Virtual Worlds and Architectural Education: A Typological Framework

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Abstract. This study introduces a conceptual analysis, a typological framework which aims to map a wide array of possible virtual worlds into a larger frame and explore their significance for architectural education. Using this analysis, we discuss the properties of virtual worlds in four groups: “the real virtual, virtual augmented real, real augmented virtual and fantastic virtual”. Based on these, we propose four different strategies for integrating virtual worlds into architectural education. Overall, this contribution can be seen as a small step towards the revitalization of the architectural design curriculum.

Keywords. Virtual Worlds; Architectural Education; Reality-virtuality Continuum; Simulacrum.

INTRODUCTION AND MOTIVATIONS
Creating new typological frameworks of virtual worlds is essential for developing an in-depth understanding of them as well as discussing their properties and capacities for mediating architectural and urban design education.

Our review of previous studies on this topic revealed that researchers from other disciplines have conducted various studies with similar purposes. For instance, Messinger et al. (2008) have proposed a typology of virtual worlds based on Porter’s (2004) typology of virtual communities. The five elements of the proposed typology included: (1) purpose as the content of interaction, (2) place as location of interaction, (3) platform as the design of interaction, (4) population as the participants in the interaction, and (5) profit model as the return on interaction.

Similarly, Gregory et al. (2010) have reframed and extended this discussion to the educational field and used this typology to compare the pedagogical approaches, the platform for delivery and associated profit models employed by the Australian higher education institutions.

These studies are valuable because they provide an overview of the applications of the virtual worlds, help to identify the historical development and stimulate future explorations. Moreover, they reveal the pedagogical benefits of teaching and learning in these environments in a broader sense. However, they are mainly out of the focus of the architectural design education field.

In this context, it is necessary to develop a new framework specific to our field in order to clarify the differences between virtual worlds.

With the motivations above we will begin our study by introducing a conceptual analysis, a typological framework. Through this framework we aim to map a wide array of possible virtual worlds into a larger frame and explore their significance for architectural education.
Following this section we will discuss possible ways of integrating virtual worlds into architectural design education in the context of this conceptual framework. In line with the conference theme "Digital Physicability | Physical Digitality", this discussion will focus on the synergetic qualities of virtual worlds and their possible influences on design learning. Reflecting on former studies, we will elaborate on relevant alternative strategies for the use of virtual world environments to contribute to the education of the architects of the future as critical and engaged intellectuals and designers.

It is important to note that, in this paper, the notion "virtual worlds" is interpreted in a broad context and refers to "computer-generated, persistent 3D environments in which users exist as avatars exploring, build-
ing, interacting and communicating” (Koutsabasis et al., 2012; Girvan and Savage, 2010). Thus, this definition includes virtual globes such as Google Earth as well as SecondLife.

A TYPOLOGICAL FRAMEWORK

Considering the variety of virtual worlds and the fact that architectural education should be contextually embedded, we organize our typological effort on two axes to differentiate the relations between the environment and the content (Figure 1, on the previous page).

The first (horizontal) axis of analysis involves the evaluation of the environment of the virtual worlds based on Milgram et al.’s (1994) reality-virtuality continuum. This continuum starts with “a strictly real-world environment clearly constrained by the laws of physics” and ends up with “a virtual reality environment in which the participant observer is totally immersed in a completely synthetic world”.

On the second (vertical) axis, we address the content that is being handled in these realms. With this purpose, we refer to the concept of the simulacrum, which goes back to Plato’s (360 BCE) ideas on “image-making” in his famous Sophist dialogues. In these dialogues, Plato made a distinction between the image that is a faithful reproduction (or as good as possible) of the original and the copy that is an intentional deformation of the original.

Baudrillard’s (1994) simulacrum took this concept further and differentiated between four successive phases of representation of a reality: in the first phase the image is a “good” reflection of the original, in the second phase the image masks and perverts the reality. In the following phase the image masks the absence of the basic reality and in the fourth phase the image becomes its own pure simulacrum. While the copy resembles the original, the simulacrum has a totally different end; it takes on a life of its own. This is precisely why this conceptualization is important and useful for our typological analysis of virtual worlds and their usefulness for education.

In our diagram (Figure 1), “factual real” is located at the bottom of vertical axis as it is a copy of the real that bears as much resemblance as possible. When we gradually move upwards, the content resembles the real world less and less. At the end of the axis are the unique virtual contents which are fundamentally different than the ones in the real world. These categories allow us to describe certain “zones” in our diagram. These are: the real virtual, the virtual augmented real, the real augmented virtual and the “fantastic” virtual.

The real virtual zone

When we speak of the “real virtual” we refer to virtual environments that represent the real world, such as serious Virtual Flight Simulator games. It is clear that they are close representations of reality (and also intend to be so); both regarding the whole virtual environment, the architecture within it and the experience they try to evoke. The most extreme “real virtual” is the fully simulated reality. It is a non-existent theoretical environment first introduced in Gibson’s (1984) “Neuromancer” book as a virtual reality dataspace, which later inspired the movie “the Matrix” by Wachowski brothers (1999).

The virtual augmented real zone

This specific category refers to the use of ubiquitous augmented information systems connected to the real world objects. Typical examples of the virtual augmented real are the pilot support systems which draw on information from integrated virtual worlds, GPS data and pilot's line of sight measurement. Pilots experience the space as a predomi-
nantly real environment superposed with a virtual world. Because of the technical complexity of these systems, architectural applications are so far limited to research projects. This category is closely related to the spaces which emerge as a combination of virtual worlds and real structures. Bertuzzi and Zreik's (2011) mixed reality games for augmented cultural heritage can be considered in this zone.

**The real augmented virtual zone**

This type includes virtual worlds where information from the real world is embedded into the virtual realm. Different than the virtual augmented real, majority of the spatial information is created and joined in a virtual system. Kinect Sports Video Game is a typical example of this typology. The majority of the game takes place in a multiplayer virtual world and avatar behavior(s) are augmented with real life motion. Because of the relative affordability and mobility of their technical platforms, these types of applications have enormous potentials for urban design, user participation in planning and construction engineering waiting to be realized (Pak and Verbeke, 2011).

**The “fantastic” virtual zone**

Fantastic virtual worlds are characterized as products of “unrestrained imagination”. Massively multiplayer online role-playing games such as World of Warcraft or Everquest are examples of the fantastic virtual worlds. Certain worlds that are created in the open simulator platforms can also be considered as fantastic, depending on the content and the configuration of the environments. At the first glance these types of games might look less useful in the field of architectural design education. However, by changing and reconfiguring the attributes and working principles of the virtual worlds, it is possible to stimulate creativity and support collective thinking (Merrick and Ning, 2011) (Rosenman et al, 2006) (Jakimowicz, 2002). For example, we can imagine and represent an environment in which people are not governed by the laws of gravity, which would allow the students to test their design strategies in this completely different setting. These kinds of
educational practices can both be a liberating experience as well as a confrontation with traditional design thinking (Oosterhuis and Feireiss, 2007).

**Non-virtual fiction zone**
This zone includes a rich world of pre-electronic games, plays and theater which take place in the real world; occurring or existing in actuality. These can be claimed as the starting point and a continuous source of inspiration for many virtual games and worlds as well as architectural education (Yurekli, 2003)(Sonmez and Erdem, 2009).

**Nonfiction Zone**
In our chart, the nonfiction zone relates to the “actuality” and includes things that are considered to be factually accurate and non-imaginary.

**Possibility of mixed zones**
It is important to add that in many situations, the virtual worlds can travel between the described zones and/or cover multiple zones.

**FUTURE PERSPECTIVES: INTEGRATING VIRTUAL WORLDS INTO ARCHITECTURAL DESIGN EDUCATION**
In this part, we will briefly highlight some of the relevant studies and the typology of virtual worlds to discuss various ways of integrating virtual worlds into design teaching.

Since 1989 CAAD Futures conference on “The Electronic Design Studio” a significant amount of literature has been dedicated to the possible relations between ICT and architectural design education. In 1993, William J. Mitchell coined the “Virtual Design Studio” (VDS) term and described it as a novel way of combining “computer-aided design technology with digital telecommunications to reduce or eliminate the need for such co-location” (Chen et al., 1994). Kolarevic et al. (1997) were one of the first to organize and test a VDS across three different continents and in three different time zones; including three dimensional representations of student projects with traceable genealogy of designs. Following these developments, Gross and Do (1999) came up with alternative models of ICT integrated design studios. They have identified “computer augmented design studio, CAD-plus studio, virtual and web design studio, cyberspace design studio, intelligent building studio, and toys and tools studio” as different paradigms.

Hubers (2006) reported on the Protospace of Delft University, a “CAVE supporting collaborative design in real-time...incorporating state-of the art parametric design” aimed at “interactive architecture, architecture that acts and reacts on changes in the environment”.

Maher et al. (2006) pointed out to the importance of the development of a sense of community in VDS and expressed that the ability to effectively collaborate depends on the development of a community. In the same year, Burry and Burrow (2006) reported the use of the MediaWiki platform which “collapses geographic and temporal distance to allow geographically dispersed agents to collaborate in unprecedented ways”.

Wojtowicz and Takenaka (2008) presented a synchronous and asynchronous environment (a dynamic web portal) for critical feedback in a VDS which functions as “a form of social space for sharing each individual design space”.

Schnabel and Howe (2010) noted that with the development of Web 2.0 technologies, VDS had found a new motivation track in many schools of architecture around the globe and introduced Inter-professional VDS (IPVDS) as an innovative method of teaching students from two different professional faculties.

Madrazo and Riddy (2011) referred to the OIKODOMOS Virtual Campus as a learning space where teachers and students of schools of architecture and urban planning collaborate in the design and implementation of learning activities shaped through an intertwining of on-line and on-site activities or “a blended learning” approach.

Achten et al. (2011) expressed that social and professional solutions are necessary to make VDS viable, not only the technological ones.
When we combine this literature with the typology introduced in the previous section it is possible to distill a number of possible strategies for integrating virtual worlds into architectural design education (since our paper aims at discussing the possible relations between virtual worlds and architectural education, non-virtual fiction and nonfiction zones are not included):

- **Virtual worlds as sustainable mirror media for increasing the quality of life in real world:** Architectural schools can embrace the use of virtual worlds by collecting student works and projects in sustainable and accessible virtual environments. Student projects can be shared and experienced online with students, practicing architects, experts and lay people to create a live and interactive debate on increasing the quality of life in real environments. These kinds of practices can also help architectural schools to establish closer relations with society. This strategy specifically relates to the “real augmented virtual zone” and Schnabel and Howe’s (2010) Interprofessional VDS and OIKODOMOS by Madrazo and Riddy (2011).

- **Exploring the potentials of architecture as a combination of virtual and real worlds:** Hybrid spaces can be considered as “open fields” for exploration. Integration of virtual worlds and architecture involves intense inter/transdisciplinary collaboration as cutting edge technological research and development is necessary for the design and implementation of hybrid architectures. This strategy specifically relates to “virtual augmented real zone” and Delft University Protospace as reported by Hubers (2006).

- **Emergent virtual strategies as tools for challenging and redefining the existing conventions:** Architectural schools can encourage the exploration of novel teaching and learning methods blended with virtual worlds and environments. The use of constructivist strategies such as crowdsourcing and open source design can pave the way to the development of alternative design studio setups which are less top-down, more inclusive and more student-oriented. This strategy relates to all virtual world typologies and Burrow and Burry (2006), Wojtowicz and Takenaka (2008), Schnabel and Howe (2010) Madrazo and Riddy (2011) and Achten et al. (2011).

- **Virtual parametric topologies as a source of inspiration, a medium for form finding and prototyping:** Virtual mathematical models offer tools for generating an exhaustive amount of form alternatives. Virtual worlds are potential spaces for the experiential evaluation of these emergent topologies by the architecture students and teachers. This strategy relates to the “fantastic virtual zone” and Kolarevic et al. (1997 and 2000), Hubers (2006) and (many numerous parametric studios which could not be included here).

The strategies presented above can also be considered as design research programs for integrating virtual worlds into architectural design education. The design studio obviously plays a central role in design learning (Schön, 1986). It is the main strand of architectural education in which the students learn how to reflect and reflect on what they have learned through their previous educational and other experiences. In this context, using the typological analysis and the strategies presented above, it is possible to create alternative architectural and urban design studio setups.

**CONCLUSIONS AND FUTURE DIRECTIONS**

In this paper, we have introduced a new way of interpreting the virtual worlds by a typological analysis that visually (Figure 1) locates different worlds according to their content and environments. Using this analysis, we have discussed the properties of these worlds in four groups: “the real virtual, virtual augmented real, real augmented virtual and fantastic virtual”. This distinction was crucial for the discus-
sion of the capacities of different types of virtual worlds that can mediate and support architectural design education. Building on the typological analysis, we have proposed four different strategies for integrating virtual worlds into architectural education.

Overall, this contribution can be seen as a step towards the revitalization of the architectural design curriculum to fit the needs of the contemporary world. For the future development of this curriculum, the proposed strategies, project themes and platforms can be combined in different ways to create and implement novel integrated design studios. For instance, in a specific design workshop, emergent functionalities and behaviors of virtual spaces can be used as a resource for extending the limits of real architecture and by this way students can challenge the existing conventions of the architectural design thinking.

The results of these design studies can be used to compare the strengths and weaknesses of these alternative setups. In this sense, spaces which are a combination of virtual and real worlds can be seen as unique and new design research programs which allow “open fields” for exploration. In contrast with traditional design studio setups, these virtual world integrated programs have the potential to promote intense inter/transdisciplinary collaboration and knowledge transfer, as cutting edge technological research and development are inevitably necessary for the design and implementation of novel spaces.

It is clear that, in the future we need to find alternative ways for encouraging students to think of their own position within the professional field and create novel ideas/concepts/solutions that are not merely grounded in the current conditions and problems and go beyond them. In this context, novel virtual worlds can be seen as highly suitable media for activating these types of educational approaches in the future. However, the complexity and inflexibility of the existing virtual and the real environments (the educational institutions) are the biggest threats to the virtual world integrated educational practices. Therefore, conducting research on novel flexible and simpler types of virtual worlds, creating alternative use scenarios and introducing new pedagogical approaches are essential for developing this field further.

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