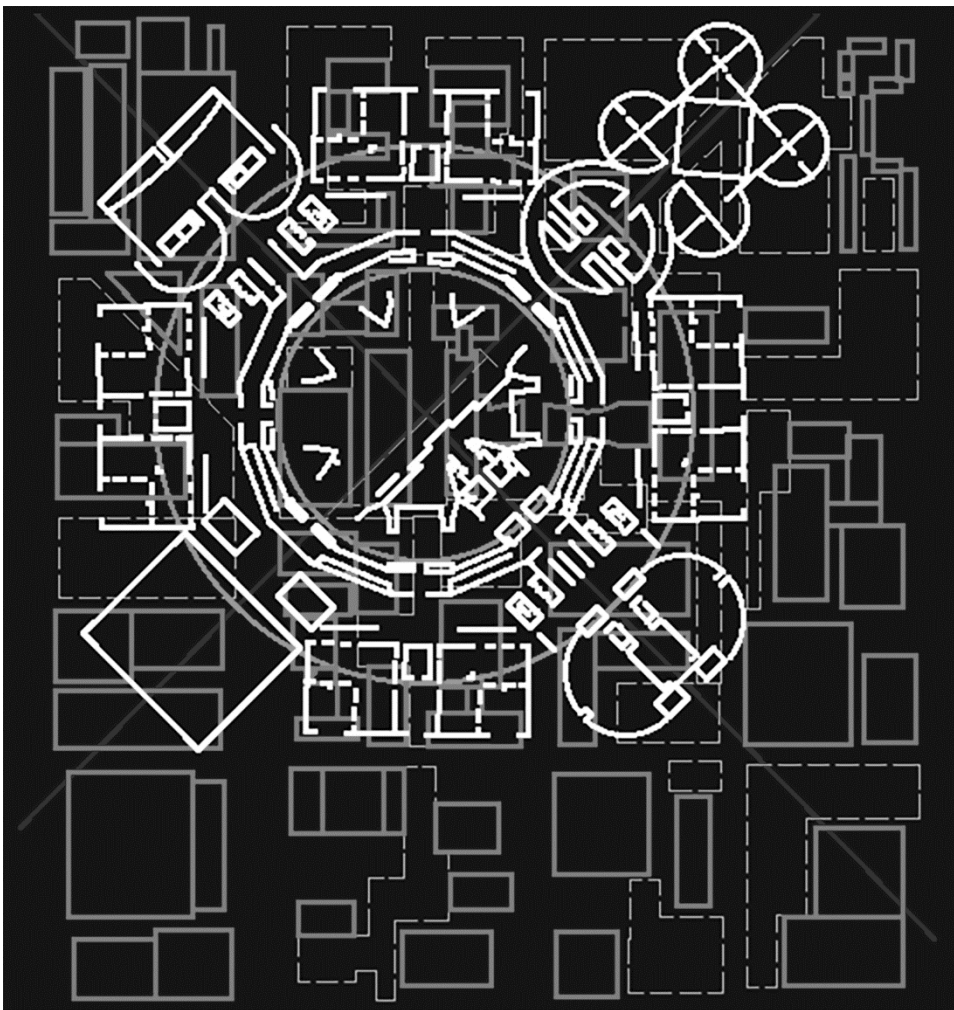


Fig. 7: Diamond Island masterplan. The ABE design methodology informed both the selection of language and the use of Elements: Louis Kahn's National Parliament House plan (white) creating a dialogue with the city of Philadelphia's grid (grey). (Source: personal archive).



Fig. 8: Aerial view of Diamond Island's completed design. Kahn's architecture (brickwork Elements) has almost reduced to ruin, therefore with the dignity of memory. Interpreted as a sort of pre-existence, it creates a dialogue with the new architectures of the Campus.
(Source: personal archive).