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OPEN COMMUNITITION

Competitive design in a collaborative virtual environment

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Abstract. The recent enthusiasm in popular culture for massively multi-player online environments has proven that eclectic online communities have the potential to develop powerful problem solving capacities, through the enactment of a collective intelligence. Foreseeing a radical change in the identity of the architect, becoming but the designer of open systems of emergent communal design environments, this paper aims at making the case for an alternate CAAD model. Rather than a fully collaborative approach, the open system proposed here encourages direct competition within a shared online environment, based on an established precedent in an associated design field known as 'communitition'. After establishing this alternate position for collaborative CAAD, outcomes from a pilot study are discussed and the specification of a full case study is presented.

Keywords. Collaborative design; virtual environments; competition.

1. Introduction

1.1. COLLABORATIVE VIRTUAL ENVIRONMENTS

Within the last ten years, the CAAD scene has shown a growing interest in the potential of Collaborative Virtual Environments (CVE). Following the technological advancements, CVEs utilize a wide range of interactive hardware, from multi-touch tabletop (Chen and Schnabel, 2011), to Virtual Reality (VR) Caves (Frost and Warren, 2000). Software wise, CVEs have drawn from traditional 2D and 3D representational CAAD tools, videogame engines (Moloney and Harvey, 2004), or a mix of both (Frost, 2003). Our field of interest, being that of multi-user collaborative virtual worlds, has been proven by Merrick et al. (2010) to be useful for collaboration as "(1) design tools for modeling new artefacts, (2) support for communication, and (3) the ability to incorporate artificial models of cognitive design processes". These CVEs, have reflected on these conceptual fields, looking at either finding new educational paradigms (Merrick et al., 2010), or generating models of existing states of practice (Karakaya and Senyapılı, 2006). However, Achten and Beetz (2009) note in their literature review on the development of design collaboration that "Much of the work in the field is technology driven." and that "[…] we probably lack publications from the managerial and psychological perspective." Moreover, a closer look at the previous works reveals two recurrent issues that hinder the success of CVEs. Firstly, many experiments denote the difficulty of implementing satisfactory motivational mechanisms. Secondly, we can witness that users tend to struggle with learning a new design tool.

Most precedents in CVE show small-scale groups of specialists in action. Yet Achten et al. (2011) remark that there is a new trend of involving bigger crowds in the problem solving process. The concept of collective intelligence, as defined by Pierre Lévy (1997), has been explored as a means to exploit the innovative capacity of a group of non-specialists, notably through crowd sourcing (Brabham, 2008). More recently, Collective Intelligence has been related back to the architectural design process by Paulini et al. (2007), who agree on the potential, but note the inconsistency of the crowd sourcing model to organize and perform better than a smaller team of specialists.

1.2. OBJECTIVE AND AMBITIONS OF THE RESEARCH

An alternate model to the consensus model of collective intelligence applied to collaborative design, is that of explicit competition within a shared environment. As an example, the lighting company Osram leveraged the collective intelligence of online communities through a monetary incentive. Social network analysis of the Osram competition reveal there is a correlation between highly competitive behavior (with a degree of collaboration) and innovative design. Hutter et al. (2011) capture this mode of competitive, but communal design activity through the term 'communitition'. The principle is that "while competition reduces collaboration, it also spurs community members' interest in innovation activities." There is an analogy with the tradition of architectural design competitions, which have continually driven innovation in architecture. Typically in architecture however, participants have no knowledge of other contestant's designs until the competition has been judged. The precedent of the Osram competition reveals that been able to track other design development and *communicate while competing* was an essential factor in successful innovation.

"… that ideas submitted by communititors – users combining co-operative as well as competitive features – show a higher probability of being highly ranked by

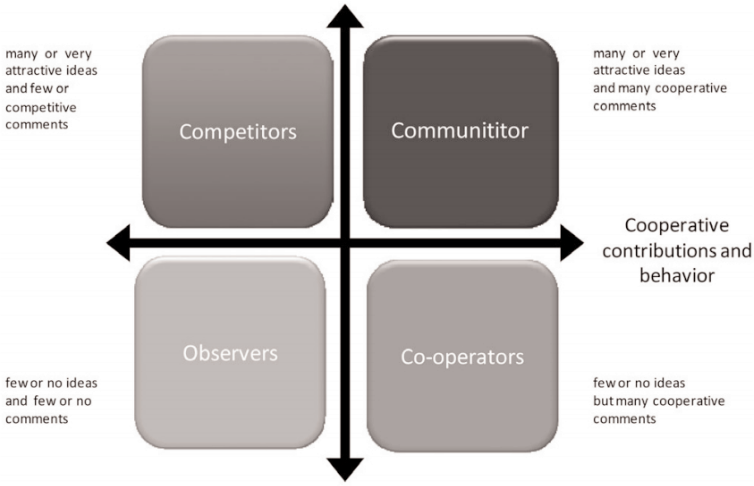

Figure 1. Different User Types Identified in the Osram study (Hutter et al., 2011).

community evaluation and winning. These findings indicate that engaging in competitive behavior aimed at winning the contest while simultaneously participating in community collaboration may positively correlate with the quality of the submitted designs." (Hutter et al., 2011)

The following pilot study explores how such a model may be evaluated for architectural design. The ambition underpinning this is the premise that the architectural design will gravitate to a more open system that operates at a 'meta-level', above the singular architectural object. As articulated by Hight and Perry (2003) "innovative design does not concern the novel appearance of objects, but rather constructing new manifolds for the production of knowledge"

2. A Game of Design

Prior to undertaking the pilot study, background work has been undertaken to evaluate the technical requirements needed for a functioning multiuser virtual world, such as interface, gameplay, and communication, and to validate design choices in terms of environment, rules of interaction and competitive mechanisms. The choice of a videogame engine for the embedment of the study is rather obvious as it is the most accessible and most malleable forms of interactive 3D environment. Andreoli et al. (2005) produced an extended comparative study of several videogame engines, and their methodology was applied to the more recent generation of game engines by adding to the seven criteria enounced (graphics engine, complex models, artificial intelligence, world physics, networking, sound engine, tools) three more practical criteria that are: cost, reputation, availability of resources. Rather unexpectedly we settled on the Source engine, popularized by Half Life 2 (2004), already present in the 2005 study.

The specific sub-framework used for the pilot study that of Garry's Mod (Newman, 2004) which released its tenth version in October 2012. Garry's mod is based on Half Life, and facilitates customization through more user-friendly means than the raw coding of the early versions. This includes but is not limited to generating complex models and modifying their attributes, and setting up complex interaction. Combined with the scripting component and the traditional map/object design tools that Source offer, Garry's mod is a flexible, efficient and stable environment to quickly design immersive and responsive virtual worlds.

2.1. THE PILOT STUDY

The pilot study uses a methodology of participant / observer to scope and prepare a specification for the future full case study. There are a wide range of tools available to manipulate complex objects, themselves subject to a mathematical model of Earth's gravity induced by the physics engine. An exhaustive list of such tools would be both interminable and irrelevant. Below is a purposeful selection of those most pertinent to the study.

- Gravity gun: the main tool. Allows to grab, move, rotate any object at any distance and in any direction.
- Weld tool: creates a constraint between two objects (or an object and the environment) that then cannot move in relationship to the other.
- Axis tool: creates a rotation axis between two objects.
- Rope constraint: creates a rope between two points on objects.
- Camera tool: creates a camera object that can be manipulated like any other. The player may switch views to the camera at any time, or display the reduced view of the camera on a Heads Up Display.
- Duplicator: a player may copy and paste an object or a group of objects anywhere on the map. One can also save the entirety of the objects in the map to spawn them in a further session, as the data is kept in the server. This permits an effective storing of the previous work sessions, and overcomes the issues of a non-persistent world.

2.2. REVERSE ENGINEERING A KIT OF PARTS

Using Source's modelling software Hammer, a series of building components have been produced that are then accessible from the object library in game. These parts are extracted from a reverse engineering process applied on Frank Gehry's

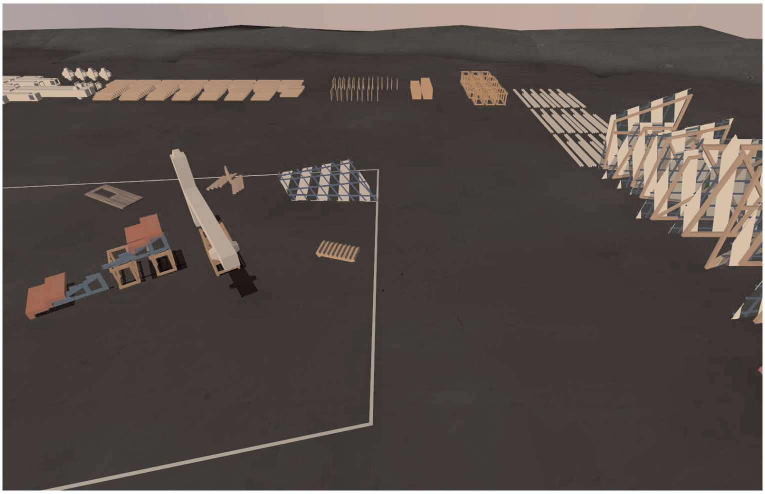

Figure 2. The kit of parts prepared in the CVE ready for designing.

2008 Serpentine pavilion. The choice of this building is embeds the collaborative process in an existing quasi competitive framework, the annual choice of architect for the Serpentine summer pavilion. Equally, it is also a convenient decision in regards to the easy readability of the building as an assembly of distinct building components. Gehry's building was fully designed in Hammer, and then disassembled into 358 pieces of 63 different shapes.

The parts are not the individual components but rather assemblies of meaningful shape and size. The design of this kit of parts as a relatively small group of simple shapes aims at considering them as boundary objects, "that allow members of different groups to come together for some common endeavour, though their understanding of the object of their mutual attention may be quite different" (Frost, 2003). Thus, future users may find in these objects a "'common ground' for their collaborative effort" (Brown and Berridge, 2001).

2.3. INITIAL FINDINGS

The participant observer study has enabled a reflection on typical design process and the implications of the use of this specific kit of parts for someone approaching the design scenario for the first time. A series of design iterations were produced over approximately two hours. During this time the architectural ambitions that arose while entering the environment and seizing the design possibilities were frustratingly out of reach. However after this initial frustration, one begins to construct more elaborate structures, reusing the first assemblies, and refining

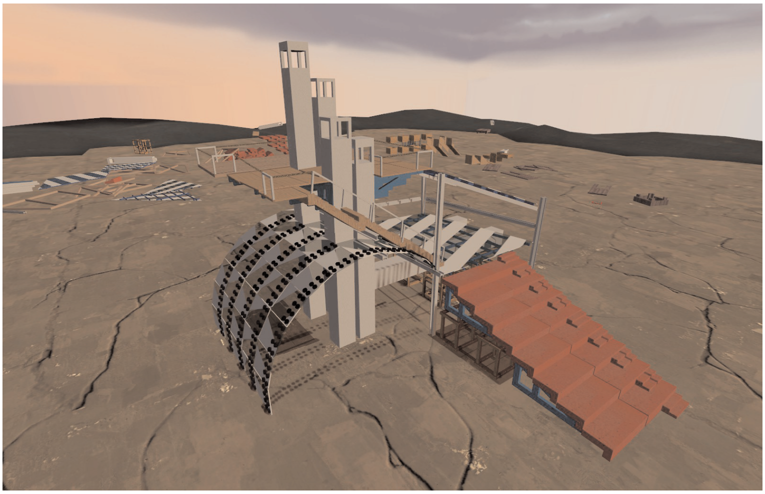

Figure 3. A design iteration from the pilot study.

skills. Limited by gravity, one must learn to build distinct parts aside of the main works in order to integrate them later. Ultimately, a reasonable pavilion iteration is put together, engaging a snowball effect: from this point the pavilion can be optimized or expanded, both for a better use of the limited parts, or one can start anew, reusing groups of parts, building systems and procedures that he learnt on the way.

An analysis based on the skill dichotomy of Merrick et al. (2010) has resulted in the following observations.

- the kit of parts fulfils its role of both a limiting resource and a motor for innovative use and reuse.
- the combination of an easy to use interface in combination with a difficult gameplay provides “an activity that is pleasurable in itself” (Juul and Norton, 2009).
- the storage and access to the precedent iterations acts well as a repository for knowledge and a foundation for erecting future designs.
- seeing every micro problem solving processes as many design puzzles that one challenges himself to solve, “enhances the potential of design capability of an individual” (Chang, 2004), that generates an understandable and satisfying aporia/epiphany cycle (Jorgensen, 2003).

3. Specifying the Next Stage

The objective is to explore the impact of a competitive behaviour within a community of designers, both in regards to the constitution and sharing of a common knowledge base, and to the emergence of innovative problem solving. Participants will be invited to create their own iteration of a Serpentine Pavilion within the collaborative videogame environment. These iterations are assessed by a quantitative and qualitative scoring system. Quantitative for they are scored in real time against a set of programmatic requirements, and qualitative, for they are assessed by the community on more subjective criteria. It is anticipated that successive generations of iterations build up the shared knowledge pool through the display of their scores and characteristics on a leader board, and through the possibility of reviewing them within the virtual environment. Competitors will be encouraged to refine their skills, expand their knowledge and communicate their findings in order to produce innovative solutions, which will be in turn beneficial for the next generation.

3.1. THE COMPETITION

Similar to a traditional architectural competition, the study will be presented as a competition for the best design respecting the constraints of site, program and feasibility. The programmatic requirements are: a stage for small scale events, a café, and a playground. Competitors are invited to comply with these requirements to build in a virtual shared space the most compelling architecture. This will be evaluated both quantitatively through a real time points system and qualitatively by the participants. The points system will attribute a score to each aspect of the program covered by the design.

- Visibility of the stage. Extra points are granted for the area that is sheltered.
- Number of cafe tables, again with those sheltered obtaining a higher score.
- Playground size. This area must be visible by at least one café table, with extra points being granted more tables looking over the playground.

The design must score a non-null number of points in each aspect of the program to be valid. Although one can deliberately neglect one or two of the program facets and still achieve a decent score with the third one, it is clear that the three sets of scores are interdependent (e.g. if some cafe tables can see the stage, they count for the stage as well) and it is strategically beneficial to consider them altogether. The three sub-scores, the total score and an inventory of the parts used will be displayed in real time on the player's HUD. This way, one can engage with the process of optimization in the early stages of the design. Once the design is complete, three pictures are taken from generic points of view, then the digital model is saved and stored in the server for future consultation by any competitor.

In between design sessions, competitors are invited to access a web-based application that displays on a leader board all the projects. The project list can be sorted by quantitative score (best score to worst), qualitative rating (most loved to least) or time of completion (newest to oldest). By clicking on them, one will be able to access a page where the detailed scoring, name of user, date of completion and the three pictures taken are shown. From this page's information, and the possibility to go back to the virtual to enjoy an immersive experience of the iteration, the competitor can then rate the project on three scales of one to ten against three subjective factors: aesthetics, technical difficulty and spatial quality. Once the project is rated, the competitor will be able to see both the main leader board and the dedicated project page the average qualitative score granted by the crowd. Competitors will be able to partake in the discussion specific to this iteration, in a dedicated forum page. The specification of this web-based design review system builds on the works of Hutter et al. (2011) and Van Bouwel et al. (2012) as an effective means of improving the quality of the submissions and stimulating constructive criticism.

3.2. THE COMPETITORS AND TIMELINE

The next stage of the research is to be started in early 2013 with 7 participants, all 5th year architectural design students and there will be a material prize to stimulate a competitive environment. The design sessions will be done in groups of two or more, and will be recorded. A tutorial session of two hours will be granted to all participants in groups of two, where the rules, the score and rating system will be extensively explained, and a basic demonstration of the gameplay will be shown, in the form of a short movie. Participants are expected to design at least three iterations, and this within a timeframe that allows at least two designs to be uploaded and rated between one's two iterations. Participants will be informed by mail whenever a new design is created, and will be able to rate and comment from anywhere. At the end of the study, the participants will be invited to partake in an anonymous survey focusing on the usability of the platform as a design tool, the validity of the collaborative aspect as a producer of quality content, and the validity of the competitive social setup in terms of motivation and fun.

4. In Summary

A position has developed that, based on precedent in an allied field, there is potential for architectural design to be conceived as 'open communitition'. The motivation is to validate the current efforts towards the extended implementation of collaborative online review platforms, and evaluate an open platform communal competition as a way to spur architectural innovation. A pilot study has been undertaken that has evaluated available collaborative videogame software and using a participant observer method, this has been evaluated for a future case study. A competitive architectural game has been conceived based on the requirements of the brief for the annual Serpentine gallery. Frank Gehry's 2008 Serpentine pavilion has been reverse engineered to produce a kit of parts, and the editing tools of the game environment have been evaluated. The case study has been specified with both quantitative and qualitative criteria being considered, and will be undertaken early in 2013.

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