The Vitruvian World: a case study in creative hybridisation of virtual, physical and networked space.

Michael Takeo Magruder, June 2009

In February 2007, Turbulence, a leading international portal and commissioner of networked art, released a call for proposals seeking to “challenge our preconceptions of what constitutes reality” within this age of interconnected and shared environments:

“Information and telecommunications technologies allow us to be continuously connected via the Internet or mobile networks. We engage one another via e-mail, chat, the interlinked pages of the World Wide Web and SMS. We create identities, and forge relationships and communities. Boundaries between real space and virtual space blur; near and far reverse themselves. Passive consumption of art is replaced by the performative—art that requires (inter)action, and involves time and space.” (Mixed Realities call for proposals, March 2007)

The result of this call was an international exhibition and symposium, entitled Mixed Realities, curated by Jo-Anne Green, Co-Director of Turbulence. Five creative teams were commissioned to produce artworks that would engage users across three distinct environments: the online virtual world of Second Life, a traditional gallery space and the Internet, via the Turbulence website. Although art events of this nature would soon become relatively commonplace within New Media Art practice, Mixed Realities was one of the earliest exhibitions—if not the first—actively to address the purposeful blending of these three types of spaces.

Towards an artistically-viable 3D shared virtual environment

As a concept, Mixed Realities was not revolutionary, but rather, an evolutionary extension of earlier, artistic trends of the previous two decades. The appropriation of emerging technologies from the telecommunication and computer industries was, and still remains, a defining characteristic of New Media Art and Performance. During this period, artists working in the fields of Internet and Telematic Art had utilised network infrastructures such as the World Wide Web and ISDN video conferencing systems for the conceptualisation, production and dissemination of artistic works and interventions. Considerable bodies of three-dimensional (3D) art were created on both the Web via ActiveX browser plugins such as Cortona VRML and Adobe Shockwave and game platforms such as the Unreal Engine (Epic Games, 1998-).

Due to the technological limitations of such systems, these virtual or mixed-reality spaces were, for the most part, discrete systems with rigid and often immovable boundaries defined by the inherent characteristics of the media. The restricted nature of these artworks often created clear divisions between the spectator/user experience and the wider environment in which they were situated. Net Art could not escape from the frame of the web browser and telematic embraces could not materialise without complex audio-visual studio facilities. As isolated events contained within, but intrinsically detached from everyday life, such artworks pointed to the need for new, more sophisticated technologies that would afford a greater-degree of cultural integration and mainstream exposure.

1 A project of New Radio and Performing Arts, Inc. (NRPA) launched in 1996 to support the creation and dissemination of networked art. (www.turbulence.org)
2 www.turbulence.org/mixed_realities/
As the early digital telephony services such as Dial-up and ISDN were supplanted by affordable broadband connections such as xDSL, applications began to emerge that took advantage of these exponentially-higher data transmission rates. With these enhancements to the global network infrastructure, the web began shifting from a pull-based information repository into an application-rich Web 2.0 platform through which users could shape to a much greater degree their own online experiences. This conjunction of inexpensive broadband with a rapidly-increasing pool of web-based applications engendered the rise of a new, mainstream online-sharing culture. Multi-user platforms such as MySpace, Facebook, YouTube, Flickr, Twitter and Wikipedia were inevitable by-products of a media-rich, interconnected net-space that both influenced and reflected the needs and desires of Information Age society. The isolated individual experience was increasingly replaced by social encounters in shared virtual environments, and many of the processes of content creation and publishing that were once solely in the domain of media corporations became accessible to individuals and communities willing to create within self-authored or inter-authored frameworks.

The impact of the Web 2.0 paradigm on 3D graphics

Advances in consumer-level graphics facilitated the rise of 3D platforms within home computing during the 1990s. For the skilled, the creation of single-user virtual realms and objects for the Web was possible through formats like Virtual Reality Modeling Language (VRML). Although the subsequent generation of multi-user environments such as Active Worlds (1995), The Mirror (1997) and Adobe Atmosphere (1999) extended the potential of online virtual worlds by incorporating facilities for customisable realms, group chat and user-generated content, uptake of these platforms was limited to small communities interested in 3D web technologies. It was not until the entertainment industry’s Massively Multiplayer Online Role-Playing Game (MMORPG) genre adopted 3D graphics that general public awareness of 3D Shared Virtual Environments (SVEs) became more commonplace (Magruder, 2008). In contrast to the low-usage of previous academic and commercial ventures, games such as EverQuest (Sony Online Entertainment, 1999) attracted nearly five hundred thousand players to a persistent virtual realm. The game industry’s domination of the format continued into the new millennium with releases like Final Fantasy XI (Square Enix, 2002), RuneScape (Jagex Ltd., 2003), Lineage II (NCsoft, 2003) and World of Warcraft (Blizzard Entertainment, 2004) that enticed millions of individuals to venture into 3D SVEs for the first time. Non-game use of the format continued, but would remain in obscurity until Linden Lab’s public launch of Second Life in 2003.

3D SVEs: (left) fantasy adventures in EverQuest, 1999 and (right) Le Mont Saint-Michel island by Moeka Kohime in Second Life, 2009.

5 When all individuals contribute as equal members of a group and share ownership (in terms of intellectual property rights and copyright) of the final output. Cf. Boddington, 2006.
Second Life’s c.1.7 million active users in 2009, though not in the league of chart-topping MMORPGs such as World of Warcraft (c.11.5m) or RuneScape (c.8.5m), is by any reasonable measure still a very notable success, particularly as, unlike most MMORPGs, it does not provide an overarching game narrative. Rather, it is a persistent virtual world occupied by avatars (personalised graphical representations of individual users in the virtual environment) and consists, for the most part of buildings, objects and effects created by its “residents”.

The extensive media coverage of Second Life and its commercial success, particularly its significant uptake by non-gaming communities, was the result of a convergence of several key factors. Linden Lab aligned Second Life with the Web 2.0 ‘do-it-yourself’ culture by associating the platform with the trademark phrase: “your world, your imagination” and unlike the prevailing subscription-based models of competing systems, entry into the virtual world and full customisation of avatars was completely free for all end users. As with the immensely successful MMORPGs, Second Life placed the virtual self at the forefront of the virtual experience. The platform allowed individuals to construct highly-personalised and detailed avatars and encouraged residents to work, play and express themselves in ways that were either impractical or impossible in their ‘real’ lives.

From a technical perspective, Linden Lab deviated from previous attempts at hosting 3D SVEs on distributed independent servers and adopted a unified grid architecture similar to those deployed within the games industry. This centralised approach provided residents with a consistent quality of service and ensured that all locations within Second Life were continuously online. Linden Lab also developed an extensive in-world set of building and scripting tools that could easily be used by Second Life neophytes, while simultaneously offering those individuals with advanced 3D authoring skills the means to fabricate complex items and environments.

These conditions attracted a diverse range of interest groups to the emerging metaverse. Established companies rushed to develop brand presence within Second Life, while entrepreneurs developed new business models, resulting in vast virtual shopping centres and innovative leisure areas in hopes of tempting residents to indulge in the latest virtual luxuries and services. Educators and artists from numerous disciplines, exploiting the environment’s native support for undertaking distributed content creation and performance, began to utilise the platform for new modes of collaborative practice and experimental research. Second Life’s incorporation of these types of ‘real-world’ activities into its core experience engendered a sense amongst its users that the platform could both facilitate and advance ‘first-life’ projects and ambitions. These factors distinguished Second Life from other publically-available platforms of the time and helped to precipitate a critical mass of registered users that evolved into a sustainable community.

Referencing antiquity to reflect upon the contemporary

The emergence of Second Life as a viable platform for creative production and research provided artists working within New Media discourses opportunities to address concepts such as those proposed by Turbulence’s Mixed Realities initiative. Second Life’s accessibility and the user-centric nature of the environment opened new avenues to update and extend practice within the field of networked Virtual Art. Practitioners viewed the arrival of Second Life as a means to overcome the technological inhibitors of previous generations of Web and games platforms; their work would no longer necessarily consist of isolated virtual microcosms with limited or non-existent interaction between users.

The Vitruvian World (Magruder/Baker/Steele, 2007), one of the five projects selected for Mixed Realities, created a multi-nodal installation that simultaneously occurred across virtual, physical and network spaces, and also linked the

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6 The term, coined by Neil Stephenson in his novel Snow Crash (1992), refers to an immersive 3D virtual realm that is metaphorically based upon the real world.
7 www.turbulence.org/Works/vitruvianworld/
three discrete environments into an overarching single ‘reality’ in which the overall experience was dependent, in part, on the interaction between users of the different realms. *The Vitruvian World* was not only conceptually positioned within contemporary New Media Art discourse concerning networks and the formation of mixed/augmented realities, but was also situated within the tradition of art appropriating new visual technologies and methodologies in order to expand the expressive potential of the creative process.

The notions of illusion and immersion, the fundamental basis of all 3D virtual realities and environments, are artistic concepts with lineages that can be traced back through Western art history to the panoramic Roman wall-paintings from antiquity (Grau, 2003), and arguably, even to the pre-historic cave paintings from Palaeolithic sites like Lascaux (Rheingold, 1991). In these settings, our ancestors projected their consciousness into spaces existing beyond the physical walls of their luxurious villas and cave dwellings—the scenographic designs and vistas acting as agents of imagination for earlier ages. Considering that these communal environments were designed to promote and enhance social interaction and shared experience, perhaps past architectural theories governing their construction could still inform the creation and usage of their contemporary equivalents, even the most cutting-edge virtual platforms.

In the 1st century BC, Vitruvius, a Roman writer, architect and engineer, authored his treatise *De Architectura* (also known as *The Ten Books of Architecture*), which after rediscovery in 1414 by Bracciolini, became a major influence on the architecture and art of the Renaissance, Baroque, Neoclassical and beyond. Within its pages, Vitruvius outlined specific formulae for building structures based on the guiding principles of firmitas, utilitas, venustas—strength, utility and beauty. Vitruvius theorised that architecture was intrinsically linked to nature and existed as a constructed imitation of cosmic order. The most well-known interpretation of this postulate, the *Vitruvian Man* by da Vinci, depicts the human form in unity with the square and circle—representing material and spiritual existence respectively. Given the relevance of this tripartite union to issues surrounding virtual bodies, mixed-realities and distributed presences within contemporary networked culture, it was conceivable that Vitruvius’ theories on proportion and architecture could inform artistic investigations within 3D SVEs like *Second Life*.

![Visual interpretations of Vitruvius’ theories: (left) Vitruvian Man by Leonardo da Vinci, c.1487 and (right) Vitruvian Ideal Temples, D. Baker, 2006.](image)

Examination of this hypothesis required close consultation with academic scholars well-versed in the interpretation of Vitruvius’ writings and the application of his theories within visualisation-based procedural modelling. In 2005, Drew Baker, Senior Research Fellow at King’s College London and long-standing member of the institution’s visualisation lab, had extracted from *De Architectura* all passages relating to the proportions of Roman temple construction and translated this information into a series of recursive equations that could be codified within a software environment. The resulting VRML model, *Vitruvian Ideal Temples* (Baker, 2006), allowed users to initiate transformation of a virtual temple through real-time modification of its structural variables and architectural measurements.

Equally important to this humanities expertise was in-depth knowledge of the technical infrastructure required for establishing interconnectivity between the proposed virtual, physical and network spaces. Data input/output problems associated with *Second Life*’s proprietary closed architecture were well-documented, and in most instances, could only be resolved through custom hacks and the addition of other software layers to the platform. David Steele, a leading independent programmer and systems architect for the US telecommunications industry, had worked in software development since the mid 1990s, during which time he pioneered the pairing of cutting-edge client systems to existing corporate infrastructures. Steele’s expertise in data mining, processing, transmission and integration could address the project’s technical challenges and facilitate the creation of an innovative schema for interlinking the three environments.

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8 King’s Visualisation Lab (www.kvl.cch.kcl.ac.uk/) is based in the Centre for Computing in the Humanities, King’s College London.
10 www.datascape.org/dbaker/vit/
11 The term for end-user modification of a computer program or device.
An installation of three spaces and three bodies

The Vitruvian World aggregated contemporary art practice, humanities research and software engineering into an interdisciplinary project influenced conceptually by the team’s previous artistic work using online 3D platforms\textsuperscript{12} and methodologically by academically-orientated initiatives such as \textit{Theatron} \textsuperscript{3} \textsuperscript{13}. The project embodied a creative intersection between Magruder’s New Media Art practice, Baker’s research and Steele’s technological development, resulting in an aesthetic environment accurately composed according to Vitruvian proportions and technically constructed with recursive, networked interplay between its elements.

For the three environments in which \textit{The Vitruvian World} was to coexist, the team envisaged three distinct bodies, each intrinsically linked to one of the realms. The virtual world of \textit{Second Life} would be host to the \textit{Avatar}, the physical space of the gallery would be conjoined with a \textit{Puppet} (a virtual entity constructed by the team for use by members of the visiting public) and the connecting network would be interlinked by a \textit{Doll} (a virtual shell devoid of all presence and integrated into the core fabric of the installation). In addition, these bodies would be defined by their capacity to express will within a system (agency) and to convey the decisions of their creators and/or users within the mixed-reality environment.

\textbf{The virtual (realm of the Avatar)}

In \textit{Second Life}, there is no material difference between environments, architectures and bodies as these elements are constructed from the same components. Virtual wind, light, buildings, plants and avatars are all created from a common

\textsuperscript{12} Cf. Magruder, 2007.
\textsuperscript{13} Conceived by Dr. Hugh Denard (Associate-Director of King’s Visualisation Lab) and funded by the Eduserv Foundation, the \textit{Theatron} 3 project reconstructed twenty historic theatre sites within \textit{Second Life} for research, education and virtual performance.
pool of prims, a scripts and media streams, many of which are user-generated, while others are native artefacts of the platform itself. The virtual realm is not bound by the laws of the physical universe, but rather, is shaped into a “living space” according to the intentions of its system architects, world builders and residents.

This fluid metaverse is the domain of its avatar inhabitants—the projected extensions of a disparate collection of individuals channelling their consciousnesses into the shared environment. For these beings, the project created a Utopian world of idealised forms drawing on Vitruvius’ strict instructions for temple construction. Occupying an entire sim within Second Life, the space consists of a set of architectural structures forming a central square enclosed by lush grounds and a forest of trees arranged in a pair of concentric rings. The environment’s aesthetics are informed by hyper-real textures reminiscent of polished stone and vegetation, while the synthetic sound of wind and columns of white light emanate from the surrounding forest enhancing the ambience of the virtual land.

The morphology of the world is based upon the unchanging diameter of a single replicated column structure, and every component of the realm is proportionally and compositionally related to this fixed seed. Many of the world’s objects are embedded with programmatic functionality that senses the presence of individual avatars. The interactions between these components and the virtual bodies trigger oscillations within the space as determined by the underlying Vitruvian framework. Human decision, through the agency of the avatar, counterbalances the deterministic foundations of the world, and creates a structured, but unpredictable aesthetic flux.

The physical (realm of the Puppet)

Within this virtual world there is a small enclosure where avatars may not venture, and although the environment appears undivided, it is apportioned into two symbiotic parts. The surrounding world for the avatars encircles an isolated space—a finite microcosm enveloped by the endless metaverse. This domain is home to a solitary human form covered with the same textures as the structures of its neighbouring architectural environment and devoid of any bodily traces of personalisation. Intrinsically linked to its prison-like realm, this being often appears suspended and lifeless, as if it exists without a person’s soul. It is a puppet, a generic vessel for human agency, waiting to be animated.

Spanning countless nodes across vast data networks, the confined virtual space is linked to a remote physical location in which visitors are confronted by the puppet’s senses. Through a dual high-definition corner projection array and a 5.1 audio system, individuals become immersed in its visual and aural surroundings. Passive spectators can become active participants by using a Wiimote that rests upon a small plinth located in front of the projection. This hacked game controller allows a person to assume control of the puppet and instil their will into its lifeless shell.

The intentions of the creative team and random users intertwine as the puppet’s actions are sensed by the environment, and as with the avatars above, initiate transformations within the virtual space. A dialogue of human choices mixing with algorithmic processes ensues, with each half of the realm exerting different influences upon the world as a whole.

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14 Short for primitive object, the term for the basic geometric building unit in Second Life.
15 A ‘corporeal space’ that is animated by the body. Cf. Appia, 1921 in Beacham, 1993.
16 Short for simulator, the term for Second Life’s primary unit of land consisting of 256m² of virtual space.
17 The primary control device for the Wii (Nintendo’s 7th generation games console) containing a three-axis accelerometer and infrared optical sensors for tracking, and wireless connectivity via Bluetooth.
The network (realm of the Doll)

The barrier separating the two distinct realms within the world is more than just a divider of space, as traces of the world’s history linger on its surface as time unfolds within the virtual expanse. It is a living boundary reflecting the past dialogue between the visiting avatars and the puppet’s masters. These memories are not aggregated by the barrier itself as it is only a receptacle for information flow. The agent of this process is a third entity that resides within a hidden place. Resting atop a simple cube as if in contemplation, its body, stripped of all human essence and free from any influence, contains no consciousness. It is a doll within the world, an object within the metaverse serving as a collector of memories and recorder of histories.

Everything that ventures within the doll’s dislocated view is captured and remembered. The images it records are transmitted out across the network to a server that algorithmically processes them into a serialised data stream. This material is then redistributed back into the network where it is accessed by the Second Life grid and reabsorbed into its source environment. Fragments of mediated time are overlaid upon the ever-changing boundary as the doll continues to record the world, thus forming a reflexive loop in which the real-time documentation process and resulting archive become part of that which is being recorded.

Visitors to the virtual realm are not the only ones able to view the machinic stream of consciousness. These recollections, like the network that transmits them, are part of the public domain and can be accessed by any web browser connected to the Internet. Individuals visiting the Turbulence website can view a webpage containing an embedded Flash applet that intercepts the data stream and transmutes it into a flowing visual narrative. The applet acquires random images processed during the previous hour and algorithmically remixes them into a non-linear sequence. Moments of the current time are blended with the recent past to generate a forever-shifting composition reminiscent of a painterly montage.

*The Vitruvian World* as part of the *Virtual/Physical Bodies* exhibition, Centre des Arts, Enghien-les-Bains, Paris, France, 2008.
Towards an artistically-sustainable 3D shared virtual environment

Installations such as The Vitruvian World exemplify the potential of the current generation of 3D SVEs for mixed-reality artworks and hint at the creative possibilities which may arise from future technological advances in the area. However, there are serious issues and challenges facing the users, developers and owners of these systems as the facilities they provide have superseded many accepted working-practices based on older traditions and media. As with popular social networking sites like MySpace and Facebook, 3D SVEs are currently embroiled in controversies regarding access to and ownership of user-generated content. Through ethically-questionable terms and conditions of service, platform suppliers are coercing their users to relinquish many of the legal rights historically given to authors and creators.

In addition, unlike many Web 2.0 platforms in which the user-generated experience is completely free, the majority of 3D SVEs such as Second Life and Active Worlds levy substantial charges for the ownership and maintenance of virtual land required for the creation and dissemination of content. This commercial reality, exacerbated by the current global financial crisis, has led to the formation of a new digital divide amongst user communities in which those without sufficient financial resources are severely restricted in their ability to use these systems for their research and practice, and indeed the commercial longevity of platforms like Second Life is as yet unknown. The introduction of open source alternatives like OpenSimulator18 has helped address these concerns and alleviate the intellectual property issues and financial restrictions of their commercial counterparts, but as with many new open source technologies, the environment lacks the infrastructure refinements–most notably a persistent shared grid–to be considered as an entirely satisfactory solution for general public use.

Despite their problems and shortcomings, it is important to acknowledge that the current generation of 3D SVEs has opened-up numerous avenues for collaborative and creative engagement in the Arts and Humanities. While artists and performers will continue to anticipate and exploit future technological developments, our minds and imaginations still have yet fully to digest the seemingly infinite possibilities that shared 3D worlds already offer.

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18 www.opensimulator.org