DESIGN EDUCATION (3B)

NU GENESIS

A Journal of Unique Designs in a Virtual Collaborative Design Studio

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Abstract. This paper presents a journal of unique design ideas emerged from a virtual collaborative design studio between Rangsit University, Thailand and University of Newcastle, Australia. "NU Genesis", a virtual island in "Second Life" is used as an experimental platform, allowing the two universities to collaborate in design and learning across the continent. The presented designs are analyzed and evaluated to highlight the new design potentials in 3D virtual worlds, such as new design context and design support, and examples of the unique design usage of these potentials in future design practices. The design experiences and outcomes of the individual and collaborative projects are also discussed.

Keywords. Virtual design studio, 3D virtual worlds, alternative design.

1. Virtual Design Studio in a 3D Virtual World

New communication technologies open many previously unavailable opportunities for collaborative design. They also offer a new platform for collaborative learning between different institutes as students who are remotely located can work together and exchange ideas across the globe. Many virtual design studios were conducted in the past (Kolarevic et al, 1998; Donath et al, 1999; Russell et al, 2003; Kubicki et al, 2004). However, 3D virtual world

technologies have evolved since those years. The current virtual worlds focus on the application and support of an integrated virtual learning environment for collaborative design, supporting constructivist learning, collaborative modeling and synchronous communication (Gul et al, 2008). With the introduction of virtual design studios into education, design schools have been changing their curriculum to employ these new design domains which enables the capture of more information that would be impossible to capture with the use of the traditional media. In this paper, we present a journal of unique designs emerged from a virtual design studio, from which we call "Virtual Collaborative Design Studio". Then we discuss our experience of applying virtual worlds as new design domain in teaching. The virtual collaborative design studio is the result of an international collaboration between two universities located in two different parts of the world. "NU Genesis", a virtual island in "Second Life" or SL (http://secondlife.com/) was set up as the virtual site for collaborative design and learning.

This paper documents a variety of unique design ideas and approaches evolved from the virtual collaborative design studio. The presented designs are analyzed and evaluated to highlight the uniqueness of virtual world designs. The purpose is to showcase the potentials of 3D virtual world as a new collaborative design learning environment.

2. Overview of the Collaborative Experience

In order to illustrate the various exercises took place in this virtual collaborative design studio, we describe them in the form of three consecutive stages: the pre-collaboration, the collaboration and the post-collaboration as follows:

Pre-collaboration: Pre-collaboration includes planning, timing, setting up the remote design teams and of course, the different design exercises. When both universities agreed to set up a virtual collaborative design studio, the first challenge occurred was the synchronisation of schedule according to various different criteria as shown in table 1.

While Rangsit University (RSU) could set up a dedicated semester of 16 weeks for this studio (ARC 423 Special Topic for Architectural Design), which started from mid June, 2008, University of Newcastle (UoN) was limited to parts of a course (ARBE2202 Communication in the Built Environment 4). However, the activities from both universities were synchronous for 5 weeks– the total duration of the collaborative design project titled "Virtual Home".

TABLE 1. Different criteria to be considered at the pre-collaboration stage.

Criteria	RSU	UoN
Time	GMT + 7	GMT + 4
Place	Bangkok, Thailand	Newcastle, Australia
Class week	16 weeks	5 weeks
Class hours (local time)	Wednesday 1pm-4pm	Monday 10am-12am
Number of students	10 (including 1 IT student)	36
Student background	3rd year in Architecture and 4th year in IT	2nd year in Architecture
English skill	Fair	Good
Modeling skill	Good	Fair

As a result of this scheduling, RSU students (who have some English language barriers) had given more time to develop adequate communication skills in English and in SL. The various exercises described here after mostly took place at RSU side, including development of skills in SL, midterm exams and the land use design competition for the NU Genesis island.

*Collaboration***:** In this stage, one of the main objectives of the virtual design studio is to enable students of both universities to learn about and make use of the collaborative virtual environment and its new design opportunities for exploring design opportunities in virtual world. The students were asked to design a "Virtual Home" that goes beyond traditional home, in a new design environment that was supposed to boost up their imagination and creativity.

Post-collaboration: The post-collaboration represents an evaluation of the studio. A comprehensive questionnaire is developed for this purpose and used in the end of the collaboration for student evaluation. The result of the evaluation will be documented in another paper. The remaining of this paper will focus on the presentation and discussion of the first two stages.

3. Pre-Collaboration Exercises

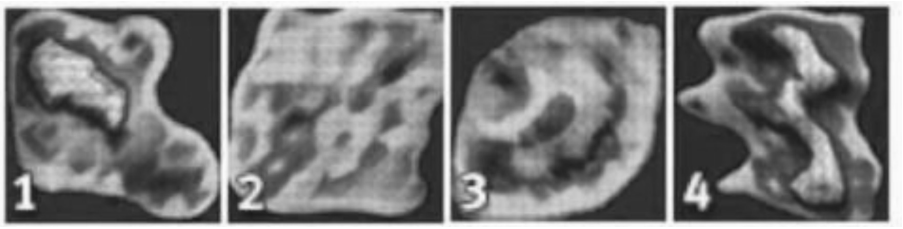

Figure 1. Possible island shapes in Second Life (NU Genesis is island shape No.3)

Shaping NU Genesis: NU Genesis serves as a collaborative platform located in SL 3D virtual world. It's coordinate in SL is (99, 143, 23). Like modeling clay, it is customizable in size and shape, within its maximum area of 256*256 or 65,536 square meters in SL. From the picture (cf. Figure 1), NU Genesis is island shape number 3 - which is in the shape of a doughnut with its hole in the middle representing a central lake.

Development of skills in SL: RSU students developed various essential skills in SL through series of exercises. A comprehensive guide to Second Life written by Rymaszewski et al. (2006) was used as reference for these exercises.

Land use design competition: After the above exercises, RSU students were asked to develop a land use proposal for the NU Genesis island through an in-class design competition. Students firstly worked individually or in pair in planning the land use in order to develop a zoning of the virtual island, for accommodating and supporting the collaborative design project "Virtual Home". The winning design was adopted to layout the island, where remote teams would be able to work on each parcel thereafter. The expected result was some original layouts of the island to serve the purpose of applying the island for the forthcoming collaborative design project.

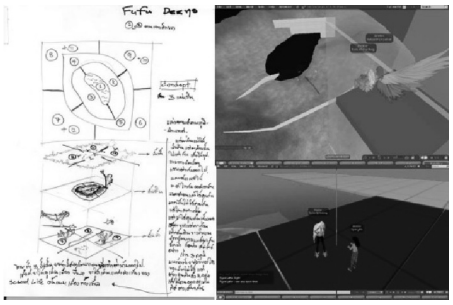

Figure 2: Winning layout of the land use design competition "Three worlds"

The outcome of this exercise was 8 different layouts. Most of them were similar in proposing one layer of land use with different ideas of division strategies. One outstanding design stood out from the rest with an original and challenging idea and was awarded winner of the competition: the "Three Worlds" layout (cf. Figure 2). This winning design nicely addresses the conflict between the limited buildable surfaces of the island and the large number of students enrolled, to enable designs to be developed in a vertical manner. The winning proposal allows the effective use of the island to its full limit as the construction can be arising in 3 layers: the ground, the water and the sky. This also provides many unusual sites to enable interesting design development. As proved later in the collaborative project, many student groups were very

interested in selecting an unusual site, for example, a floating site in the sky, or an underwater site, which they rarely can work with in a conventional architectural design studio.

Transforming the Wright House: This exercise served as the midterm exam for RSU students to demonstrate and evaluate their modelling skill developed in SL. The exercise covers adequate skill sets for testing but was also brief enough so that students could finish the exam in 3 hours. The students were asked to reassemble a readymade Frank Lloyd Wright style house, then transform it into other styles of their own preference and decorate it with furniture available in SL. The students worked in pair and 6 distinctive styles were developed: (1) Artist House, (2) Lighting House, (3) Orange House, (4) Gaudi House, (5) Zebra House and (6) Green House (cf. Figure 3).

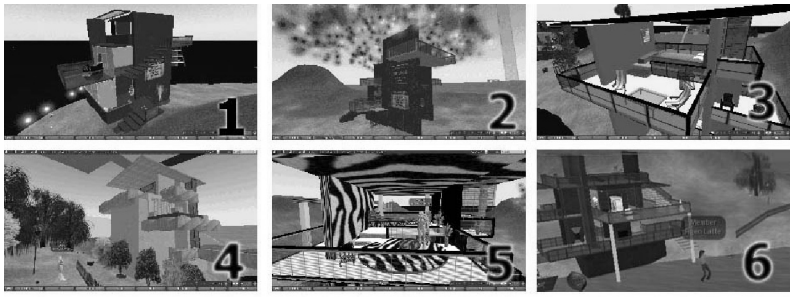

Figure 3: Transforming the Wright House

This midterm exam was not only an evaluation of basic modeling and other technical skills in SL, but also a learning opportunity in preparing for the collaborative project. Students were able to show their creativity in SL and learned about the advantages and the limits of the modeling tools in SL through design exercises. At the end of this stage, they were ready for the collaborative design of 3D "Virtual Home" where students were asked to go beyond designing a real-world home, in a virtual world expanding their vision and imagination.

4. Collaboration: 3D "Virtual Home" Design

Assignment brief: 3D virtual worlds differentiate from conventional CAD systems by providing an integral platform supporting collaborative design and modelling, and remote team communication. In this collaborative design project, students were required to explore the use of SL, for a collaborative project of designing a "Virtual Home".

Group formation: For this collaboration, students were divided into groups each containing 4-5 students (for example, 1 RSU:4 UoN) to form a "remote

collaborative design team". Students and their remote collaborator(s) were formally introduced prior to the collaboration. Each team were required to design its team dynamics, define the roles of team members, and discuss the arrangement with the instructors.

Design tasks: As a remote collaborative design team, students were required to explore the potentials of virtual worlds, and design and model a "Virtual Home" in SL. The "Virtual Home" should go beyond the traditional design concept of a home in the built environment, and reflect the unique characteristic and experience of virtual worlds. Each team had to choose a plot of virtual land in SL for the project development and implementation.

Communication tasks: Each remote design team were required to use SL or other electronic communication tools such as Skype, MSN Messenger, email, and so on, to conduct at least 1 project meeting per week during the 5-week collaboration. At least 2 of these meetings were needed to be conducted synchronously in SL with the attendance of all team members to guarantee sufficient team collaboration.

Design outcomes: The students come up with some very unique designs. The designs outcomes presented here (cf. Figure 4) are carefully selected. Not only they are interesting because of the variety of the concept presented, but also because each of them represents different level of unique aspects of the designs.

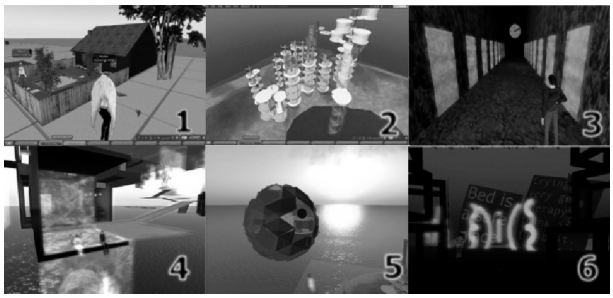

Figure 4: Interesting design outcomes

In order to help us investigating the unique aspects of the designs and to understand students' different design approach in 3D virtual worlds, we have analyzed the design outcomes from the following three perspectives:

(1) Degree of realism in form (whether the students have used dominantly real-world forms in their design): The design using dominantly the real-world forms or objects is classed as "realistic"; one using dominatingly the forms that are impossible to construct in reality like floating structures in the air is classed as "surrealistic"; while one using a combination of both kinds is classed as "semi-realistic",

(2) Degree of abstraction in concept: This means whether the design has a profound meaning or concept behind the infrastructure and visualization, deriving from words, philosophy, and etc. For example a concept of simulating a "Garden" literally is considered as non-abstract, while a concept of depicting "freedom" in design is considered as abstract.

(3) The design approach (whether it is object-based or concept-based). The classification is presented in the following table (cf. Table 2):

TABLE 2: Classification of the design outcomes

No.	Group	Degree of realism in form	Degree of abstraction in concept	Design approach
1.	Sky Garden	Realistic	Non-abstract	Object-based
2.	Archi-Bio	Semi-Realistic	Non-abstract	Object-based
3.	Metamorphosis	Semi-Realistic	Abstract	Concept-based
4.	Floating Cubes	Surrealistic	Non-abstract	Object-based
5.	Zero Gravity	Surrealistic	Abstract	Concept-based
6.	})i({	Semi-realistic	Very abstract	Concept-based

1. Sky Garden (using a site in the sky): The group explored the idea of gardens. This group's design was most similar to real-world objects, house, garden, trees, etc.
2. Archi-Bio (using a site on the ground): Objects in the form of large columns were initially modeled experimentally by one of the team members. The group liked the idea and hence developed assemblies of structures based on the initial experimental models and a quick 2D sketch of layout.
3. Metamorphosis (using a site under the water): The concept mainly revolved around Krishnamurti's philosophy of "Living without Conflict" where materiality of the physical world conflicts with a person's inner self. The group showed different levels of subconscious throughout different layers of underwater rooms with real world objects but aimed to create ambient environments that depict different "emotions".
4. Floating Cubes (using a site in the sky): The group presented series of floating cubes with connecting paths. Some moving objects were created using scripts called Linden Scripting Language (LSL).
5. Zero Gravity (using a site in the sky): Since SL has no gravity but still has up and down orientation (like the physical world with gravity); this design challenges the idea to have all the different spaces spread over the inside of a sphere. The items in the top of the sphere are upside down, like it is glued to the inner surface of the sphere.

6. })i({ (using a site under the water): The name of the group is a representation of butterfly - a symbol of "freedom" - but you cannot say it. The project explores ideas of isolation, restriction, and safety.

A combination of "Degree of realism in form" and "Degree of abstraction in concept" assist us in understanding and evaluating the designs developed in the collaboration. Surrealistic and abstract designs often receive higher recognition in the studio as they often arrived to break out from design conventions with innovative and challenging approaches, which often lead to interesting outcomes and encourage students to explore different design possibilities during the collaborative process other than repeating what they have already learnt in the conventional architecture studio.

From these design outcomes, we further remark two different design approaches. Firstly, the object-based approach where students started with the exploration of interesting forms, then adopt or sometime "make up" a concept afterwards. Sky Garden, Archi-Bio and Floating Cubes are some of the groups that follow this approach. We noticed that these groups could quickly reach certain design outcomes, as the design collaboration within the group started with form making and 3D modeling. Secondly, the concept-based approach, where students firstly explore, develop and agree on certain concepts and then create forms that could realize the concepts. These groups are among the ones such as })i({, Metamorphosis and Zero gravity. They often progress slowly with their design compared to the object-based groups. However, their design outcomes often become very interesting and often with more depth once they have successfully communicated the abstract ideas to each member of the group and realized them in forms because the final designs are much better sustained with thoroughly considered concepts. On the other hand, a very few groups (not presented here) failed completely with the project since they could not communicate or come to agree with their ideas and then some of the members started to build just anything in order to meet the deadline.

5. Conclusion and Discussion

In this virtual collaborative design studio, students have explored potentials and limits of SL as a virtual collaborative design environment:

- The students have faced some challenges including language barriers, cultural differences, and demands of communication, management, and teamwork.
- The communication challenges have encouraged some groups to develop skills such as using visual objects for communication rather than words. Thus those groups have adopted the object-based design approach.

- SL provides a platform where there is no physical design constrains such as gravity, our experience shows that students can practice generic design skills in a flexible environment that has more freedom in design exploration by using their imagination to a full extent.
- In the end of the collaboration, the students have gained not only design skills and experiences in designing on Collaborative Virtual Environments (CVEs), but also communication skills using cutting-edge digital technologies.

With numerous limitations, to further apply 3D virtual worlds in professional practice, due to complexity of the projects, using these environments as the new design contexts still needs future investigation. Nevertheless, the unique design ideas recorded in this paper showed that 3D virtual worlds such as SL are one of the promising tools for teaching design. It allows realistic 3D modeling for physical architecture but is also flexible and "thought provoking" enough to give students freedom of thinking "out of the box" and to explore and express alternative design concepts that are not often well supported in the conventional design studios.

The flexibility and benefit of 3D virtual worlds such as SL for both object-based and concept-based design have shown potentials for their use in design. It is noted that students often adopt the object-based approach for collaborative design in SL when there are language barriers.

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