Learning Space

Incorporating spatial simulations in design history coursework

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Art and architectural history education has long relied on photographic imagery. The geography of architectural history often demands an analog representation for the built form and photographic recordings have long been the widely adopted standard. In many cases, specific buildings have been taught for generations based on a handful of historical exposures. The impact of this precedent is an imperfect and highly privileged conception of architectural forms. Students learn only of a particular viewpoint of any given building, rather than understanding the building as a whole. Augmenting the tradition of select and static imagery in the classroom with new technologies can create a more comprehensive understanding of architectural precedents. This paper discusses an experiment conducted in Spring 2017 in presenting an architectural case study to a history class using a Virtual Reality 3D experience in comparison to a set of canonical photographs.

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INTRODUCTION

Art historian Irwin Panofsky proposed that meaning can be derived initially in two ways when one seeks to understand the subject of a work of art/architecture: first, perception is what he called “natural subject matter” by recognizing forms and situations that one knows from his/her own experience. Then one identifies the conventional meanings associated with forms and figures as bearers of narrative or symbolic content, often specific to a particular time and place. Panofsky called this process iconography. The third step is what he termed as iconology. In this step, the goal is to interpret the art/architectural work as an embodiment of its cultural situation within broader social, political, religious, and intellectual contexts. This approach requires an understanding of the beliefs and principles or goals and values that underlie art/architecture’s cultural situation as well as the position of an artist/architects and patron within it rather than identifying subject matter or conventional symbols.

While first two steps could easily be achieved in architectural survey courses, due to the inherent limitation of images and architectural representation techniques, educators come across difficulties to explain the cultural aspect of the architectural work or its iconology.

Besides architectural representation tools such as drawings, sketches, models, architectural history
has been taught with the utilization of images, often photographs. This creates two main issues:

1: Architectural representation tools have more sophisticated inner dynamics than simply signifying the architecture that they represent. With reference to McLuhan’s famous motto which suggests that “medium is the message,” architectural drawings and models have been building their own “virtual” realities that refer to themselves before the architectural product. (McLuhan 1967)

2: Architectural documentation, mostly photography since its invention in the 19th century, that claims some sort of objectivity is purely illusion. Photography had never been used to document reality with pure objectivity, but this had almost always been the claim. The will of the photographer, his/her gaze shaped by that will, purpose of the photograph have served as the illusionistic tools. Showing photographs of a building, thus, embodies a more sophisticated network of representations rather than simply revealing facts about that building. Interestingly enough, this potential of photography has been deliberately used by the patrons, photographers and the architects from early times of the photography on. A good example would be the integration of the automobile to the images of Le Corbusier’s buildings, for instance, to the iconic Weißenhofsiedlung project he contributed, Villa Savoye and many other “modernist” projects.

Julius Shulman’s iconic photographs of Case Study Houses designed by different architects would be another example. They are arguably more valuable to explain how those photographs were utilized to socially construct the “image” of modernist architecture and how they reinforced that image by propagating the points that modernist architects aimed to disseminate such as emphasis of transparency (of both architecture and the society), hygiene, standardization, modularity. Among these, the Case Study House No. 22 by Julius Shulman (Figure 1) is a resonant example of staged photography creating an iconic image of modernist design ideals. The women seen occupying the house are youthful models recruited for the photo shot and the furniture within the residence was specifically staged for the shoot.

Neither the self-referential nature of architectural representation nor the constructed message of architectural photography, indeed, should create a problematic situation in architectural history education unless they are defined and promoted as tools of objective documentation.

The project we developed in Spring 2017 at New Jersey Institute of Technology adopted new tools such as VR technologies and aimed to overcome these pedagogical issues, to introduce photographs as sophisticated mediums rather than simply representational tools.

We are using VR technologies not to represent a particular building with all its details and its architectural paradigm, but to help students understand dysfunctional attempts to represent an architectural space through 2D representations that were not produced to document an architectural situation objectively in the first place. On the contrary, as explained, they were produced to be the very tools of architectural and discursive fiction.

The building selected was the Barcelona Pavilion by Ludwig Mies van der Rohe, which was the Ger-
man Pavilion for the 1929 International Exposition in Barcelona. The Barcelona pavilion survived less than a year. When the International Exposition was over it was torn down in early 1930. Despite its short lifespan, visual representations such as photographs and architectural drawings kept the structure’s memory alive. For decades the Barcelona Pavilion was praised as one of the masterpieces of Modernist architecture and design.

The Barcelona Pavilion was eventually reconstructed permanently in Barcelona between 1983 and 1986 by a group of architects with the help of the visual representations of the building which already did an important job by reconstructing the image of the building in people’s minds.

The Barcelona Pavilion (Figure 2) was a well situated foil for this study: a long history of existence only in historic photographs, a role in architectural education as a waypoint in modernist design, and a clear set of modern design principles students could be tested for the cognition of.

Our project aims to take advantage of complex nature of architectural representation and documentation tools by appreciating their invaluable potential to explain the historical context that the buildings were located into. How these tools besides the actual space play a crucial role in terms of “building” their -virtual- reality i.e. concepts of monumentality, nationalist/romantic architecture and so on.

By giving students a chance to experience virtual space, we emphasize, that space is not the space that it claims to represent. At this point one should remember René Magritte’s “Ceci n’est pas une pipe.” Similarly students in our project were well aware that what they experienced was not the Barcelona Pavilion, but, with its limited and problematic resemblance, tools that they can adopt to rebuild that specific building with the references to its reality: its fragments, parameters, compositional and discursive elements. In short, they were taught how they could build their own version(s) of Barcelona Pavilion.

VIRTUAL REALITY

Recent advances in Virtual Reality (VR) have made immersive viewing hardware highly accessible. The HTC Vive and Oculus Rift are relatively affordable and available at the consumer level. These technologies have the capacity to playback highly immersive spatial simulations. On a more ubiquitous level, the Gear VR and Google Cardboard framework make VR available to most members of our College student body.

VR technology was adopted early on for architectural design studios (Achten 1999) but has been relatively underutilized in architectural history. While visual simulations have recently been implemented in some historical studies (Favro 2010), especially in the realm of Digital Humanities (Wendell et al 2016), the adoption of VR has yet to become common. The potential for VR in expanding architectural knowledge
through experience over imagery has been acknowledged but largely understudied (Alvarado 1999).

**SIMULATION**

Based upon the convergence of our discussions, the presence in our school of ubiquitous VR technology, and an eager cohort of undergraduate design students we decided to undertake a study. We designed an experiment to gauge the effectiveness of augmenting traditional photographic history with an immersive VR simulation. We posed the question of whether an architectural virtual reality simulation could create a demonstrable understanding in students beyond that of historic photographs.

An existing 3D model of the Barcelona Pavilion was used as the foundation of our VR simulation (Figure 3 and 4). A project in Unreal Engine 4.0 collected the 3D model assets and the controls for the HTC Vive Head Mounted Display into a real time 3D simulation. The HTC Vive hand controllers were used for a step based interactive navigation. With the head mounted display calibrated at floor height any participant could experience the simulated space according to their natural height. Participants could crouch, lie down, jump or otherwise manifest height and viewpoint differences in a natural manner.

**STUDENT ASSIGNMENT**

The project leveraged 50 undergraduate design students in Spring 2017 semester. Students were required to complete an assignment exploring these topics in the final weeks of the semester. Students had the capability to navigate throughout the entire Barcelona Pavilion and view it from any location or direction they chose.

During the simulation, each student was given the opportunity to save images of their first person experience. The framing and composition of these image became an empowering act of virtualized photography through the lens of unique experience.

Students were expected to produce a visual narrative of what they learn during their VR experience. In doing this, they were asked to use formal parameters given by the instructor. Although students were allowed to add different elements, textures or colors, they had to use all the given shapes which are essentially produced from actual Euclidean geometries of the structure. Students were mandated to instrumentalize their recorded images from within the VR experience to produce the visual narrative.

Students had two options: they could either transform given shapes into a 3D assemblage by using software or they could craft those forms by hand and integrate them into a collage.

The final student deliverable was a PDF file including the images they captured during their VR experience, their visual narrative (i.e. collage or assemblage), and one-page written report that explained their project.

In addition to the visual narrative assignment, all students executed a questionnaire prior to the start of the VR experience and upon completion of
the VR experience. The project team used this questionnaire to assess the familiarity of students with VR HMD technology and to measure simple associative cognitive measurements of spatial perception. The questionnaire made clear that; 66% of participants had previous experience with VR HMD, and that after the VR experience 78% of participants perceived the Barcelona Pavilion as primarily horizontal.

**STUDENT OUTCOMES**

Andrew Carter (Figures 5,6) developed an investigative approach. Rohe’s De Stijl connections defined a starting point for him to test whether the architectural tools of the Pavilion could be reduced to its elements. These elemental forms were then employed to re-construct the “dynamic equilibrium” that Piet Mondrian investigated in his works. He simultaneously explored this opportunity to experiment with the fluidity of space as an architectural idea. Translating his fluid virtual visit to pavilion he reversed Pavilion dynamics and re-arranged the architectural tools and elements vertically.

Jenna Stuiso identified large fields of physical materials in the pavilion. Figure 7 shows the extraction of these materials into a two dimensional collage reflecting the collapsed and collected planes. The proportion of each band in the image reflects the gross horizontal proportion of the pavilion. The translation from three dimensional to two dimensional presents a critical analysis of material use cast into the organizing principles of the architectural form.

Daniel Han created an interactive game environment. Daniel developed a platform based game (Figure 8), inspired both from the architecture and from his VR experience. The large scale horizontal canopy reflects the horizontal bias of the Barcelona Pavilion. He investigated the terrace and architectural flooring as platforms carefully aligned and arranged. He suggested re-purposing those platforms as interaction devices where the player encounters historical events and paradigms in Europe such as WWI, colonialism, Industrial Revolution which he believes informed the creation of the pavilion.
MAKING AND LEARNING

In order to evaluate the students’ understanding of this building, it was important that the project aimed beyond simply a virtualized recreation of space. While a thoughtful and attentive recreation was authored, it was in service to larger idea. We conceptualized the project as creating an opportunity for the students to experience an outcome of the tools (color, material, volume, proportion, etc) of modernism in an effort to have them then use those tools. The adoption and use of these same tools is a way to measure knowledge.

The Barcelona Pavilion, and modernism in general, are fitting topics for this approach. Within the confines of this project early modernism can be approached as a parametric design process. Roofs become wide horizontal planes, windows become dissolved barriers, floors become planes of material. Modernism was positioned as a demonstration of parametricism. Students could demonstrate a cognition of this systemization through a new parametric design implementing these ideas.

CONCLUSION

The use of photographs in teaching architectural history presents a skewed reality. From a pedagogical standpoint, it is important to acknowledge and embrace this condition. The complex conditions surrounding the use of photography, agency and influence create an informed teaching opportunity. Through the adoption of new technologies, we are simultaneously becoming capable of augmenting students’ perceptions of historic spaces. These new teaching tools hold a promise to make present aspects of architecture previously masked through the lack of photographic evidence.

Virtual Reality is an important technology to facilitate a tangential experiential study of historic spaces. The ability to occupy, explore and record these experiences places students in a powerful role as explorer and witness to history. However, occupation of space is not enough to overcome our current pedagogical challenges. We must acknowledge the role students’ agency and making plays in learning. The active engagement of the student in exploration, recording and synthesizing experience is critical learning. The application of principles, systems and concepts into creative outcomes solidifies learning and aids in assessment.

The study we undertook was an informative first step in developing a pedagogical dialog and approach.

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