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Open Communitition

A thesis

By

Achille Segard

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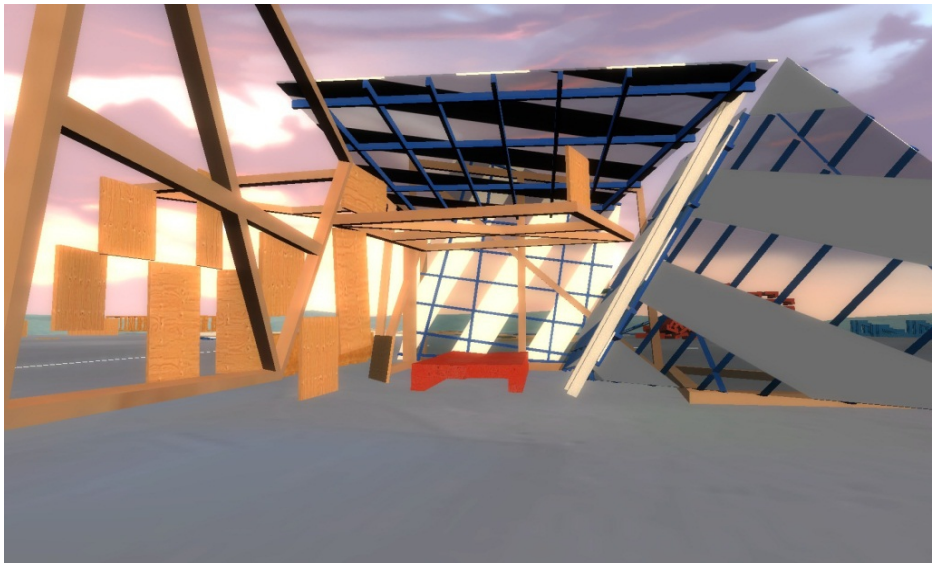


The very first attempt at designing a better Serpentine Pavilion.

0. Abstract

The recent enthusiasm in popular culture for massively multiplayer online environments has proven that eclectic online communities have the potential to develop powerful problem solving capacities through the enactment of a collective intelligence. In collaborative design, this calls for the implementation of a shared environment leveraging the collective intelligence of online communities through open competition. The goal is to spur innovation through a public process where the emerging design ideas are available to all competitors.

Foreseeing a radical change in the identity of the architect, becoming but the designer of these emergent communal design environments, this paper aims at making the case for this alternate CAAD model through the execution of a pilot study. This study, based on the Serpentine Pavillion procedural framework, sends a sample group of designers to a shared videogame environment, where they are asked to create their own pavilion using a kit of parts drawn from the reverse engineering of Frank Gehry's 2008 pavilion. These iterations are scored in real time against a set of quantitative programmatic requirements, but they are also assessed qualitatively through more subjective criteria by the community of competitors, enriched by the immersive virtual experience of each other's designs. Observation and analysis of participants has been undertaken through the recording of design sessions and online survey.

This pilot study is currently being undertaken, yet the initial results hint at displaying much potential for a participative, intuitive and instantaneous form of collaborative CAAD based on communal competition.

1. Introduction

1.1. Topic

This thesis puts the finger on the crossroads between three fields of study that have undergone massive changes due to the booming improvements of information technology: Architecture, the Virtual Representation and the Collaborative Process. We look here at the intersection of these fields being respectively Computer Assisted Architectural Design (CAAD), Collective intellingence (CI), and Collaborative Virtual Environments (CVE).

Amidst the union of these three new paradigms of knowledge creation, lays an idea of a collaborative virtual design tool utilizing the power of the many. The following pilot study explores how such a model may be evaluated for the context of architectural design, with the conviction that a certain degree of competition is an answer to successfully implementing such process.

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 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"(pp).

What is treated here is the pilot application of this new way of producing and gathering knowledge, and its following analysis and critique. The tangible product of this enterprise, in the form of virtual spaces, will only be seen as the intermediary results of an experience destined to assess the veracity of the hypotheses outlined below. In other words, this thesis is neither about producing good architecture, nor about discussing the pertinence of designing in a fully virtual environment; it is about creating a collective process that generates *better* architecture than (and based on) the previous iterations.

1.2. Hypotheses

Such enterprise may be declared successful if we prove that:

- It is worth exploring CVEs as a promising architectural practice paradigm

- Online virtual platforms are the appropriate places to generate CI, which allows to process and share massive amounts of data and accelerates problem solving

-Communitition is a model that spurs motivation and innovativeness along its participants, thus solving previous failures at CVEs

-The Virtual is a place adapted to implement:

CI for technical reasons

Communitition for theoretical reasons, at the concept is linked to the field of ludology.

- Toolkits/Kits of Parts, although creating limitations, allows for an enhanced dialog between peers and the apparition of the phenomenon of emergence.

1.3. Research questions

Is Open Communitition applied to Design in a shared Virtual Environment a valid form of Architectural Practice?

To this main research question is appended a trio of subsidiary ones, which will focus on the aforementioned three fields of study:

What are the communititive levers that need to be implemented in order to bring motivation, force innovation and create information?

What are the components of an online platform that can shelter a CI, store and display data meaningfully and encourage exchange?

What are the characteristics of a virtual tool which allows creativity, rewards expertise and opens dialogue?

2. Why communitition for design

2.1. State of the art

The body of knowledge on collaboration in the virtual for design is small, young but full of promises. Even though the research cannot keep up with the technological improvements, some visionary breakthroughs in the field need to be applauded.

2.1.1. The use of CVE's for design: precedents, discussion

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: multi-touch tabletop (Rui and Schnabel, 2011), Virtual Reality (VR) Caves (Frost and Warren, 2000). Software wise, CVEs have drawn from traditional 2D and 3D representational CAAD tools (Hubers, 2009), videogame engines (Moloney, Harvey, 2004), or a mix of both (Frost, 2003), (Frost, 2007).

These CVEs have reflected on these conceptual fields, looking at either finding new educational paradigms (Gu, Williams and Gul, 2008), (Hoog, Falkner and Seifried, 2007) or generating models of existing states of practice (Karakaya, 2006). All results reflect upon the potential of what was once called the Virtual Design Studio, which presents a "new model of design that is immersive, reflective, integrative and interactive."(Shaki, Mark, Ahmadi, 1999, p5). Being synchronous, asynchronous or a mix of both, involving taskforces, teams on an equalitarian level, or individuals, these CVEs always focus on the issue of a proper interpretation of the concepts of representation, communication and motivation.

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."(p.362) In turn, Gul (2011), relating to the use of CVE's for educational purposes, deplores "a lack of design support in 3D virtual worlds; inability in teamwork management; […] lack of shared design understanding; lack of common

goal in collaboration."(p. 207) 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.

Some notable work has been made by Lee, Kim and Banerjee (2010), who focused on tracking and categorizing the different design iterations produced by the collaborative process into a design history, made available to all to see, and this to point out redundancies and nourish the database with that processed knowledge. Two years later, the works of Van Bouwel et al. (2012) draw from their conclusions and propose a more visual version of that classification in the form of a project-tree embedded in a web application. Building the communicational aspect of their CVE around that tree, they find conclusive ways to enhance social exchange. Most importantly, the highly rewarding component of growing a branch proves that the motivation issue can be partly solved through good representation.

Our field of interest, being that of multiuser collaborative virtual worlds, has been proven by Merrick, Gu and Wang (2010) to be useful for collaboration as "design tools for modelling new artefacts, support for communication, and the ability to incorporate artificial models of cognitive design processes"(p.174). According to the result of their case studies, virtual worlds are appropriate to support design for the four following reasons: "They permit the synthesis of design computing technologies, collaborative design and artificial models of cognitive design processes; they support human-human interaction, potentially on a very large scale (hint for what is coming up - Editor's note); they support human-computer interaction; they can be used to simulate and experiment with new designs and design related systems; they can be functional places in their own right."(p.185) What also transpires from their analysis of Second Life notably, is that the specific sense of each other's perception through the medium of avatar, in the case of synchronous design sessions, proves successful at installing ways of communicating that allow both big-scale and small-scale design with minimal confusion.

Hoog et al. (2007) in their own words extol the benefits of avatar-based social experiences, as they bring "relationships and operational functions, which are core to architectural design."(p.363) Gul, Gu and Williams (2008) concur on this idea of virtual worlds being a better place for meaningful discussion than their web-based counterparts (chat rooms, image sharing) even though the latter may still be required: "[…]

exchanging ideas, sharing design documents and sharing and developing design concepts and knowledge are essential for engaging students in collaborative design."(p.13) The specific spatial representation and negotiation that virtual worlds introduce, here proven to be suitable for collaborative design, will be explored in another part of this paper.

The downside of these worlds for Design is the skill issue: the core skills one has to learn or develop differ from the usual set of 3D modelling commonly used, whether it is library-based or real-time parametric; and a differentiation occurs between avatar-based skills and design skills, which can hinder one's motivation. This calls for a reflection on the design of a user-friendly interface that retains the full potential of an avatar-based experience while allowing for intuitive design moves.

The timid steps towards CVEs as an established alternative to "traditional" design haven't led us too far. And even if "technology alone will not be enough to make [genuine collaborative design environments} happen" (Achten, 2002), we must look at what technology offers in terms of effectively gathering masses of users behind the same design problem. Maher, Paulini and Murty (2010) have advocated for this necessary scaling up, from Collaborative Design to Collective Design. For them, the undeniable advantage of switching from individual to collaborative, with the aim to "create a synergistic solution" and "provoke the emergence of solutions that could not be seen by any individual", is nothing compared to the advantages of switching to Collective.

2.1.2. Collective Intelligence applied to CVE's: precedents, discussion

As seen, most precedents in CVE show small-scale groups of specialists in action. Yet Achten, Kowszewski and Martens (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 Levy (1997), has been explored as a means to exploit the innovative capacity of a group of non-specialists, who do not have particular qualifications, but they make the best use of their access to knowledge. For him, knowledge "ceases to be the object of established fact and becomes a project."(Levy, 1997).

The excitement for such concept has given birth to the concept of crowd sourcing (Brabham, 2008). As Brabham describes, "the crowd

outperforms industry faster and cheaper than even the top minds in the field."(p. 79) More than a new format for holding contests, crowdsourcing may be the answer to "blend commodity culture with social justice goals"(p. 80), thus making a step forward Levy's utopian vision of the "knowledge communities"(p. 80). Brabham too begs for the rejection of "the binary notion of client/designer''.

Von Hippel (2005) foresaw this shift from manufacturer-centered innovation to user-centered innovation through the rapidly growing communication and computing technologies. Information-based tools such as CAD design softwares are being distributed to the masses at a radical speed, and "as a consequence, innovation by users will continue to grow. […]The net result is a pattern of increasing democratization of product and service innovation – a pattern that will involve significant changes for both users and manufacturers." (Von Hippel, 2005).

More recently, Collective Intelligence has been related back to the architectural design process by Paulini, Maher and Murty (2007), where they witness, among other things, on quirky.com the involvement of a duet made of a team of pro designers and the crowd. In this set up, the crowd would carry the design protocol online as a collective while the team of designers, holding the production facilities, would publish the outcome of each stage of the manufacturing for extended comment. In this very design-oriented use of CI, Paulini et al. agree on the ability yet the inconsistence for the crowd to organize itself and perform better than a team of specialists limited in size. Yet they emphasize on the fact that the forced egalitarian quality of the system set up is what upgrades the socialising phenomenon to a point where the contributions go beyond solving the problem of need (function) of a product, and start addressing aesthetics and composition. As to say, it is the quality of the social communication, depending on the features the cyber workshop offers as well as the involvement of the individuals, is what shapes the design process. Hight and Perry would say on this topic: the design of a "precise and synthetic commons of exchange […] precipitates the construction of a collective intelligence through the design process itself." There is indeed no asking politely a crowd to "make some Collective Intelligence", it has to come from the cyber platform which ought to offer a legitimate place of exchange. What Paulini et Al. conclude on, is that CI applied to design, or "CID" is highly promising as a model that allows for aggregating and sharing ideas given that the motivational incentive is strong enough.

Later, Paulini et Al. (2010) would study in depth the issue of motivation, and assume that Collective Design needs to be undertaken by "individuals who are not preselected, but are motivated to participate for personal reasons that go beyond the financial reward."(p.592) In order to achieve that, one does need to "structure and organize design tasks so that people are motivated to participate"(p.581).

Hemetsberger (2001) expands our knowledge on the behaviours observed in virtual consumer communities and addresses the issue of their long-term survivability. In her classification of the exchange processes, she tries to isolate the factors that lead to constant voluntary contributions from the crowd: where such event starts, exchanges are due to moral obligations of reciprocity induced by "cultural convictions in capitalist economies"(p.28), but then many other specific motivations come into play. Hemetsberger evokes a shared passion, small group bonding, caring for equity, social approval, but cannot enclose that altruistic impulsion under only one concept. Nonetheless, we can say that cooperation can be fostered online whenever the sources of social reward are deemed functional by the users.

Füller (2004) made an attempt to explain "why consumers engage in virtual new product development initiated by producers"(p.639). His reasoning is coming from more of a social exchange theory based point of view than an economic analysis. From an empirical study of a relatively small crowd of 825 users, he extracts five main motives which are in order of importance: monetary reward, the ability to show ideas, the ability to gain knowledge, the intrinsic motivation interest, the dissatisfaction of existing products, curiosity. After the usual screed on the efficiency and spurred creativity of these types of crowds when motivated by the medium of these six factors, Füller concludes by a a remark of interest for our subject: "The main challenge of virtual consumer integration may be to create a compelling experience. Only, if virtual integration is experienced as a spectacle, may it become a marketable, consumable product itself attracting consumers to contribute on a continual basis."(p.645)

What is underlying in Füller and Hemetsburger's works, is that individuals come to partake in these CI phenomenons for distinct reasons, and that it usually makes them stick to a precise role within the community, such as the the teacher, the boundary spanner, the commentator, or the visitor (commonly called "lurker"). McGonigal's work on CI (2007), which will be explored further in this thesis for its relationship with gaming principles, shows well how CI can perversely bring lead into a high level of specialization from the individuals,

introducing a hierarchy which is not irreversible, but which compromises the innovative potential of an individual who is not looking anymore for the thrill of a challenge in his comfortable niche.

A place of exchange, a safe haven for the produced knowledge and a public plaza, where contributing is didactic, challenging, rewarding and entertaining all at the same time would be our simplified recipe of a successful user-oriented virtual platform for Collective Intelligence Design. Precedents have shown that when a critical mass of participatory mechanisms is in place, anything is possible, the only obstacle being the motivational aspect. Finding a good incentive enough to raise interest in the first place, then encourage excellence and risk taking, is what competition might bring to CI.

2.2. Communitition: a step forward?

An alternate model to the consensus model of collective intelligence applied to collaborative design is that of explicit competition within a shared environment. As we will see, a certain amount of competition within the cooperative process may provide a way to legitimating malevolent behaviours that necessarily arise in collaborative environments, while emulating excellence.

2.2.1. Communitition: origins, potential

Before the term communitition was first uncovered by Hutter et al. in 2011, many studies have been done around the idea of fostering innovativeness through a dialogue between competition, cooperation and collaboration within either a business framework, or a more user-centered environment.

Coopetition, according to Bengtsson and Kock (2003), is "a situation where competitors simultaneously cooperate and compete with each other"(p.2). The word was made famous by Ray Noorda in the eighties (Dagnino and Padula, 2003), but occurrences can be found starting 1913[moot]. Nalebuff and Bradenburger studied co-opetition in 1996. Acknowledging that business in its purest form can be considered as a

game, Nalebuff and Brandenburger argue that a company should integrate customers, suppliers, competitors and complementors into a single "Value-Net". This Value-Net can then be seen as a game field, where players are rewarded when they employ cooperative or competitive oriented tactics to add value to the whole system. The aim of that strongly game theory related way of seeing a business is to push the actors to create opportunities through not only the way they play, but on which rules they agree on, to reach maximum benefit. N&B think that co-opetition "encourages bold action" while "it encourages you to adopt a benevolent attitude" and "By showing the way to new opportunities, co-opetition stimulates creativity." As outlined more recently by Walley (2007), co-opetition is about turning the former "win-lose" competitive scenario into a "win-win" co-opetitive scenario, that would be profitable for all parties in the several firms involved. There were no doubt then about the benefits of intertwining cooperation and competition in firms through rule-based sub-frameworks. But what Walley actually begged for, was the potential of such concept applied to the community of consumers.

Planting here a stepping stone to the reconsideration of the role of the architect in the light of this new setup of the user-designer pact, we may move on to the study of innovation contests involving bigger crowds of users, necessarily by modern communication means, bringing to Co-opetition the depth of Collective Intelligence formerly exposed, and paving the way to an idea of Communitition.

Bullinger et al. (2010) extensively analyzed these online innovation contests from the angle of social theory and built their conclusions around the study of "boundary spanning"(p290). Boundary spanners are persons who have "a predisposition to bring people together in collaboration" (Obtsfeld, 2005). On a side note, the appearance of proactive boundary spanning in such contests is strongly correlated with curiosity as a motivational factor. Boundary spanners are placed in opposition with the hardcore competitors, who act as "lone wolves". The first bring innovation through bridging the right knowledge to the right people, the second through individual hard work.

Bullinger et al. assume that "an innovation contest can deliver highly innovative solutions if it is designed for participants with a very high cooperative orientation and with a very low cooperative orientation."(p.299) They add that innovation contest should not target the participants with a mixed profile as they show only a low degree of innovativeness. Therefore, to have access to the best of both worlds,

community building as well as high quality submissions, innovation contests should be designed to attract both groups, and "this might be realized by accepting both individual and team submissions."(p.301)

Finally Hutter et al. (2011) reconcile with this dichotomy competitor/co-operator to bring us the concept of communititor: "… ideas submitted by communititors – users combining co-operative as well as competitive features – show a higher probability of being highly ranked by community evaluation and winning. These findings indicate that engaging in competitive behaviour aimed at winning the contest while simultaneously participating in community collaboration may positively correlate with the quality of the submitted designs."(p.16) Hutter et Al. mention the Emotionalize Your Light Contest, where the Osram lighting producer 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 'communtition'. The principle is that "while competition reduces collaboration, it also spurs community members' interest in innovation activities."(p.5) 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.

Hutter et al.'s final remarks regarding the successful gathering of these communititors into an innovation contest won't surprise us as they have been the underlying concern of our conversation and CVEs and CI: "… it is important to provide community functionality that allows members to collaborate through communication and interaction."(p.16) and "The results of our study also prove the need for appropriate rewards and encouragement for users who are actively contributing to supporting the needs and health of the community."(p.16)

Of my three angles of attack, Motivation, Communication and Representation, my literature review may have extended our knowledge on the two first ones so far. Without expanding yet on the characteristics of the tool itself, we may present now the components of our little contest, components which eventually solve the Motivation issue through the

excitement of challenge, the crave for a reward, and the desire for Fun; and solve the Communication issue through the satisfaction of social recognition, the facilitation of exchange, and the organisation of knowledge.

2.2.2. Opportunities for communitition applied to the design process

I report here on a pilot study that looks at the blurred role of the individual designer operating within a digital community oriented towards innovative design through competitive mechanisms. The objective is to explore the impact of the emulation 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 are invited to create their own iteration of a Serpentine Pavilion within a 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. The successive generations of iterations build up the shared knowledge pool through the display of their scores and characteristics on a leaderboard, and through the possibility of reviewing them within the virtual environment. Always willing to perform better than the precedent generation, competitors are 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.

2.3. Informing the research question: design decisions

Drawing from my body of knowledge, I will here display the rules of the contest and its features in the light of our former conclusions. Similar to a traditional architectural competition, the study is presented as a competition for the best design, respecting the constraints of site, program and feasibility. Indeed, the study utilizes an existing context, the Serpentine summer pavilion. The pavilion and its surroundings are designed are modeled virtually, where a building area is delimited. The programmatic

requirements are: a stage for small scale representations, a café, a playground. The feasibility component is induced by the forced use of a limited kit of parts issued from the deconstruction of Frank Gehry's 2008 pavilion. Competitors are invited to comply with these requirements to build in a virtual shared space the most compelling architecture. These iterations are assessed by two layers of scoring. The quantitative one is effectuated in real time within the design environment, and the qualitative one is done between the design sessions.

Let us take the "ten key design elements for Innovation contests"(p.292) written by Bullinger and Moslein (2010) as a template to describe this one:

1-Media: Online
The design will be carried in an online game environment and the assessing via an online webpage.
2-Organizer: Individual
As opposed to a company or a public organization, this contest is run for academic purposes.
3-Task: Specific task
The participants are invited to produce iterations that can take up to 4 hours of work and require a certain level of skills and knowledge.
4-Degree of elaboration: Solution, evolving
The required iterations, in order to be useful for the community, must go beyond the sketch and be considered as fully resolved. Yet they are but a step towards the next generation, making them necessarily evolving.
5-Target group: Specified
Here we aim at master students in Architecture or Design. However, no computer skills or specific design skills is required.
6- Participation as: either team or individual
As seen, allowing both increases chances of better submissions. Moreover, allowing individuals to learn and experiment together in the same virtual space may accelerate learning.
7-Contest period: Short term
The expected timeline would not go over two months with a succession of five to ten generations of designs.
8-Reward: non-monetary

A monetary reward connects the contest with “real” assets, effectively nullifying mechanics of motivation that are inherent to a Game and is therefore not welcome. More on this later.

9-Community functionality: Given

There is no expectation of community building outside of the web application, which will provide sufficient features.

10-Evaluation: Peer Review

The choice of the best designs will be made by the crowd, with the quantitative analysis as a background indicator.

It is now left to prove how the formerly exposed concept of Communitition is activated by the duet of assessment methods. Generally speaking, the quantitative scoring brings to the participants the intrinsic motivation to perform better (than themselves or the others), therefore inform themselves about the existing performances, be rewarded accordingly. On the other hand, the qualitative scoring aims at bonding the community together towards a deepened treatment of the information produced, thus bringing the extrinsic motivation to be socially rewarded for a contribution, whether it is a submission or a comment.

The quantitative scoring takes place in-game, in real time, as the participant puts the pieces together. Based on an arbitrary point system, a built-in calculator attributes a score to each aspect of the program covered by the design. This point system acts as a metaphorical interpretation of a typical brief, with consideration to the London weather, the supposed behavior of an average central city European, and the expected modest occupancy. It is to say that the quantitative rules are a very strict set of mathematical variables that is not destined to literally mimic a brief’s constraints or to promote compelling architecture (this part being covered by the qualitative aspect) but to provide a framework in which one can experiment on rather rational grounds. As Moloney and Harvey (2010) would say; “This embedded information [here, real time feedback on the design “such as floor area and environmental performance.”] need not to be highly accurate for the early stages of the design but provide approximate values on building performance to enable the designer to monitor the implications of different basic approaches.”(p.6)

Without further talk, here are the detailed rules.

The stage gets points by the area where the stage is visible from, as a simple model of the number of persons being able to enjoy the staged performance. These points per square meter are calculated proportionally

to the proximity of the stage. Extra points are granted for the area that is sheltered. In the game, a special entity representing the stage is to be placed by the participant. The café gets points by the number of tables installed. Tables get more points for shelter. In the game, an entity represents the café booth. The playground gets points by the size of the dedicated area allocated to the kids. This area must be visible by at least one café table. Extra points are granted for the number of tables looking over the playground (This is to simulate the adults willing to watch over their kids while having a drink).

It is to note that a design must score a non-null number of points in each aspect of the program to be valid. Also, all aforementioned surfaces must be pathable and accessible.

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 subscores, the total score and an inventory of the parts used are 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, and then the digital model is saved and stored in the server for future consultation by any competitor.

The qualitative scoring takes place in a third-party web page. It is a place of social bonding that participants are invited to visit anytime regardless to whether or not they contribute by submitting an iteration. On the main page, this application displays on a leaderboard all the projects via thumbnails of the pictures taken as précised earilier. The project list can be sorted by quantitative score (best score to worst), qualitative rating (most loved to least), time of completion (newest to oldest), or number of comments (most to least). These simple settings of classification are in the line of both rewarding the best users, who are willing to stay on top for the longest time, see successive generations of designs not being able to kick him them off the hill, and to display the evolution of designs in the simplest yet most meaningful way.

By clicking on them, one can 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, technicity and spaces; as to say how much the

building is compelling visually and dimensionally, how well the parts are used in a structural manner, and how pleasant it is to wander around it.

Once the project is rated, the competitor can now see on both the main leaderboard and the dedicated project page the average qualitative score granted by the crowd. Also, he can now partake in the discussion specific to this iteration, in a dedicated forum page. This mechanism of partially retaining the information is an incentive to rate as many projects as possible to get a better grasp of the community efforts, and to not be influenced by the previous ratings. The success of this type web-based design review system has been proven by the works of Hutter et Al (2011) and Van Bouwel et al (2012) as effective means of improving the quality of the submissions and emulating constructive criticism. Additionally, to each participant is attributed a profile page, with the history of the contributions (submissions, comments, ratings) and their detailed number and dates.

This way, the web app complies with the requirements of being an appropriate platform for exchange and discussion, autonomous and comprehensive, as well as triggering motivation. Indeed, the communititor sees both his competitive (achiever) and collaborative (socializer) efforts being explicitly and publicly displayed. On the matter of the organization of knowledge, the emphasis is put on offering different levels of detail (from the thumbnail to the virtual experience) to satisfy all levels of involvement from the crowd. Where the hardcore competitor would scrutinize every assembly detail on the virtual model and analyze the comments to understand a community's excitement for such design, the co-operator would be active in the discussion and who knows, organize virtual group visits. This system is also designed to reward innovative use of the tool beyond the top rated entries: Raging debates may appear around a design that might have (re)used an uncommon technique or feature, or that might have an improbable quantitative rating due to an abuse of the software (thus triggering the alarm for the contest organizer).

On the reusing the knowledge side, participants are indeed invited to steal each other's innovative ideas. However, no one is expected to know the full range of technical and architectural solutions made available to him by the crowd. And even if someone would, that wouldn't mean he had the necessary skill level to make the best use of it. This is where the phenomenon of CI comes into play: iteration after iteration, the best designs start aggregating the body of knowledge, de facto skimming away the "bad" ideas and regrouping the successful ones into a more succinct

repository. Over time, participants become *more easily* knowledgeable, which supposedly scales nicely with their increased mastery of the tool.

It has been made clear now how the contest rules take the best of Communitition and Collective Intelligence to merge them into a design-oriented machine working towards the satisfaction and education of an eclectic crowd and the creation and enhancement of a truly architectural knowledge that can always be experienced first-hand (virtual visit). The next step is to detail the characteristics of the tool, the rules of the game, and see how the virtual experience can be the cluster of a compelling design process, challenging and rewarding; with keeping in mind the ever-so-important motivation issue.

3. The Virtual as a medium

3.1. A Designer in the Virtual

"The defining element in computer games is spatiality. Computer games are essentially concerned with spatial representation and negotiation" (Aarseth 2007, p.44). Bringing the design process into a virtual platform implies considering a shift in a designer's spatial and social perception, which in turn determines a specific behaviour around the "built" environment. Here, we will discuss the virtual component in the context of our study.

3.1.1. Synthetic worlds, authentic perceptions

Virtual realities have been known to man for a long time, but it is the first time those worlds are reachable, visible and interactive. They are places where people share a same spatial metaphor, usually a metaphor of space. As Wertheim (1999) says: "[…] conceptions of space and conception of ourselves are inextricably entwined. Because we humans are intrinsically embedded in space, then, logically, we ourselves must reflect our conceptions of the wider spatial scheme." The user navigates through a conceptual space, where information and its processes are spatialized.

Virtual spaces are entered through the means of an interface. Unlike a mechanical object, where physics are at stake (input: press a piano key, output: sound wave), an interface to the Virtual returns a set of stimuli that has nothing to do with the physical object. From the cognitive and sensory-motor standpoint, computers play with a language never seen before, where intuition is useless. This is why interfaces determine the nature of the embodied interaction: whether they appeal to "intuitive" mechanics, or refer to former cultural standards, interfaces truly represent the digital hand that manipulates the tool. Or as Dourish (2004) would say: "[embodied interaction] is a perspective on the relationship between people and systems."(p.192)

A virtual space is based on rules. Rules that cannot be broken or bypassed. They direct the range of human to computer and human to human interactions. Rules are abstract, and must be learned through experiments. Before they are fully understood in order to be meaningfully interpreted, transitional mechanisms must accompany the user towards a better understanding. However, rules are but the canvas on which the

mechanisms of meaning-making will be initiated by and between users. The essential purpose of a virtual space is to embed this meaning and to highlight it through the users' actions.

Next to describe is the specific aspect of the virtual space: from a designer's point of view, each constituent of the space is involved in the meaning-making process, by two manners: spaces can be designed as pieces of the interactive virtual object, or as a background, or both. The synthesis of the two is a space with two levels of lecture: the digital can be seen as a place to play, as well as an object which one can play with. However, even if these two conceptions of space merge perfectly, we can assume that the user is always conscious of this dichotomy. Going further, a virtual environment is a discursive field where the representation of space is both conceptual and associative. It is at the same time a representation of space, the scenery, the symbolic background, and a representational space, rule-based, which purpose is to shelter a specific process.

The environment as it appears in the pilot study

Yet beyond static rules, men of flesh and bones coexist by the means of their avatars, a "persistent extension of their human users" (Latowska and Hunter, 2003, p.64) and build themselves an identity that is in reaction to the purpose of a virtual world. And because one's presence in the virtual cannot be constrained to that of an observer, one is forced to act upon his virtual existence, necessarily engaging with the process of creation. Iacovoni (2004) states that there is no separation between the exploration and the construction of a virtual world. The user is an actor and a spectator at the same time; he creates knowledge as well as gathering

the existent one. For Iacovoni, cyberspace may be the most real place, as it is the place of living knowledge.

We may then think of online spaces as eternally processed by its users, who support the rules and suffer them at the same time, with an acute consciousness of their proactive act. Tied by a common vision on how their shared place should be experienced, a community of users is integrated in the process of creation at the very first minute. Being in worlds that often mutate encourages the desire to be innovative both in terms of acting and thinking.

3.1.2. Designing in the Virtual

Where we saw earlier how the virtual is an appropriate place for the implementation of collaboration, and communitition, left is to see what implies designing through the virtual at the individual level. A deciding asset of the virtual is the ability to experience a design even at its earliest stages by being in it. Moloney et al. (2004) said on the Memory Games, a software used for academic purposes, that: "the ability to explore projects in real time demonstrated the importance of context and challenged the 'object' based thinking of typical design students." To what Gul (2011) may add: "This visual inspection opportunity of the 3D virtual worlds is very important for the design students who need th gain the skills and ability to think in 3D space." Exploring a digital model as a pillar of the design-event has been referred to as an "engaged presence" (Frost and Warren, 2000, (p.5)). The nature of this experience gains in depth when shared: seeing someone else interact and/or observe is described as "consequential communication" (Segal 1995 quoted by Gul et al. 2007 on Second Life, p.45), where all acts of manipulation of the design object are made readable for all users. In turn, Merrick et al. (2010) naturally observed that "Being together also increased the awareness of others' activities and social presence."(p.183) Shiratuddin and Thabet (2010) made official this interest in seeing the Other evolve in the Virtual and developed for their Virtual Design Review System a Behind Shoulder View (BSV) where the many could follow one's path from behind: "it was agreed that BSV was a good viewing option especially during a collaborative design review session."

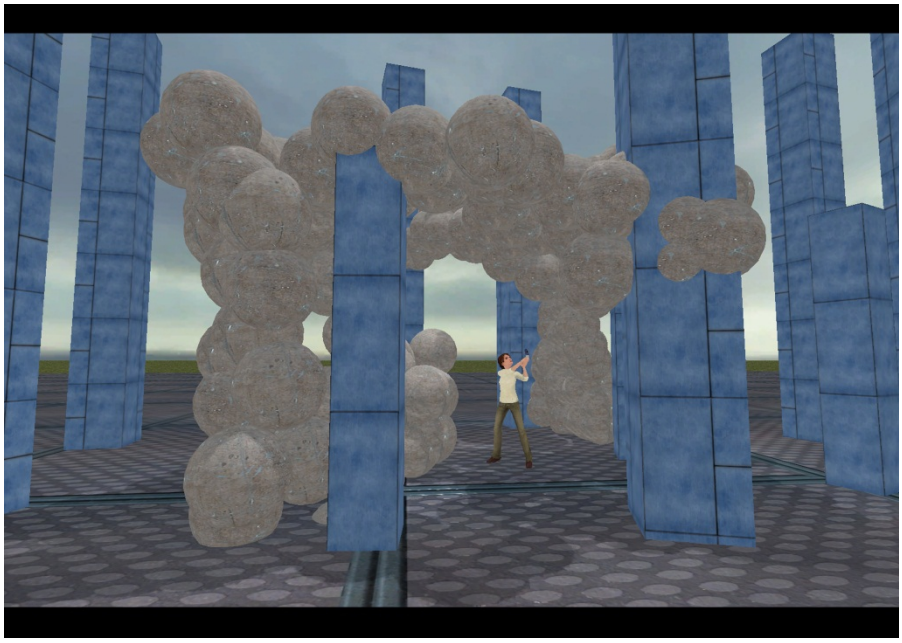
On the matter of what has been designed in the Virtual, History shows two main streams: the use of virtual studios for early sketching of projects supposedly destined to be physical, and the design of virtual spaces as places per se. The latter generally focusing on the unique qualities of the Virtual, for example aiming at creating "Intelligent Environments" (Merrick et al. 2010). This separation is described by Gu et al. (2007) as the "Metaphorical Approach versus the Virtual Approach"(p.) . Our attempt here is indeed falling into the category of the Metaphorical approach.

The means for designing in the Virtual have mainly been library-based, as it is the case for our study. Usually, the libraries offered by the softwares used are limited and constrain the design into a standardized look: "the affordance of library based designs provide the uniformed "AW (Active Worlds, author's note) look" due to the repetitive use of standard library objects […]." (Gul, 2007, (p.44)). The same can be witnessed with the Torque Game Engine (Shiratuddin, 2010) or Second Life (Merrick et al., 2010). Although these softwares offer to some extend the possibility to parametrically modify the Library objects, "the approaches to generating customized models can be cumbersome as users are unable to model directly in AW." (Gul, 2007(p.44)). This is of course a hindrance to the collaborative mechanisms that we try to implement: "[…] because they [modeling tools] are used externally they cannot be combined with in-world collaboration and objects are not designed in-situ."(p.170) It is made clear that for the sake of the "consequential communication" that is most vital for our conception of virtual collaboration, no third-party design tool should be allowed and that we must stick with a library that is both furnished and simple to avoid the aforementioned issues.

The skill factor plays a major role in the success of virtual design. Where some state the need for "support sessions which provide basic skills and knowledge of using these applications and tools" (Gul et al., 2007(p.47-48)), and "It is very important to provide adequate tutorial

sessions to teach variety of the design features of the CVEs." (Gul, 2011), another school of thought states that "3D virtual worlds allow learning by 'doing' and experimenting." (Gu et al., 2007(p.47)) and that the virtual world itself should "include them as 'in-world' features forming an integral part of the learning environment." (Gu et al., 2007(p.47)). Anticipating the next sub-chapter, we will see how the studies on virtual gaming inform us that the latter point of view is the most pertinent, how

to reconcile with the skill obstacle, and how the process of learning skill, but also knowledge is intimately tied to the mechanisms of motivation.



An early personal attempt at implementing a design tool in the virtual: the ball gun.

3.2. Design through Play

As we saw, our design objective, which can be seen as the generation of a community-based innovation contest in a virtual online environment, relates back to the field of ludology in two ways. Firstly, there is an obvious correlation between competition and the mechanisms of Play at the macro level. This is shown by Hutter et al. (2011) always placing communitition within the context of a tournament, or Brandenburger and Nalebuff (1996) making an extensive use of Game Theory to explain their idea of co-opetition, resting on the notions of players, rules and strategies to explain their business model.

Secondly, "contemporary virtual game worlds are the precursors to online communities that will become increasingly important in the future." (Latowska and Hunter, 2003(p.71)). The Game dimension, in its mechanisms of Play, brings a new depth to Collective Intelligence. Merrick and Gu (2011) argue that "there is a mapping between [gaming concepts]

and the requirements to achieve collective intelligence in design"(p.1) . Castranova (2008) hasn't waited to conduct large scale studies concerning his own field in these worlds, concluding that "There are major methodological advantages to addressing macro-scale social science questions using virtual world petri dishes"(p.15) .

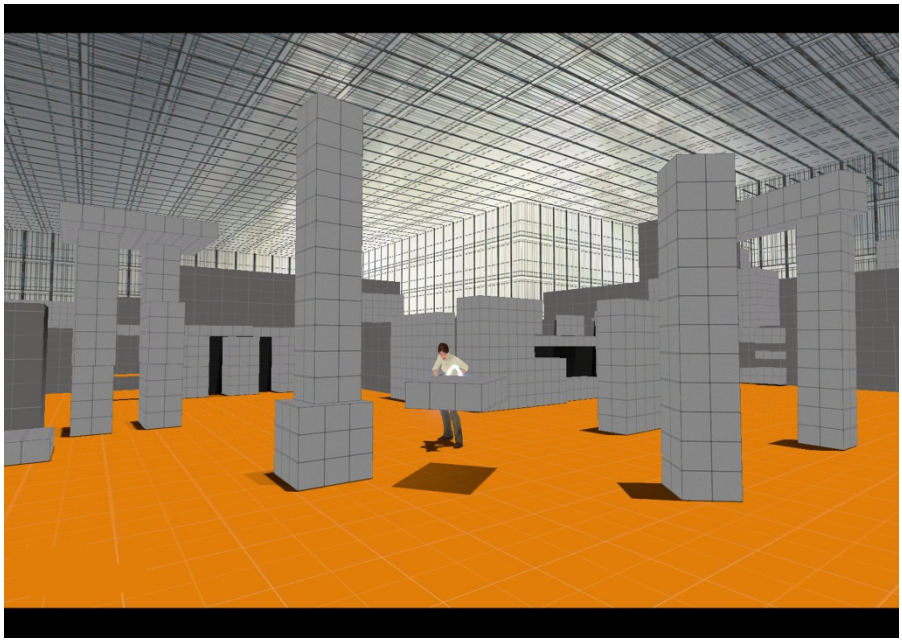
Finally, at the personal level, our bringing the design event into a videogame engine implies considering many aspects of the design process as game elements, whether it be in terms of gameplay, spatial representation, or problem solving. The Virtual has always been a place of make-believe which has been logically been taken over by the gaming industry and much work has been produced around the social and psychological aspect of online gaming communities. Ignoring this body of research would indeed be detrimental to this study. Therefore, to inform this design, it is relevant to step in this field to explore the concepts of Play related to both virtual environments and big scale online communities. Will also be outlined the existing attempts to integrate Play in the design process.

3.2.1. Play and Outplay

The design tool that we are about to implement in fact falls into the category of a game. According to Ren Reynolds (2011), "Play is the recognized, negotiated, process of a purposeful shift in the dominant meaning; and contextual attribution of value, of acts. Games are normative forms of play." Against this fairly recent definition of a game we can put this one: " A game is a semi-bounded and socially legitimate domain of contrived contingency that generates interpretable outcomes." (Malaby, 2007(p.96)). Without dragging on to endless game theory discussions, we can draw from these definitions that a game, in fact is about generating disorder and attributing meaning to it. Furthermore, "[…] games are grounded in (and constituted by) human practice, and are therefore always in the process of becoming. […] games are moving targets, capable of generating new, emergent effects which then inform the following instances of the game." (Malaby, 2007(p.96)) This assumption is undoubtedly made live by the blossoming of online games, which do adapt to the expectations of their players based on the extensive analysis of the existing state.

Seeing the game as an ever-changing cultural artifact reinforces our idea of embedding our generative process into one. Yet we must not forget

that the essence of a game is to produce fun among its players, and design isn't about fun. However, Totten (2009), referencing Don Norman, relates "how designers and problem solvers think in a more 'out of the box' way in an environment that makes them happy." Behind this bland statement though, lies the idea that "the combination of the breadth first thinking created by gaming and the focusing nature of rules creates a design method that allows for controlled 'out of the box' thinking, which […] results in quick and clever decisions on the part of the players/designers." (Totten, 2009).



Banzigan, an early attempt at bringing the design event into a one versus one game.

Several attempts have already been made to merge Gaming and Design. From early attempts with "board games" as a structure for collaboration (Frost and Warren, 2000) to the use of a CI for Design based on game elements (Merrick and Gu, 2011), it has been established that embedding the design event into a game improves collaboration and problem-solving. For example, the χ-house game developed by Carrara and Fioravanti (2007) that can be seen as a simple model of the building process in its legal and technical aspects is considered by its creators as a "useful 'design training tool'"(p.1) . Brown and Berridge (2001) made no less than three games reflecting upon the ideas of collaboration and visualization; here as well, the gaming component proves itself successful at

fostering collaboration through a common understanding of the rules of the game.

Going to the next level, Collective Intelligence has been related back to gaming by the works of McGonigal (2007) and Merrick and Gu (2011). McGonigal (2007) works aim at fostering the exceptional qualities of a community of gamers in terms of task-defining, problem solving and purposeful (as in game-related) communicating, in order to solve a complex puzzle. More specifically, the crowd had to organize itself into different task forces to aboard the problem from different angles; this differentiation is seen by the author as an invitation to innovation, for the greater good. Merrick and Gu (2011) see in Lego Universe, an open-ended design tool an appropriate framework if not the only one, to activate CI, since they have "the potential to fulfill the design representation, communication, and educational requirements of collective intelligence applications."(p.14) Furthermore, they salute the existence of a game theme, which is "both motivating and relevant to a wide range of real-world design tasks. The game theme will influence the manner in which design tasks are presented in quest/reward chains, and how they are motivating to participants."

And this is where our analysis of games is leading us: The definition and exploitation of a unique quality of gaming that is to offer a problem-solving cycle which is rewarding, motivating and enriching. I will attempt to grasp this concept in the next part.

3.2.2. Solving problems

As seen, a player finds satisfaction in beating the game. He achieves it through the development of his own skills and knowledge, under the condition that his motivation is continually stimulated. When it comes to the Virtual, this dimension of engagement from the player is indeed highly correlated with the good design of a game from the first approach, in terms of creating a compelling experience. As opposed to other Virtual Realities, a videogame is more favorable to bring its player in a state of advanced immersion, where we observe "a decreased awareness of the real world and a high sense of involvement in the game world." (Jennett et al., 2008). Moreover, "immersion might be one of the most important aspects to be

considered in the design of learning and training environments for visual-spatial cognition." (Kozhevnikov and Garcia, 2011(p.24)). Jennett et al. (2008) state that "players willingly subject themselves to the rules because rules are what make a game enjoyable". Thus, "the rules of interaction often become fully internalized to the extent that the controls are made to seem transparent."

A player's involvement is but the expression of the desire to successfully negotiate the consequences of his actions: "The investment of player effort tends to lead to an attachment of the player to the outcome since the investment of energy into the game makes the player (partly) responsible for the outcome." (Juul, 2003, p.1). Therefore, a game must offer "goals that the user must meet [in order to] enter the magic circle." "{A magic circle] is a finite space with infinite possibility where the learner is able to suspend all disbelief." (Paras and Bizzocchi, 2005, p.5).

Jorgensen (2003) enriches the magic circle concept through the concept of a pair "aporia-epiphany", which is in essence why the player engages in the problem solving process. "[…] often the epiphany is obvious while it is hard to find out how to execute it."(p.3) We can see a model developing: a player, first hooked by his own curiosity, starts putting effort into learning the rules and experimenting them, to progressively gain control over his actions. He can then beat the offered challenges, consequently granting them with another skill or knowledge asset, that he may use to solve the next challenge. It is then the spacing between the epiphanies, either the ones offered by the game (rewards), or experienced by the player through his personal cycle, that makes the playing "an endogenous learning experience that is intrinsically motivating." (Paras and Bizzocchi, 2005, p.1). But that "learning is not fully realized unless the player reflects on the events that took place during the game experience." (Paras and Bizzochi, 2005, p.6). As to say the rhythm imposed to epiphanies also indicates the moments when one is invited to, or forced to reflect upon his own experience.

The works of Liang and Chang (2006), aiming at testing a modest design process within a videogame framework, validated the idea that "players could be satisfied emotionally by establishing and solving a goal in a personal manner."(p.5) What they ultimately unravel is that the player's pleasure (and therefore the motivation to spend more time playing) comes as much from the problem-solving as the problem-making process. And the problem-making is itself an educated (experience) yet intuitive (experimentation) mental procedure of organizing one's resources into an idea on how to get to the solution, in other terms, a strategy. Chang (2004), considering that "The design process is a puzzle-solving

process."(p.293), related the game-like problem management back to the design process. He vouches for the use of "the 'playing' characteristics to amplify and explore the learning process, furthermore the learning process. […] Puzzle making and puzzle solving provides an incremental exploration mechanism that is more intuitive for design learning" because design puzzles actually support "the self-constructing pattern of design". According to him, this necessitates rules that are simple, and the goal simply defined. This goes very well along the way of Nolan Brushnell's arch-famous quote: "All the best games are easy to learn and difficult to master. They should reward the first quarter and the hundredth." (Brushnell, 1971). However, against this valid design advice, we must remember that "games are not committed about anything or to achieve anything but can be designed for optimum experience." (Juul, 2009, p5). In our case, we must keep in mind that however amusing it is to grasp the fundamentals of our game and produce for the first time decent iterations or beat the best designs with long-learned mastery, our game is admittedly relying on this to make the design event attractive, but its ultimate goal is to generate innovative design.

How are we implement such a game, that, compelling at first sight, drives the player into several levels of aporia-epiphany cycles, that drive him to refine his skills, expand his knowledge, and always push further, aiming for innovative solutions, but most of all inventing innovative problems? And how can our game, beyond rewarding the individual, translate one's experience into useful information for the rest of the community, as to say seeing in each other's design iterations not only technical or architectural solutions, but also the intentions, the aspirations, the ambitions one has put into his design?

3.3. Informing the research question: design decisions

Prior to exposing the specificities of the gameplay, we must report on the background work that has been effectuated to comply with the technical requirements needed for a functioning multiuser virtual world,

such as interface and communication, and to validate design choices in terms of environment and rules of interaction.

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 I applied their methodology 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, fame, availability of resources. The Source Engine will be ultimately selected. Popularized by Half Life 2 (2004), it was already present in the 2005 study. Here is why:

- It is a powerful engine, very optimized, thus not demanding much computational power, and facilitating the fluidity of multiplayer sessions. Coupled with today's powerful machines, this makes us significantly less exposed to recurrent technical issues.
- It has a physics engine that has been and is to a certain extend still the reference today. This allows for an improved immersive gameplay, making up for the engine's limited graphics compared to today's very photorealistic engines.
- The multiplayer network, through Steam, its dedicated entertainment platform, is a world reference for its easiness of implementation, the gratuity of hosting online servers, the possibility of hosting Local Area Network (LAN).
- It is widely known in the modding world (to "mod" is to modify an existing game, effectively creating a "mod" of it). It means that there is a broad and active online community who have shared the fruits of their efforts for the last eight years to a point where the amount of produced knowledge is overwhelming
- It has been the reference in the First Person Shooter (FPS) genre, and this ever since Half Life (1998). The Half Life Series have established the canons of first person immersion and interaction. For the purpose of our study, we can conclude that both beginners and experimented users will have an easier time learning and mastering the gameplay mechanics

Being commonly called "the best game ever", Half Life 2, through its Source engine, "tapped into the essence of the gaming community, encouraging direct creative input" (Hodgson, 2003, p.4). The specific sub-framework on which I intend to base my study is that of Garry's mod

(2004) with released its tenth version in October 2012, reactivating the excitement of the modding community. Garry's mod is indeed a mod of Half Life, and essentially facilitates further modding through more user-friendly means than the raw coding of the early days. In other terms, this mod gives the opportunity to design the environment and the rules of a desired shared environment from within the game. This includes but is not limited to generating complex models and modifying their attributes, and setting up complex triggers. Combined with the scripting component and the traditional map/object design tools that Source offer, Garry's mod proves to be a flexible and efficient tool to quickly design immersive and responsive virtual environments.

In this section will be discussed the means of interaction that will be given to the users of the full study. Here is just displayed the results of a personal exploration; justifying these design choices and their implications on the user design process will be discussed later.

Diving into one of Garry's mod maps, one's avatar is human-shaped. He can not only walk, jump, crouch, strafe sideways, and even fly. In this supposedly inviting, visually pleasing and rich environment, representing the Serpentine Pavilion and its gardened surroundings, one is enthusiast about wandering around the trees, listen to the birds sing at the sun setting, or observing the dance of the clouds. When his contemplative lust is fulfilled, and an idea of place is born in his mind, he may begin to consider the design problem.

The player is given a wide range of tools at his disposition to manipulate complex objects, themselves subject to a mathematical model of Earth gravity induced by the physics engine. An exhaustive list of such tools would be both interminable and irrelevant. However, I may explicate a purposeful selection of the ones that are kept for the study.

- Gravity gun: the main tool. Allows grabbing, moving, rotating any object at any distance and in any direction, in order to be either laid down and become subject to its own weight again, or frozen in its current state, to be repicked at any time.
- Weld tool: creates a constraint between two objects (or an object and the environment) that then cannot move in relationship to the other. Basically, it welds two objects together at a point determined by the player
- 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 object. The player may switch views between his avatar's eyes to the camera at any time, or display the reduced view of the camera on his Heads Up Display (HUD).

- 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.

Note that any tool can be modified to have personal attributes: the camera field of view, the elasticity and length of the rope or the resistance of a welding. The use of these tools, in conjunction with the ease of movement and the precision of a mouse, grant a great flexibility and precision in the manipulation of objects, while opening ways for highly complex outcomes.

A player reviewing his creation from within the game, tool gun at hand.

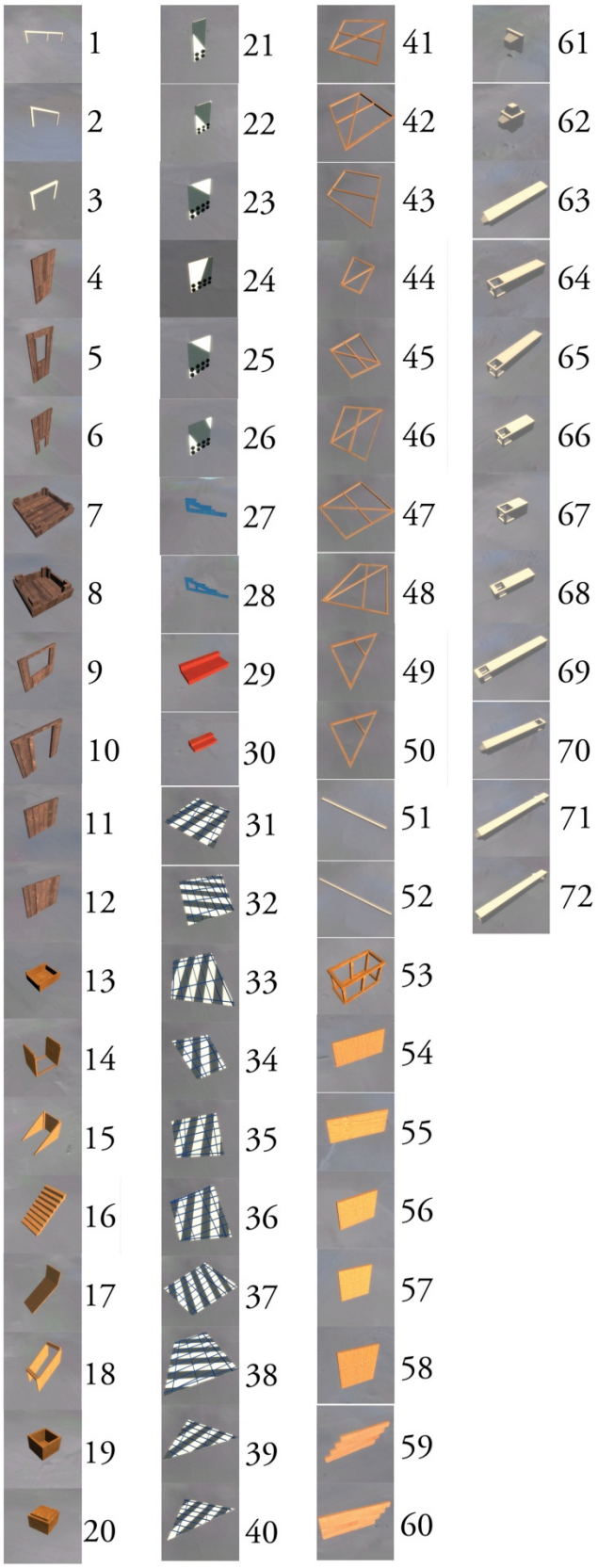
The player's objective is to make the best use of these tools to manipulate and organize the building parts that are available to him in order to comply with the above-cited scoring rules, and to his first design ambitions. This set of tools is precisely chosen to be concise (4 building tools), understandable at first use, and metaphorically coherent within the register of building tools. The "hook" is in place: a compelling world, easy to enter and inhabit, full of exciting toys.

The breadth of the experimenting-learning process really debuts with the attempt to use different tools together, on parts of different attributes. It is then made clear that the endless possibilities of parts assemblies and

building techniques leave room for emergence. The requirements for an interactive tool that allows for a personal setting of the goals and challenge in conjunction with the external rewarding system (competitive rules) are made.

Then, a player may inform himself on detailing tricks used by the others via the webpage, get inspiration from the existing spatial statements, refine his own techniques, push the limits of a tool or a part, and hopefully produce a compelling piece of architecture, that may differentiate itself from the others either by the substantial amount of points granted, or by the contribution of an original combination of parts, or even an unsought use of the terrain features.

After seeing how the competitive rules enhance the design process, and how the game rules facilitate it, both layers of rules spurring interest and motivation, it is left to aboard the question of the kit of parts: already in charge of carrying the metaphor of the built to the very end, it will have to be designed in coherence with the tools offered (the rules of interaction) and favor emergence by their simplicity, yet their substantial number of potential uses.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4. Flat-pack Pavilion

In this section we explore the reasons behind the choice of the Serpentine Gallery and especially Gehry's pavilion as foundations for our experiment. We will furthermore detail the design process that gave birth to the kit of parts, and report on the first use of it through a participant observer study.

4.1. A Story of the Serpentine Gallery

The successful settlement of a player in the virtual, as seen, depends on the efficiency of the process of immersion to support the problem-solving cycle. Thus, the choice of a good narrative or plot is not to be taken lightly, since it will serve as the very first step to immersion, happening even before the virtual event. Furthermore, for the sake of consistency, it will have to conduct the design of the spatial metaphor. The Serpentine Gallery annual pavilion cycle has been chosen primarily for its legible competitive implications, as explained hereabove. But this narrative also justifies many design choices in terms of gameplay and environment, helping to "make the illusion playable." (Aarseth, 2007, p.47).

We could first evoke the quaint atmosphere of a park, which can be a leading theme for the design of a peaceful place perfect for long reflexive wandering. The park is also mostly composed of flat areas; they are a suitable canvas to the design activity for on-the-side sketching. The site, clearly marked, stands out visually. Flanking it, is the Pavilion. The pavilion itself the centerpiece, facilitating way finding. It is modeled after the real pavilion with a level of detail sufficient for worthy close-ups, yet consistent with the low level of detailing of the kit of parts. The pavilion serves also as an entrance point, pacing down the discovery of the whole map.

Also, we can suppose that the Serpentine Gallery is in the collective culture a place constantly changing; the Serpentine is strongly associated with the ephemeral iterations of pavilions it welcomes. This may actually help the exploring designer begin his creative thinking more assertively, since it is of common knowledge that this place has been used for an iterative process in the physical realm.

We have here a narrative that is consistent with both the rules and the environment, therefore strengthening the metaphor. The metaphor then extends itself through the kit of parts. In the following paragraphs, we

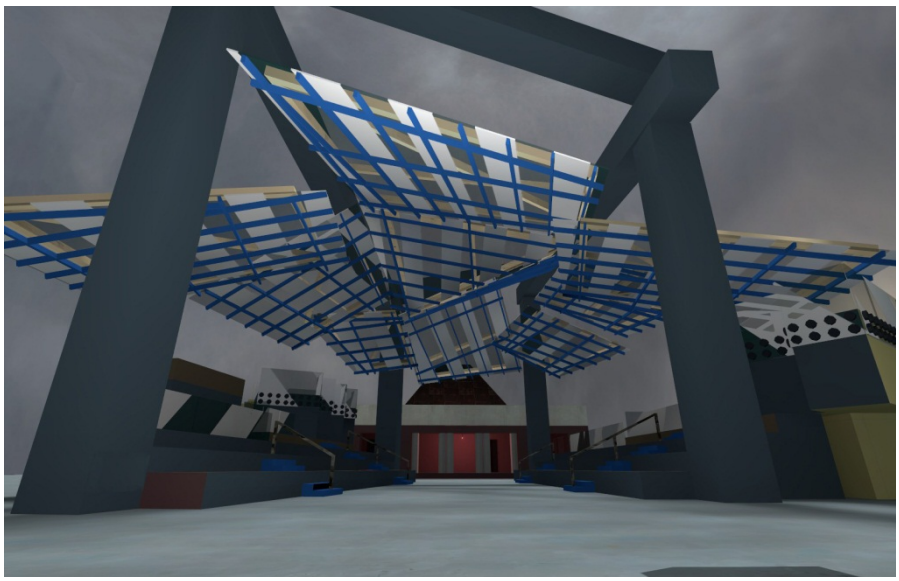
will define the bill of specifications this kit of parts has to comply with and why. We will then test the proposed design with a participant observer study and discuss on the eventual appearance of an inherent typology.

4.1.1. Reverse engineering of Gehry's pavilion

For the design of the kit of parts, the choice of deconstructing a former pavilion to extract the parts offered many advantages: stay in continuity with the narrative by offering to build from a previous iteration, tickle the competitive facette of the player (imagining beating a famous designer at his own game), and stick to existing physical elements.

The Gehry 2008 Pavilion was then chosen for its unique features. Gehry (2008) comments: "The Pavilion is designed as a wooden timber structure that acts as an urban street running from the park to the existing gallery". "Inside the pavilion, glass canopies are hung from the wooden structure to protect the interior from wind and rain and provide shade during sunny days. The pavilion is much like an amphitheatre, designed to serve as a place for live events, music, performance, discussion and debate." (Williams, 2008, p.1). This pavilion indeed complies with the programmatic requirements and would score in a very balanced manner under the quantitative assessment, making it a pertinent "initial iteration". But it is it in the legibility of the structure that this pavilion becomes useful. First, the dimensions of the monumental canopy structure and the orthogonal shapes that surround it , and their repetitive use, are in concordance with a low level of detailing, making the volumes easy to perceive. In conjunction with its modest material palette, namely glass, metal and timber, respectively textured the same way, and its modular cladding, the Gehry Pavilion succeeds at being a building that is easy to understand, mentally deconstruct, and effectively reverse engineer.

Using Source's modeling software Hammer, Gehry's 2008 Serpentine pavilion has been modeled on site, and then split into parts. We report on the shape of our slices in the next section.



Gehry's pavilion modeled in Hammer.

4.1.2. Bits and Pieces

Gehry's building was fully disassembled into 441 pieces of 72 different shapes. This is of course very far from the actual count of pieces constituting Gehry's pavilion; we have to keep in mind that most small pieces (bolts, screws, joints and so on) are in fact represented through the use of the tools and thus are not modeled. The design of these pieces had to comply with several requirements.

First, the parts need to be representing an architectural element that one can name simply ("big board", "stair pod", "hand rail") and this to facilitate the recognition and memorization of the set. Also, the parts are not the individual components but rather assemblies. They have to be unique in the idea that each piece would display a special feature that may or may not lead to a specific use. Although the objective here is to deliver relatively simple shapes, there is no point in designing a set of parallelepipeds of various dimensions. This means that it has been a conscious process to grant different attributes to all pieces for each of them to keep the potential of being exclusive to a design solution: they need to be both efficient and constraining depending on the relative value attributed by the player to the piece, seeing length, or transparence, as either a strength or a weakness. The player is then confronted to a veritable design choice, favoring a solution to another, and progressively restricting his options. On the other hand, the parts must not go over a certain level

of complexity, which may reduce their use to a very limited set of structural problems, or esthetically overcharge the design of its too recognizable form.

Furthermore, the pieces are dimensioned and shaped for a facilitated manipulation. Although there are sets of very large parts, their lack in manageability is counterweighted by their ergonomy. Moreover, some minor changes in dimensions have been effectuated to standardize lengths and thicknesses. This is because of both software limitations, and to further enhance synergy between parts and favor a more mixed use.

The parts cannot be modified in game by any means. Apart from the weight calculated from the density of their respective material have no other attributes: they do not bend, they do not break. Thus, there is no correlation between a piece's primordial use in the Gehry version and the roles it may fulfill in future iterations. For their versatility they can then be seen as the abstract geometrical shapes they are.

The full set of pieces as exposed in the appendix (4) can be classified into several sub-sets, sharing similar qualities. We will here describe how they have been designed by a deconstructivist approach applied to the Gehry Pavilion. All parts will be mentioned by their relative number on the reference sheet. Before detailing each sub set, we must expose some general design guidelines that were applied to the whole set of parts.

All pieces extracted from the original design respect a minimal size. Anything smaller is considered a detail and will not show. It implies that a significant part of the detailing is lost in this simplification, yet when the detail is a strong part of the element, the detail will be modeled on the element. An example of this principle is in the glazed handrails (21-26): The chromed pins at their bottom, if modeled individually, would increase the total number of pieces with no purpose, and provide the users with pieces hard to manipulate and seemingly destined to aesthetic purposes only. Therefore, these pins are modeled on the glass panels instead,

The thicknesses of all flat elements have been standardized one unique dimension, and sometimes its double. This means that the modular elements related to these flat parts, such as piece 53, have their dimensions tweaked accordingly. By the same principle, when two parts are meant to have matching dimensions, such as the stairs (16) matching their base pod (18), but do not in the original design (where a 2 inch difference is made for assembly purposes), these dimensions are then harmonized.

The texturing, although globally in accordance with the materials nature, is issued from a texture palette, crafted with the aim of differentiating each part from the other through contrasting tones and colors. However, the main visual features of the Gehry elements have been

expressed in the texturing, namely the striped pattern on the glazed elements, and the timber patterns on the pillars.

Keeping these guidelines in mind, here is how the sub sets have been thought through.

The gigantic pillars, most notable feature of the Gehry design, are materialized by the parts 59 to 72. The four pillars have been cut down in half to generate a set of 4 identical bases (63), with four heads of various sizes (64-67). Identically, the four beams sitting on top of these pillars have been cut down to retain two sets of identical bases (70, 71) with two sets of varying heads (68, 69 and 72). The original plating system binding pillars and beams together has been simplified to a plug system placed at each end of the elements, either male or female. To complement this, and to allow for more versatility in the usage of this system, end caps (61) and additional intermediary male parts (62) have been added. The cladding covering the entire surface of the elements has been stripped off into a large number of boards (59, 60) that respect the original pattern of boards in staggered rows. Thus these boards differentiate themselves from the other, squarer boards, by their unusual shape.

The kit of parts as it appears in the virtual environment.

The roof structure has been naturally split into ten groups comprising the glass panels and their aluminum frame (31-40) and the steel structure they are attached to (41-50). These parts are the largest in the pool, and are the ones displaying the most visual similarities to Gehry's design. Being but wide flat quadrilaterals of various shapes, it was

predictable that they would be used in many designs as they are the easiest option to quickly achieve wide floor surfaces, roofs or wall panels. Here, this versatility had to be broken down by merging the glass panels with their aluminum grid, to limit the options given by the otherwise flatness of both sides.

The large number of steel profiles linking the glass roofs to the pillar structure has been simplified, to only retain two sizes of beams (51, 52) while retaining the same order of magnitude in the numbers (36 beams). This standardization, here, carries the objective of preventing unnecessary confusing scenarios of users not noticing slight differences in lengths.

The two sheds flanking the Gehry Pavilion, of which one is hosting an elevator, have been cut in five pieces each, four walls and a roof (4-11). Where the walls simply retain their respective openings, either doors or windows, they are left as empty frames, again to keep options open in regards to using the openings in any way. The roofs (7, 8) display erected flaps, destined to be used as anchor points for either the original walls, or any other piece; the intent being to make these two pieces appropriate starting points for complex assemblies.

Next to these two sheds and overlooking the center are two pods. Originally, they are wooden frames cladded with wood panels. These are represented by a modular frame box (53) and its panels of various sizes (54-58) that fit in between the frames. This way, these frames can be cladded back to simple cubes if desired, but also serve as a less massive option for structural use. Some dimensions of the boards (either length or height) are also matching other pieces' dimensions, for a more extensive use across the field.

There are two pairs of flight of stairs serving leading to the aforementioned pods. Although slightly different, they have been simplified to become two identical kits comprising the bottom flight (15, 16), an intermediary landing (13, 14) and top flight (16-18). Where everything works in pairs here, the four flights of stairs are identical. In this sub-set, much attention has been given to give to the pieces several tenon and mortise joinery types of details that allow for an easy assembly of sturdy stairs but do not constrict the pieces to this usage, as the same flap dimensions can be found elsewhere.

The glass handrails (21-26) come in the same number and variety of shapes as they exist in the initial design. However, their unique individual pattern has been simplified down to five sets of different textures.

The seat row structure is materialized by the pieces 27 to 30, with the handrails 1 to 3. Where the frames (27, 28) are very close to the original design, the actual seats (29) have been thickened up significantly. The

result is an L-shape block exactly thrice as thick than deep. The reasoning behind that extreme redimensioning lies behind the fact that this piece is the most represented non-flat element (56 units): foreseeing an extensive usage of these for many purposes, they had to be shaped for versatility beyond the simple cladding usage. Thus the thickening vouches for easier seat-to-seat assemblies as well as easier vertical configurations. It is to note that these pieces, despite the changes retain their archetypal step quality.

To conclude on that matter, we must remark that slightly different design approaches have been made for the different sub-sets. It has to do with the various natures of each sub-set, but most of all it reveals the exploratory aspect of the kit of parts, which is supposedly subject to improvements in the light of the upcoming waves of iterations. Be a piece not used at all, or another one used for only one purpose throughout the whole experiment, it would show a major flaw in the design intentions of the concerned piece, and provoke its reconsideration within the pool of parts.

In the next part the designer himself will have a first attempt at building his own pavilion, and draw the first impressions on the usage of the tools and the kit of parts.

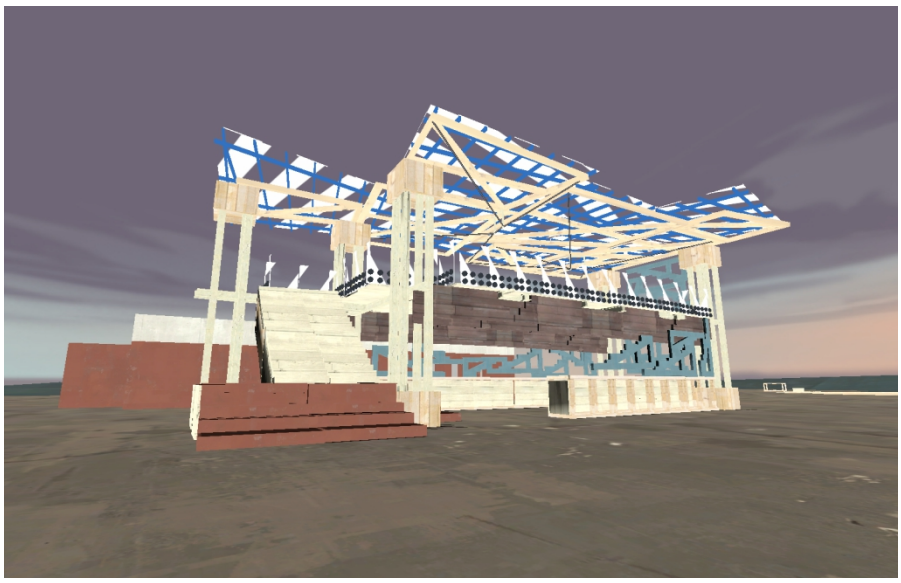
4.2. Participant observer study

4.2.1. Report

Jumping in the game in the fashion of a participant observer study, I have been able to reflect on my own design process and refine my expectations on the implications of the use of this specific kit of parts.

I produced a series of design iterations with a simple agenda that is to create a standing structure providing shelter (Appendix 1).

Executing the basic actions and knocking up primary assemblies as an early approach to discovering the tools and the parts seem to be a pleasurable introduction to the matter, where one learns by shaping his own primary problem solving mechanisms. However during that phase of approximately two hours, the architectural ambitions that arose while entering the environment and assessing the design possibilities are frustratingly carried out of reach.

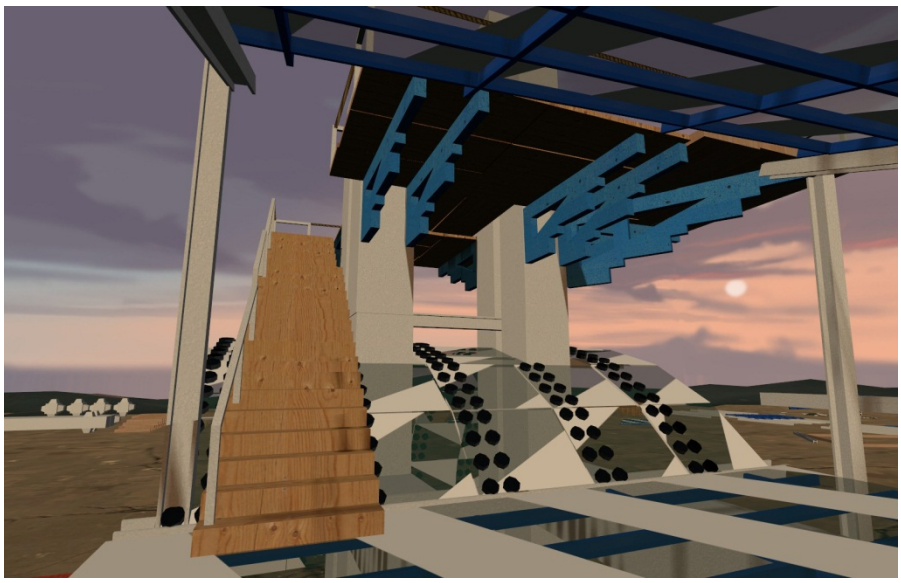


The first decent iteration. The pillars, copied and pasted several times, feature complex detailing

There are a lot of parts to consider when designing a detail, and trying out each potential one requires a lot of manipulations. Even with the help of the duplicating tool as a way to avoid tiresome repetitions of the same chains of actions, much time is dedicated to put together complex assemblages just to ponder on their usefulness. It is to say that during the early phase, although the mechanisms of skill improvement and knowledge building kick in from the very start, bringing the affiliated satisfaction, there is no acceleration in the workflow whatsoever. I was quickly able to reinsert the first design attempts into more skillful constructions, and expand from there, but even the simplest tasks, even mastered, couldn't be effectuated faster.

Yet after that first phase, I began to construct more elaborate structures. Limited by gravity, I had to build distinct parts aside of the main works in order to integrate them later, discovering an unsought dimension to this game: the necessity of organizing construction phases and the planning ahead it implies.

Ultimately, a decent 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 I can start anew, reusing groups of parts, building systems and procedures that I learnt on the way.



Another iteration. Attention has been put into the interior spaces.

4.3. Discussion

Where it would be pointless to report on the immersion aspect as I am the sole designer of the environment, this participant observer study allows us to comment on some of the positions taken on the game features.

Generally, the tool proves to be user-friendly and easy to domesticate, and manages to carry the player beyond the first contact, overcoming the first obstacle of reluctance. Then the player is actively willing to test the rules and establish the principles of his skill and knowledge learning procedure. Basing my auto analysis on the skill dichotomy enounced by Gu, Williams and Gul, (2007), as to say architecture-related skills, digital design skills and generic design skills (problem solving), I came to the following conclusions:

-the kit of parts fulfills both its roles of a limiting resource with constraining uses, and a motor for innovative use and reuse.

-the combination of an easy to use interface in combination with a difficult gameplay provides the illusion of a learning curve ambitious yet achievable

-the storage and access to the precedent iterations even on the personal level acts well as a repository for knowledge (on an individual level so far) and a foundation for erecting future designs

-seeing every micro problem solving processes as as many design puzzles that one challenges himself to solve, “enhances the potential of

design capability of an individual" (Chang, 2004), generates an understandable and satisfying aporia/epiphany cycle that promotes the alternation of acting and reflecting in a small timeframe, ultimately supporting the creation for the user of an endogenous motivation.

Reflecting on this participant observer study, we may see how the implementation of a full-scale study, including the competitive factor within this CVE can enhance even further the innovative process.

5. Pilot Study

A Pilot study has been undertaken in March 2013. It carries the objective of putting into application and assessing the validity of key elements of this design paradigm. It is far from the ideal of full-scale experiment involving thousands of users for over a year, and yet it may help paving the way to the implementation of such bigger structure.

The study carried over 12 days and gathered 6 participants, all design scholars. All design sessions were done under observation. A wiki was set up and made accessible online for all participants to comment and rate.

At the end of the study, a winner was declared, and participants were 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 communication.

5.1. Data gathering method

The study started on the 8th of March and lasted 12 days. During this time, eight sessions were organized, where six participants produced eight designs. The sessions lasted on average 2 hours and 5 minutes under constant observation by the examiner.

At the start, the subject is shown the webpage and is introduced to the objective of "beating Gehry at his own game" by designing as a group bound by a competitive mechanic. The program, quantitative rules and marking criteria are explained to the subjects as they appear on the webpage (Appendix 2). Then the subject is invited to review, comment and rate the existing submissions.

After this, the subject was introduced to the virtual environment. A five minute long oral explanation was made about how to use the controls and the tools. During the design session, questions about controls, hotkeys or rules were answered by the examiner. Once the subject was done, the design was quantitatively assessed and three screenshots were taken under three points of view, one of which being chosen by the subject. The submission was then uploaded. The subject was then invited again to review, comment and rate the existing submissions, as well as comment on his own if desired.

From this point onwards, the subject was able to access the webpage without restriction and this until the end of the study. At the end of the study, all participants partook in an anonymous survey.

The online content is embedded in a wiki (full transcript in Appendix 2 or http://opencommunitition.wikispaces.com). It comprises the following pages: home, rules, high scores, submissions. On the home page is explained the competitive framework. On the rules page, the quantitative and qualitative ratings are explained. On the high scores page, all projects are listed in chronological order. Are displayed their detailed quantitative and qualitative assessment and respective rank within the existing submissions, the dates of submission, the number of pieces used, the points per pieces ratio, the highest community ranking. On each submission page appears the same information that appears on the High Scores page for this project, with the addition of images and comments. There are three images: a Top view, identical for every submission, a corner view, chosen from 4 corner views by the examiner, and a perspective view, chosen by the author of the submission (if desired). The perspective view is taken from a gallery visitor's standpoint. Under the pictures is the comment section, where participants comment and rate as one post.

The design sessions took place in a Garry's mod map, as outlined above. Due to recent updates, some functionalities remained unavailable at the time of the study: only two tools were given, the welder and the gravity gun, there was no possibility to start from a previous design. Also, the point system was not embedded in the game, therefore the scoring did not happen in real time; the calculations were made by the examiner at the end of each session.

The six participants were all Architecture or Interior Architecture Masters under 40 years. Worth noticing is that within them, are present two confirmed gamers having a strong online activity, and two strangers to gaming, with a low online activity and low usage of the CAD tools in their job. Also, a seventh potential participant, Game Design Masters, left at the very beginning of a session, stating that she came to play a game, and not to design.

5.2. Findings

In the light of these observations, the analysis of the content produced by the community and the questionnaire (Appendix 6), primary findings can be emitted in regards to our three areas of focus: the online platform, the design tool and the architectures produced. All data and statistics can be found in the appendix (3).

Generally speaking, all participants enjoyed submitting designs over other activities, and they would pursue the study mostly to improve their designs. They have seen their design skills and knowledge moderately put to use. All participants agree to say that there has been a significant improvement in the quality of submissions over time. Complementing this with general observations about the enthusiasm witnessed during sessions, we can safely assume that the study was positively welcomed and raised the interest of all participants (except for the seventh).

The webpage was thoroughly analyzed. During the study, four participants submitted one design, two participants submitted two designs for a total 8 submissions, on which 22 comments were posted, of an average length of 45 words. 15 comments were made during a session and 19 comments accompanied a mark (see all comments in Appendix 5).

Participants were mostly curious about the new submissions, and preferred submitting designs over any over activity. Overall, participants are slightly more interested by the visual content than by the comments and ratings. They mostly consider that the other designs helped them improve the quality of their submissions over other comments, and none would be strongly influenced by quantitative ratings, qualitative ratings or comments when it comes to marking. Considering this and the observations made when a participant was reviewing the content online, we can say that the visual content *per se* was the preponderant center of interest, regardless of its attached ratings or comments.

When it comes to the quantitative assessment, four participants did not take it into consideration either when designing or rating. Two participants found it moderately useful for rating, and were concerned about it when designing, yet along with the qualitative assessment. Moreover, both ratings were deemed less useful to the participants than the images or the comments. We can conclude that the quantitative assessment was overall overlooked if not ignored by all participants.

All submissions were marked at least once, for an average of 2.4 marks per submission. The final grades range from 3.3/10 to 7.4/10. Most of the participants found the visual content sufficient to understand,

comment and rate the designs, yet most of the participants found it insufficient to examine the assemblies and details. As said earlier, none would be specifically influenced by either comments or quantitative rating or qualitative ratings when marking, if not influenced at all. However, there *is* a correlation between the quantitative and qualitative rating: the three median quantitative_mark/qualitative_mark ratios match the average ratio (by +-5%). Although it might be a major breakthrough in Robot Reviewers AI algorithms, we will disregard this finding as coincidental. Additionally, the final winner, with the highest qualitative rating, scored the smallest quantitative rating. Crossing these results with the ones just above, we can assume that participants' ratings were mostly exclusively driven by the images.

The competitive aspect can be observed through several informations: Half of the participants would pursue the study to try and win, amongst other things. This same half wants to see their designs rated at least better than most of the designs and is more concerned about scoring well in both the ratings. We can say that these three participants are motivated to win.

The collaborative aspect is also to consider: half of the participants would grant more value to a comment from someone generally well rated and who submits often or comments often, and would rather always comment and rate anonymously. The other half disregards the author of the comment yet would rather comment and rate anonymously sometimes. When we analyze the comments, we can see that most of them are structured with a concern for constructive feedback in the form of compliments, encouragements or suggestions. Overall, most of the comments are of cooperative nature. Eight of them contain critiques, negative questionings and feigned appreciations. These comments can be deemed of competitive nature. We shall precise that four of these comments are emitted by the same person.

On another note, almost all participants decided to comment under a pseudonym. Whether it is a conscious concern about privacy or a trend started by the first commentator cannot be decided.

Before we can categorize each participant as being competitor, cooperator, communititor or observer, guided by Hutter et Al.'s (2011) own analysis, we must precise that we will focus our analysis on the qualitative results rather than on quantitative results, considering the fact that very few results have been produced. Moreover, due to the limited

number of submissions for each participant, we can but extrapolate on their expressed desire to post better/more designs.

The six participants, considering their ambition to win, relationship with the content, nature and number of their comments, and less importantly their behavior during the sessions, can be categorized as follows:

-Participant 1 is a Competitor with highly competitive positions, few comments, shortest comments on average.
-Participant 2 is a Cooperator, with lowly competitive positions, positive comments, high interest in the content. Submitted two designs.
-Participant 3 is a Communititor, with highly competitive positions, high concern to score well in all ratings, many comments of both kinds.
-Participant 4 is a Cooperator, with the most comments, moderate competitive position.
-Participant 5 is a Competitor, with exclusively competitive comments, moderate competitive position, high concern to score well qualitatively. Submitted two designs.
-Participant 6 is an Observer, with all contributions low in quality or numbers, and moderate curiosity about content online

The design sessions teach us about the behaviors of these six participants. But before that, we must evaluate their relationship with the game as a design tool. Whereas two participants were new to First Person type controls, the others consider themselves at least comfortable with it. However, all participants agree to say that they grasped the basics of moving around and understanding the tools in less than 30 minutes. This correlates with the observations. All participants found both tools moderately useful and moderately easy to use, yet most of participants think they are not precise enough. Generally, participants have a poor opinion of their proficiency in using the tools, but half of the participants assume they could become very good at using the tools if granted two more hours of usage. On the other hand, all participants agree that the hindrances in the tools limit their quality in the submissions, and all participants consider the gameplay as the most limiting factor to creating compelling design.

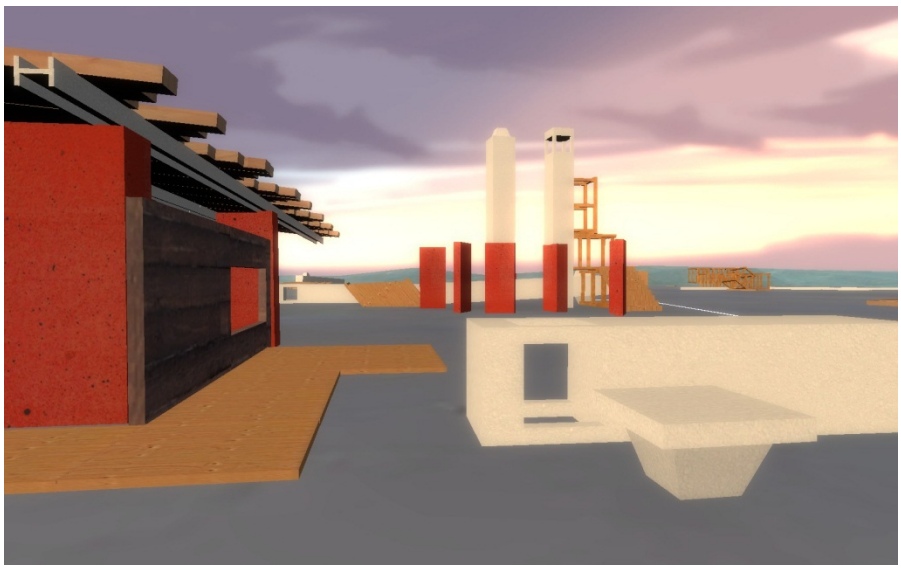
We can doubtlessly assume that the participants easily learned how to use the tools regardless of their background. From there, individual learning curves may take various tendencies, but again regardless of their

initial skills. Finally, we can say that participants see their design workflow and options limited because 1- they are not familiar with the gameplay enough (yet) and 2- the tools do not offer enough variety of usage.

Given that, let us look into the design sessions. The average session length is 2 hours and 5 minutes, with the shortest being 1h30min and the longest 3h15min. When presented the webpage at first, most participants would consult the previous submissions (if any) without necessarily looking at the comments or ratings, as outlined earlier. Only once, Participant 1 blatantly disregarded any type of content to start designing straight away. After the tutorial, when participants were given their freedom, most of them would look for inspiration by wandering around reviewing the parts. This inspiration phase lasted longer in the latter sessions, often punctuated by oral comments about previous designs' features. Participants 5 and 6 felt the need to sketch the premises of a spatial arrangement on a piece of paper. Then the stacking of parts starts.

Generally speaking, the first pieces placed influenced strongly the final design. Being uncomfortable with the tools at the start, participants would not bother removing placed parts, especially when being part of the main structures. However, later in the session, this behaviour wears off and participants are more willingly to restart or refine some assemblies. Participants 3 and 6 went through the displacement of the totality of their project, one for architectural concerns (orientation relative to the site), one to stay in the boundaries, both very fastidious procedures.

A corollary to this is the fact that some mistakes made by using the tools in the wrong manner were sometimes kept, either for their serendipitous value or out of laziness. Participants prone to this behavior logically were not concerned about precision. Participant 3 was rather concerned and would correct most of his mistakes. Participant 6 was very concerned and proves us with Submissions 3 and 8 that the tools can allow for very precise actions.

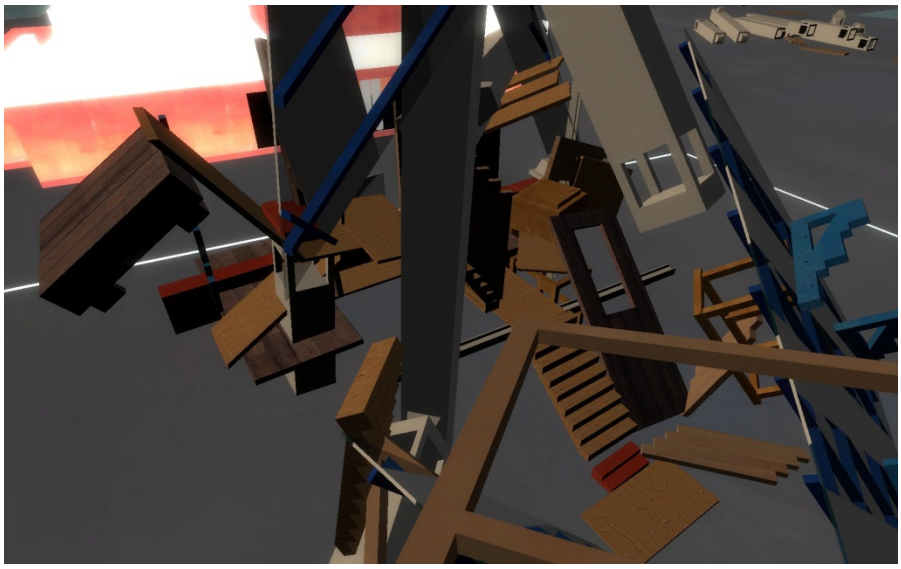


Submission 3's orthogonally precise roof tiles and deck.

When it comes to the parts, participants would, in equivalent measures, look for a part that fits their design objective or look for a design objective that fits a part. Without extrapolating too much on participants' design intentions, we can compare on this matter Submissions 3, 7 and 8. Submission 5 started with an ambition to do a multi-story, spiraled structure, as orally stated by its author at the beginning of the session. Upon discovery of the glass panels as a worthy solution, he would start favoring these parts for he was used to manipulating them, in other sections of his design, displaying hints of both behaviors. Submission 8 was designed under a different approach: Participant 1 started with a strong architectural objective, sketched on paper beforehand. All along the design, he would try out many different parts and pick the ones that he judges closest to his initial idea, often complaining about resorting to use a part that is not optimal. Submission 7 is the example of a very part-oriented design: Participant 1 at some point in the process would seemingly pick pieces at random and add them to his design in appropriate locations. He would sometimes throw pieces in the air and wait to see if they fall in a satisfactory position, and if so, keep these as they were. This is the most vibrant example of a design procedure that could only happen in this very environment.

Identically, participants would either experiment new techniques to reach a design objective or reuse techniques that match their tool skills. This can be identified as an experimentation-learning-application cycle. Generally, participants began by an experimentation-heavy phase in order

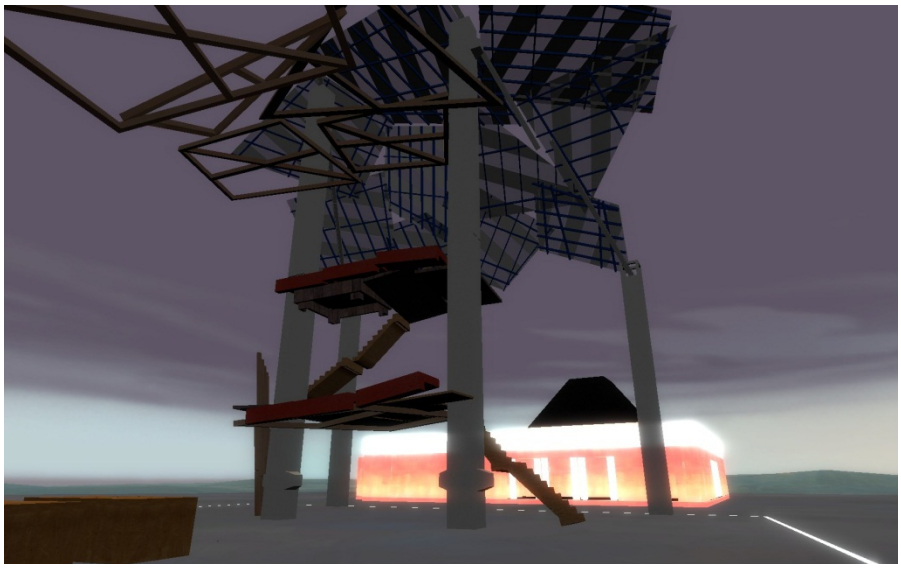
to settle on a range of techniques that they then reused thoroughly. Four participants assume having discovered "tricks" with the tools that allow them to either accelerate their workflow or achieve something otherwise unreachable. Three participants effectively demonstrated innovative uses of the tools or controls that were not known by the examiner.



Submission 7 has the highest ranking with the lowest score.

Most of the design process was effectuated while flying (avatar in no clip mode toggled). Most participants made extensive use of a top-down point of view to review their design in plan. At some point, all participants walked through their design (avatar in walking mode) and half of the participants were so concerned about the pathing (the fact that the avatar is able to walk through an itinerary) that they corrected their design to allow for a smoother visit. We can say that all participants used a combination of both modes to bring their design to completion.

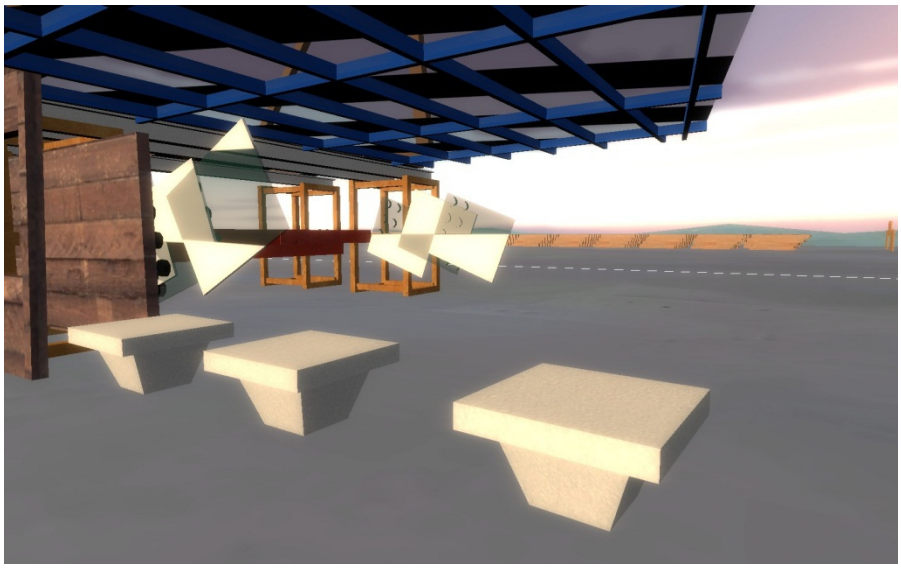
The impact of site and program can also be measured. Half of the participants admitted neglecting and/or focusing on a part of the program (café, stage or playground). As said earlier, little attention was given to the quantitative scoring when designing or rating. Additionally, even though most participants were satisfied by the visuals and graphics of the map, no participant felt like being at the Serpentine Pavilion in London. When looking at the submissions, five of them show a consideration to the site; for four of them, participants explicitly mentioned a site related design choice during the sessions. We can conclude that the digital site was generally not appreciated, yet it was taken into consideration by more than half of the participants for the design.



Submission 6 features a playground on top of the stage.

Analyzing the designs reveal the amount of ideas that transpired from submission to submission. Half of the participants admitted reusing features seen in other designs and two participants admitted reusing features that were present in their previous designs. Effectively, the only obvious thefts were done by participants 2 and 5, the only participants having submitted twice; their thefts concern each other's designs: Participant 2 stole from Participant 5 the café seats and the playground layout then adds a flag, Participant 5 creates a new playground and in turn adds the same flag. In fact, both participants' pairs of submissions (2, 4 and 3, 8) are extremely similar and the second one can be judged as a revised or refined version of the first submission. Other similarities between submissions can be found, but we lack elements to decide if it is conscious, unconscious or fortuitous. We can then state that participants rarely reuse features seen in previous designs, but that all second designs heavily reuse features of the first one.

The designs also teach us about the usage of the kit of parts. On average 58 parts out of 441 were used per design (a usage of 13%), and all types of parts have been used at least once. The most frequent pieces are the stairmodule_stairs (16) and bleachers_large (29), they have been used at least once in 7 designs out of 8. The least frequent piece is stairpillar_bottom (14), it has never been used. The most represented pieces are bleachers_large (29), the pillar family (63-72), the glass panels



The controversial café seats. Note the influence of textures in the arrangement of the glass panels.

family (31-40) the box cladding family (54-58). Most designs would include several pieces of these groups.

Most participants seem satisfied with the number and variety of pieces. Also, it is to note that 6 submissions are issued from a first session. We can observe that with the first iterations, where the number of pieces used is low there is a notable use of a diverse corpus of pieces in all submissions. The session observations teach us that during the first iterations when the tool is not mastered, participants would assemble fewer parts in a given time, but also try out as many parts as possible as part of a discovery process. We also outline that we cannot conclude on a supposed variation in the number of pieces used over time.

The modular aspect of some parts has rarely been used. The stairs modules, the sheds and the box modules (pieces 7-12, 13-20, 53-58) have never been assembled together in the expected way, not even once coincidentally. However, the pillars (parts 61-72) a set of pieces that is partially represented in all designs but X, have had their male-female ends exploited in X designs. We can safely assume that the modular aspect of the parts was neglected by all participants partly because such assemblies were deemed pointless in regards to the participants' design intentions, partly because the use of the tools, specifically the welder, rendered these modular features needless, as observed.

The raw data has been processed. It can be now confronted to our initial expectations, to confirm or infirm the success of communitition applied to design.

5.3. Conclusions

The study undertaken does not provide sufficient groundings for the advocacy of some of the hypotheses enounced at the start of this journey. First, the limited number of participants is far from being the critical mass necessary to evaluate the impact of Collective Intelligence. Secondly, the limited number of submissions does not allow any pertinent observation on the evolution of the online social habits, the design protocols and the competitive framework. In short, it is made impossible to know if it pays to be a communititive designer. Nonetheless, the impact of a virtual design tool, of an online platform, and of a competitive framework can be assessed with the objective of informing the execution of a future study with extended features. Truly, this study carries the objective of assessing the well-functioning of a protocol that could be applied to a bigger scale.

The virtual design tool is first to be analyzed. Its objectives were to provide a compelling virtual experience, to reward the mastery of key skills and the usage of knowledge, and to encourage innovativeness. In terms of creating a compelling environment, and defining a sense of virtual place, this one failed. Yet it did not disturb participants who probably took this opportunity to interpret the site in their way. Besides, the real-time scoring, supposed extrinsic motivation emanating from the gameplay experience, was not implemented.

As said earlier, the tool however allows for learning through experimenting, and it is emotionally satisfying to do so. The gameplay was learned fast but mastered with difficulty by participants, but mistakes along the way were a big part of the entertainment. There has been one innovative use of the physics engine to directly influence the design by throwing parts in the air. Other than that it is safe to conclude that besides the very immersive, used and abused first-person view, the limitations and imprecisions that the game bring makes it not a valid design tool. Nonetheless, it proves much potential to be used as a sketching tool, and it is how it has been used by most of the participants.

It has been explained earlier in this thesis that people would find the reasons to collaborate when they are given the opportunity. In those terms, the web platform was successful at being the canvas for motivations to collaborate: the test subjects were more than acquaintances to each other at the start, and this platform was a pertinent support for their friendly exchanges about their common passion: architecture. This small group bounding as described by Hemetsberger (2001) is a source of social reward, therefore is an incentive to collaborate. Given that, the community functionalities in terms of facilitating exchanges and organizing knowledge, although relatively limited, proved themselves of appropriate scale for a crowd of this quality and quantity, as the findings revealed.

It has been seen earlier how Communitition, by bringing the competitive aspect in the collaborative process, could solve the motivation issue in the longer term, Achilles' heel of all CVEs. It has been made clear that the competitive framework worked as Hutter et Al. (2011) would have expected: a dynamic in which cooperators feed from the competitors, and vice versa. The Communititors, of course, get the best of both worlds. We cannot hide that motivation is difficult to evaluate when the number of submissions or comments per participant is basically driven by the number of sessions, yet the synergy between competitors and cooperators has been witnessed at many levels, from the competitor responding strongly to comments on his design to the frantic collaborator rating every design. It is to note that the participant qualified as a Communititor expressed much more interest and dedication throughout the study than anyone else.

The point system, however did not work as intended. The quantitative rating, supposed to bring an additional layer of motivation and a tool for informed evaluation, failed at both. Worse, it brought some perverted design choices: for the lack of an authentic design drive, some participants would resort to just score as many points as possible. An interpretation of this is that the qualitative assessment was too simplistic, therefore useless as an additional information about the design.

The qualitative rating, not as disregarded as the qualitative one, only caught the attention of the participants when in the form of a ranking. Most probably, there was not a critical mass of grades per submission, which lowered the weight of such score in a participant's personal judgment. This leads us to this crucial observation: what participants cared most about was to *make good architecture*. And neither a points system nor the opinion of five other persons is going to radically influence their methods of designing and judging (as seen earlier, only images mattered). The desire to win was present, but the battle took place beyond the level of the rankings and markings. Rather, what can be seen when looking at the

projects was a strong will of originality. Participants, when looking at others' designs, would only see what has already been done and is pointless doing again. Submissions 5 and 7 are the living example of this. Indeed, participants were strongly motivated to differentiate themselves from the other submissions and find a niche in which they are the best. From there, they started to refine this specific style. Within this precise community, it is this behavior that made each generation of designs, especially the earlier ones, very beneficial to the next wave of designers. Moreover, submitting innovative content becomes even more of a strategic competitive choice because it limits the opponents' options. Eventually, all options would be listed and participants would have no choice but refining the existing ones, but this is pure extrapolation.

For all of these points, Communitition, applied within the boundaries of this study, proved to be effective at spurring innovation amongst its participants, in an unexpected manner.

Enlarging the perspectives on a future study, it can be said that this one, as expected, paved the way to committing to the following improvements: there is enough information to undertake a redesign of the kit of parts according to the observed usage, and this with the aim to encourage emergence further. There is also sufficient data to commence a rewriting of the quantitative system, to both improve its usefulness to designers, and provide a better understanding of the designs to a supposed bigger crowd that does not necessarily include exclusively designers. Moreover, a more multi-faceted digital podium, rewarding a wider range of design behaviors, may enhance community specialization. Finally, although this is a whole different axis of research, the virtual design tool can be developed to bring novel design practices.

In conclusion, this study expanded the horizons of considering the Architect as creator and administrator of systems based on the inclusion of wider sources of knowledge and expertise, bound behind a communal structure, thus making the best of today's spirits and technologies.

6. Future work

In this thesis, I have reviewed the existing state of CVE's for design and its recent attempts at exploiting the phenomenon of Collective Intelligence. I advocated for the use of Communitition in CVE's as a driving force for a more efficient motivation and communication among the crowd of users. In the light of the research about online virtual gaming, we isolated the key components to a virtual representation suitable for the settlement of a Collective Intelligence applied to design driven by Communitition. The game and community functionalities were designed.

A Pilot study was undertaken. It demonstrated much potential on the use of videogame environments as more intuitive and instantaneous collaborative virtual environments, validate the current efforts towards the extended implementation of collaborative online review platforms, and open the way to considering collaborative CAAD based on communal competition as a way to spur innovation.

Further work may be undertaken around two axis of study: the development of more complex virtual tools that comprise extended architectural functionalities and a more in-depth discussion about the Architect becoming but the designer of more open systems that operate at the meta-level above the architectural object.

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Appendix

1. Website Transcript

2. High Scores and Statistics

3. Piece count and usage

4. Comments

5. Questionnaire

OpenCommunitition

1 alty | My Wikis | Help | Sign Out

Search

home

Edit 0 2 ...

Welcome to the Open communitition Wiki.

Open Communitition is a community project erected from a Master's Thesis started at the Victoria University of Wellington. Its aim is to testproof the concept of open communitition applied to design. Participants are invited to design their own Serpentine Pavilion based off Gehry's 2008 Pavilion, using a videogame environment as their sole design tool.

In this wiki, participants post their own designs and comment on each other's.
See the rules for more information about how to design and rate, and the high scores to see the current competitors in the lead.
Trawl through all the submissions to review designs and gather ideas.

Rules

Rules of Design

Competitors are invited to design a pavilion using GarrysMod, their skills and their knowledge.

They must build a design that comprises three elements of an arbitrery program: a cafe, a stage for small scale representations, and a children's playground.

Quantitative Scoring

The stage gets points by the area where the stage is visible from, as a simple model of the number of persons being able to enjoy the gig. These points per square meter are calculated proportionally to the proximity of the stage. Extra points are granted for the area that is sheltered. The café gets points by the number of tables installed. Tables get more points for shelter. In the game, an entity must represent the café booth. The playground gets points by the size of the dedicated area allocated to the kids. This area must be visible by at least one café table. Extra points are granted for the number of tables looking over the playground (This is to simulate the adults willing to watch over their kids while having a drink).

It is to note that a design must score a non-null number of points in each aspect of the program to be valid. Also, all aforementioned surfaces must be pathable and accessible.

Qualitative Scoring

Competitors are invited to rate eachother's projects according to three categories:
aesthetics: how much the building is compelling visually and dimensionally
technicity: how well the parts are used in a structural manner and innovative perspective
spaces: how pleasant it is to wander around it.
All ratings are out of 10. The reference point is the 2008 Gehry Pavilion being rated at an average of 5/10.
Competitors are invited to explain the motive of their rating by submitting a comment.

OpenCommunitition

High Scores

Author	Link	Date of Completion	Quantitative Score	Pieces Used	Points per pieces	Quantitative Rank	Aesthetics	Technicity	Spaces	Average	Qualtitative Rank	Highest rank
Tane Moleta	Submission 1	12/04/2013	25.3	44	0.57	7	5.8	5.8	4.8	5.4	**6**	1st (for 4 days)
Terese Fitzgerald	Submission 2	08/04/2013	46	52	0.89	1	6	6.3	6.3	6.2	**5**	1st (for 4 days)
Krishna Duddumpi	Submission 3	13/04/2013	32.2	80	0.40	6	7	8.3	7	7.4	**2**	1st(fror 8 days)
Terese Fitzgerald	Submission 4	16/04/2013	41	65	0.63	4	7.3	7.7	5.7	6.9	**4**	2nd
James	Submission 5	17/04/2013	39.2	29	1.35	5	3.5	5	4.5	4.3	**7**	5th
Jaden Cairncross	Submission 6	19/04/2013	43.4	69	0.63	3	7	7	8	7.3	**3**	3rd
Thomas Pye	Submission 7	19/04/2013	9.7	59	0.16	8	8	7	8	7.7	**1**	1st
Krishna Duddumpi	Submission 8	19/04/2013	44.6	65	0.69	2	7	9	6	7.3	**3**	3rd

OpenCommunitition

Search

Edit 0 14 ...

Submission 1

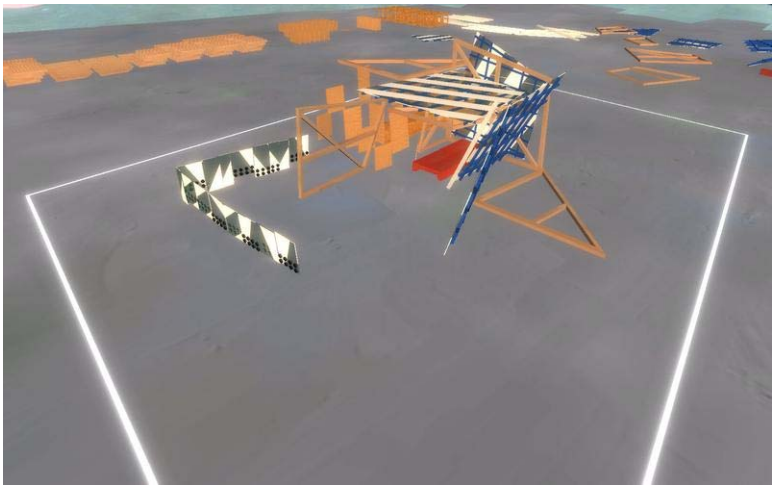
Author	Tane Moleta
Date of completion	08/04/2013
Number of parts used	44
Stage Score	9
Playground Score	8.8
Cafe Score	7.5
Total Score	25.3

Community Rating:

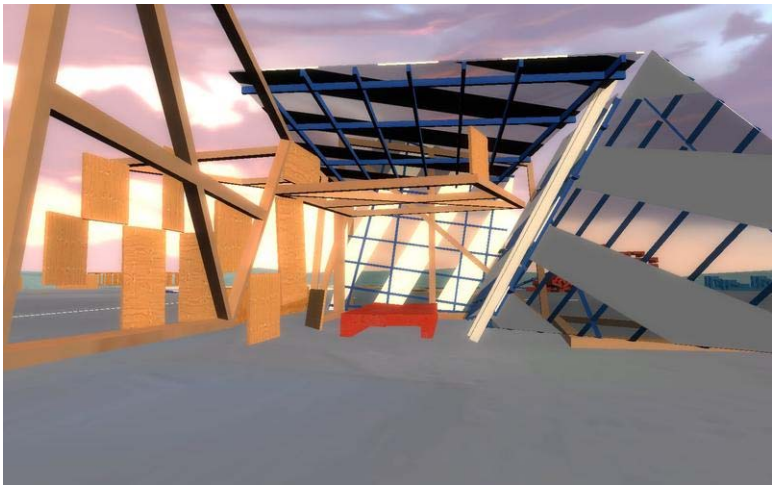
Aesthetics	5.3
Technicity	5
Spaces	5
Average	5.1

Competitors please comment and rate down below.

Top View



SW Corner View



Interior View

Comments and Ratings Section

Author: REX
Comment: I really like the stage/catwalk area, it's very exciting, but the other ones leave me guessing.
Aesthetics: 5/10
Technicity: 6/10
Spaces: 4/10

Author: Funky "Fresh"
Comment: Really interesting overall with dynamic geometry, I think the chekked arrangement of timber panels is nice (this idea will be stolen).
Unfortunately the arrangement of spaces isn't convincing i.e. have to walk though the playground to get to the cafe & stage.
The stage also feel very "trapped", is there an opportunity to open it up a bit more?
Aesthetics: 6/10
Technicity: 4/10
Spaces: 4/10

Author: Hitlad
Comment: I like the overall usage of space, particularly with the play area visible from both the cafe and stage but still allowing some separation between the cafe and stage
Aesthetics: 5/10
Technicity: 5/10
Spaces: 7/10

Author: J-Dizzle
Comment: Love the material transition from the steel and glass side of the stage to the timber toward the playground. Also, the mezzanine-type space above the stage provides a different persepective on the performers - nice.
Aesthetics: 7/10
Technicity: 8/10
Spaces: 4/10

OpenCommunitition

Submission 2

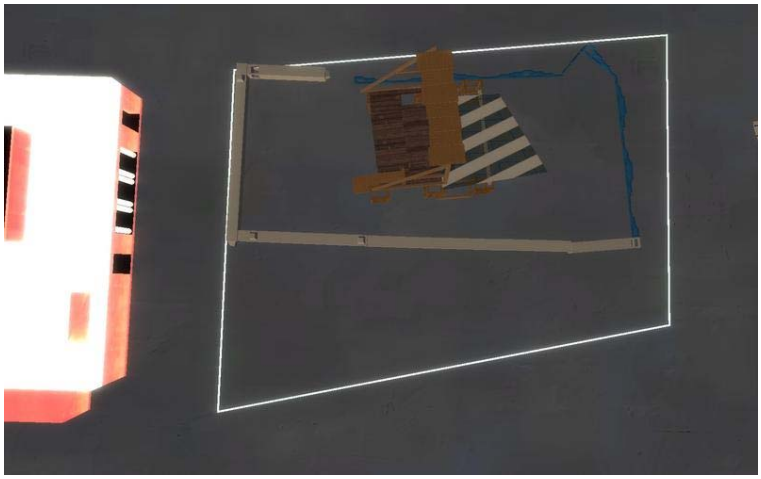
Author	Terese Fitzgerald
Date of completion	12/04/2013
Number of parts used	52
Stage Score	24
Playground Score	12
Cafe Score	10
Total Score	46

Community Rating:

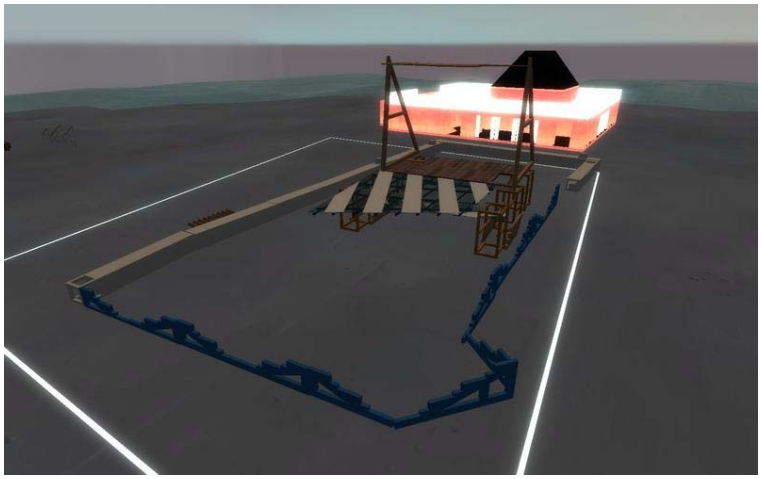
Aesthetics	6
Technicity	7
Spaces	5.5
Average	6.16

Competitors please comment and rate down below.
A filmed visit is available on demand.

Top View



NWCorner View



Interior View

Comments and Ratings Section

Author:TM
Comment:
The volume seems nicely compact (in plan), and the translucency of the glass panel has some nice effect on the solidity/ transparency of the structure. In plan the blue perimeter seems a little crooked, although defining a larger area for generating points, it does not add overly to the architectural experience. Structurally it seems sound, with an interesting use of a number of parts of differing material properties. It has a good use of height (I will probably steal this idea).
Aesthetics: 6/10
Technicity: 7/10
Spaces: 6/10

Author: Funky "fresh"
Comment:
The double height is an interesting idea with a stage above and a cafe below (this.... may be stolen). Not sure if this would be an ideal environment for patrons or staff to sit under with a band blaring above, none the less it looks good!
Is there an opportunity to integrate some of the architecture to define the perimeter?
Aesthetics: 6/10
Technicity: 7/10
Spaces: 5/10

Author: J-Dizzle
Comment: Love the use of volume above the stage with more intimate spaces for the cafe! Like the thought around the perimeter fence, stepped pryimad-type aesthetic almost mimicks the overall centre structure.
Aesthetics: 6/10
Technicity: 5/10
Spaces: 8/10

OpenCommunitition

Submission 3

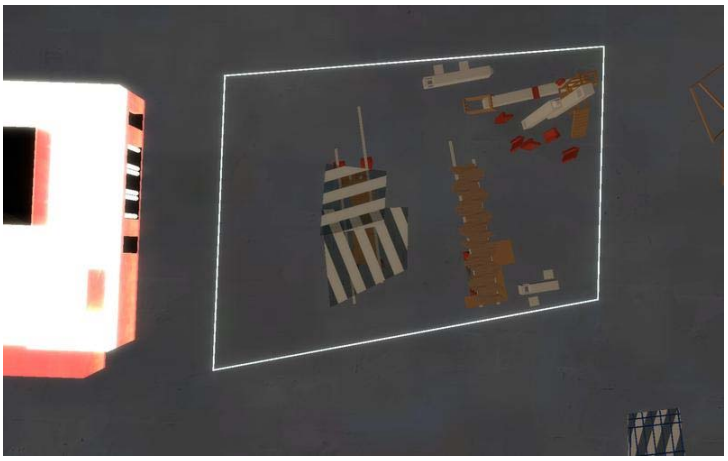
Author	Krishna Duddumpi
Date of completion	13/04/2013
Number of parts used	80
Stage Score	14
Playground Score	7.2
Cafe Score	11
Total Score	32.2

Community Rating:

Aesthetics	9
Technicity	9
Spaces	9
Average	9

Competitors please comment and rate down below.
A filmed visit is available on demand.

Top View



SE Corner View

Interior View

Comments and Ratings Section

Author: REX
Comment: COOL. I love the little seats - can I steal them! And I really enjoy the last perspective view - I think everything works in a very controlled and sophisticated way. very cool!!!
Aesthetics:9 /10
Technicity: 9/10
Spaces: 9/10

Author: J-Dizzle
Comment: I love the use of components for their redefined use but the spaces seem quite separate - intentional or not?
Aesthetics: 5/10
Technicity: 9/10
Spaces: 5/10

Author:Thom Pye
Comment:This looks pretty cool there is good use of spatial planning and a strong architectural grounding
Aesthetics:7 /10
Technicity:7 /10
Spaces:7 /10

Author: Funky "Fresh" (Author of this submission)
Designers Comments: The architecture and spatial planning was defined by the program and sightlines as opposed to a focus on unified structure, The spaces were divided to accomodate various tresholds of "expriences" (for a lack of a better word at 5pm on friday). Considering various scenario's:
1. A parton that wishes to have a coffee in relative isolation away from the playground and stage.
2. Seating is provided for parents at the playground where they can minitor the children but also have sight lines into the stage.
3. Ample space is provided in front of the stage for dancing and gathering
4. Patrons may gather at the back of the cafe in order to enjoy a coffee and the music
5. If the boundary facing the cafe's facade is treated as the "entrance", The program is designed to be easily identified and the cafe roof's extension unifies the three distinct programs as a whole visually.

- That is all... (Thank you).

Submission 4

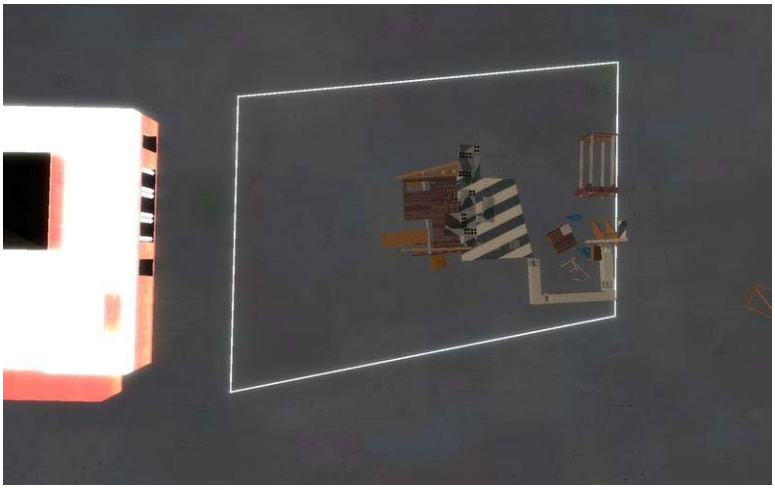
Author	Terese Fitzgerald
Date of completion	16/04/2013
Number of parts used	65
Stage Score	21
Playground Score	4
Cafe Score	16
Total Score	41

Community Rating:

Aesthetics	8
Technicity	7
Spaces	7
Average	7.3

Competitors please comment and rate down below.
A filmed visit is available on demand.

Top View



SWCorner View

Interior View

Comments and Ratings Section

Author: Funky "Fresh"
Comment: I think your design has evolved significantly! It looks really interesting! I really like the flag in the playground (this will be stolen !),What do you think about the quality of the spaces? Too hectic with children yelling, band playing in the background.
What if someone just wants to chillout and have a coffee? Should the installation be spread out a bit more?.. Just a thought..
Aesthetics: 8/10
Technicity: 7/10
Spaces: 5/10

Author: J-Dizzle
Comment: Oh I like this! A lot more texture and free-flowing spaces.Do the viewers look through the glass roof to view the stage? Restricted views could be clever but also annoying?
Aesthetics: 8/10
Technicity: 8/10
Spaces: 7/10

Author:Thom Pye
Comment:This design is interestign good use of repitition and proportio... the lay out tends to manouver the design to a single point and back again so there is consideration for circulation patterns
Aesthetics: 6/10
Technicity: 8/10
Spaces: 5/10

OpenCommunitition

Submission 5

Author	James
Date of completion	17/04/2013
Number of parts used	29
Stage Score	25
Playground Score	3.2
Cafe Score	11
Total Score	39.2

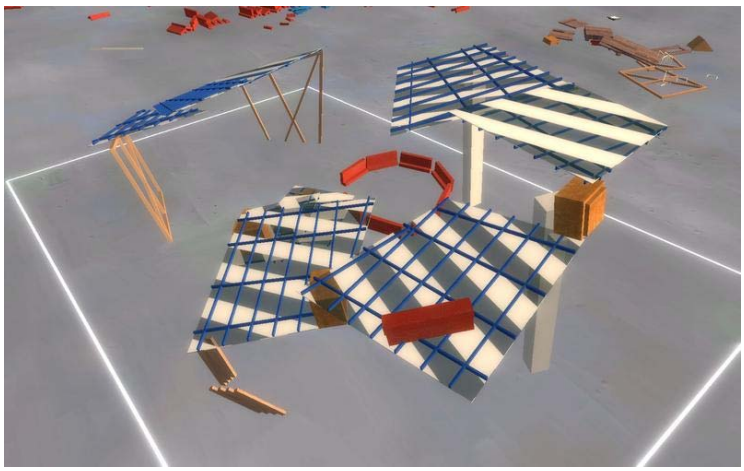
Community Rating:

Aesthetics	
Technicity	
Spaces	
Average	

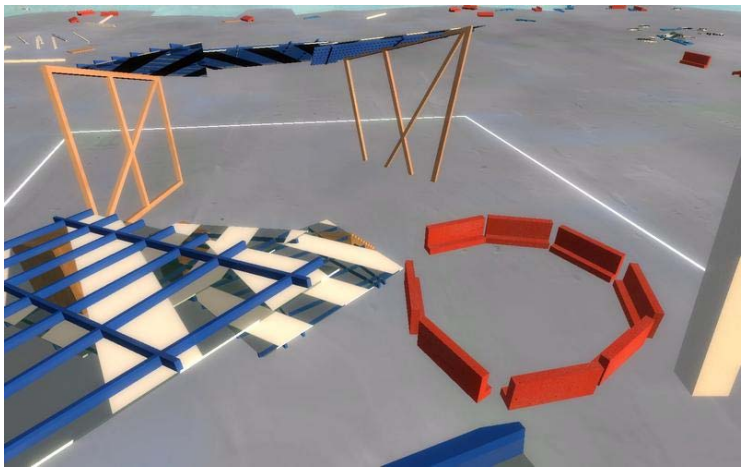
Competitors please comment and rate down below.
A filmed visit is available on demand.

Top View

NWCorner View



Interior View



Comments and Ratings Section

Author: James (aka Hitlad, author of submission)
Comment: The spiral platform is the cafe, with the bar halfway up. The covered area is the stage while the enclosed area is the sandbox for kids. The parents can view the stage from above in a reverse pit-like fashion, which is all the rage in Northern Europe (so says I) while keeping an eye on the kids without having to turn their heads.

Author: J-Dizzle
Comment: Nice visual cohesion. Perhaps more defined boundaries to the spaces could help the aesthetics? Its cool but I think it could be EXTREME!
Aesthetics: 5/10
Technicity: 6/10
Spaces: 6/10

Author:Thom Pye
Comment:loose spatial arrangement, and interestign use for covered structures
Aesthetics:2 /10
Technicity: 4/10
Spaces: 3/10

Author:tmatvuw
Comment: The project looks like it would work in plan, but seems overly slender in section. Somehow, the mess of the site bothers me in this submission. Possibly a little too open for me at this stage.
Aesthetics:2 /10
Technicity: 2/10
Spaces: 0/10

OpenCommunitition

Submission 6

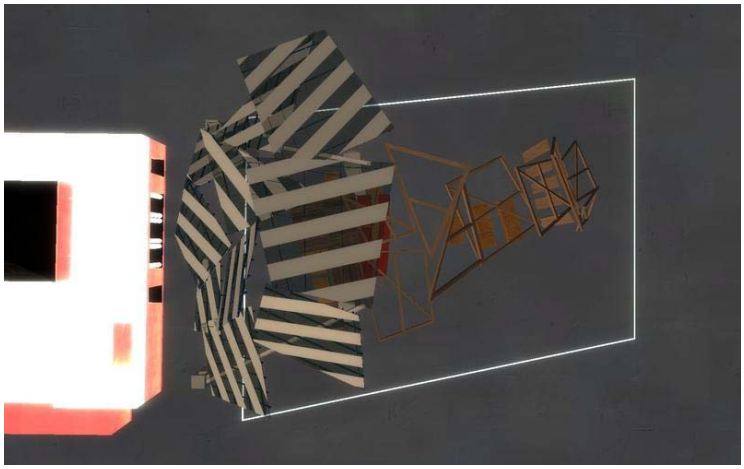
Author	Jaden Cairncross
Date of completion	19/04/2013
Number of parts used	69
Stage Score	26
Playground Score	3.4
Cafe Score	14
Total Score	43.4

Community Rating:

Aesthetics	7
Technicity	7
Spaces	8
Average	7.3

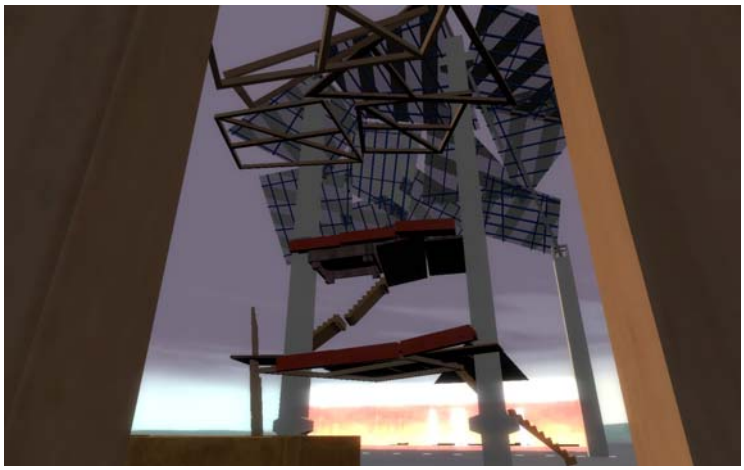
Competitors please comment and rate down below.
A video visit is available on demand

Top View



NE corner view

Interior View



Author: J-Dizzle (author of this submission)
Comment: Single view shafts to see both the playground and super stage exist one above the other to maximise supervison and create a theater-type experience.

Author:tmatvuw
Comment:Great transition of materials, the shift from a 'closed type of translucency' to the more open porous timber enclosures works well. Interesting siting, putting it up so close to the existing building.
Aesthetics: 7/10
Technicity: 7/10
Spaces:8/10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces:/10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces: /10

OpenCommunitition

Submission 7

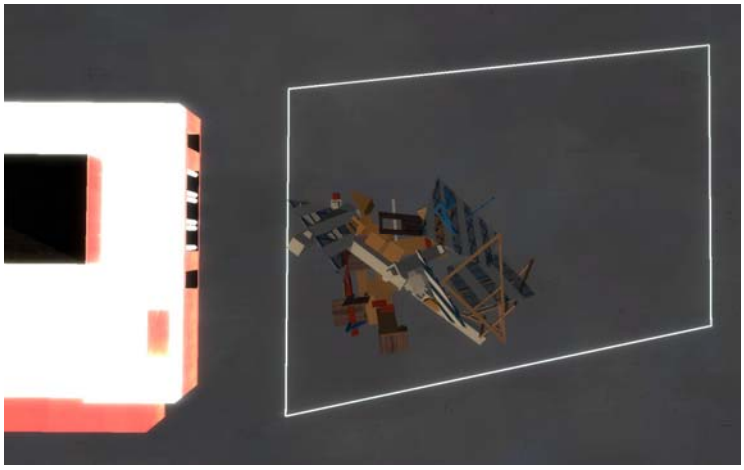
Author	Thomas Pye
Date of completion	19/04/2013
Number of parts used	59
Stage Score	4
Playground Score	3.7
Cafe Score	2
Total Score	9.7

Community Rating:

Aesthetics	8
Technicity	7
Spaces	8
Average	7.7

Competitors please comment and rate down below.
A video visit is available on demand

Top View



SE Corner View

Interior View

Author:tmatvuw
Comment:Works really well in section. This project has probably the most developed sculptural qualities. Perspective/ interior views well developed. Use of material and color somehow seem quite sensitively worked through.
Nice that you cleaned up the site before submission.
Aesthetics: 8/10
Technicity: 7/10
Spaces: 8/10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces: /10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces: /10

OpenCommunitition

Submission 8

Author	Krishna Duddumpi
Date of completion	19/04/2013
Number of parts used	65
Stage Score	19
Playground Score	9.6
Cafe Score	16
Total Score	44.6

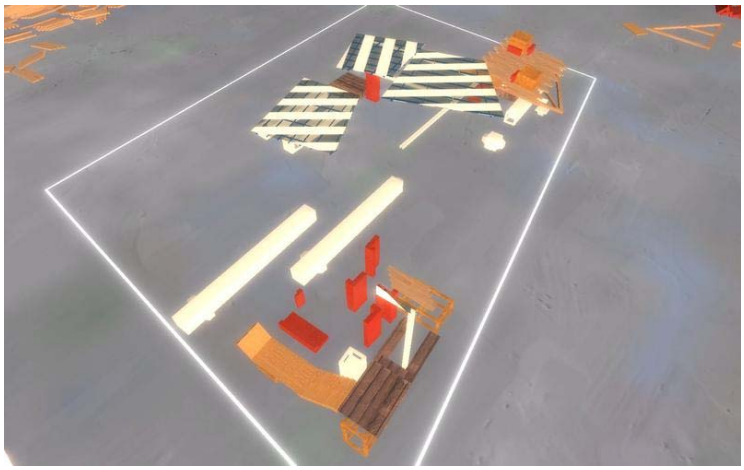
Community Rating:

Aesthetics	7
Technicity	9
Spaces	6
Average	7.3

Competitors please comment and rate down below.
A video visit is available on demand

Top View

SW Corner View



Interior View

Author:tmatvuw
Comment:Spatially this seems to gel well. The perspective view has a very complete architectural feel to it. Looks build-able, and inhabitable. Not convinced by the arrangement of the plan. Inclusion of the weld tool in the final perspective brings in a human dimension - nice work Mr.Researcher. Materials are well composed.
Aesthetics: 7/10
Technicity: 9/10
Spaces: 6/10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces: /10

Author:
Comment:
Aesthetics: /10
Technicity: /10
Spaces: /10

High scores and Statistics

Submission	Criteria	Grades				Average	qualitative scoring	pieces used	quantitative scoring	number of comments	quantitative/qualitative
1	aesthetics	5	6	5	7	5.8	5.4	44	25.3	4	4.7
	technicity	6	4	5	8	5.8					
	spaces	4	4	7	4	4.8					
2	aesthetics	6	6	6		6.0	6.2	52	46	3	7.4
	technicity	7	7	5		6.3					
	spaces	6	5	8		6.3					
3	aesthetics	9	5	7		7.0	7.4	80	32.2	4	4.3
	technicity	9	9	7		8.3					
	spaces	9	5	7		7.0					
4	aesthetics	8	8	6		7.3	6.9	65	41	3	6.0
	technicity	7	8	8		7.7					
	spaces	5	7	5		5.7					
5	aesthetics	5	2	2		3.0	3.3	29	39.2	4	11.8
	technicity	6	4	2		4.0					
	spaces	6	3	0		3.0					
6	aesthetics	7				7.0	7.3	69	43.4	2	5.9
	technicity	7				7.0					
	spaces	8				8.0					
7	aesthetics	8				8.0	7.7	59	9.7	1	1.3
	technicity	7				7.0					
	spaces	8				8.0					
8	aesthetics	7				7.0	7.3	65	44.6	1	6.1
	technicity	9				9.0					
	spaces	6				6.0					
Average							6.45	57.88	34.6	2.75	5.7

Piece Count and Usage

Reference number	Name	Frequency	Number of submissions that used this piece at least once
1	handrail_large	2	1
2	handrail_small	2	1
3	handrail_flat	4	1
4	shedwall_plain	2	3
5	shedwall_topdoor	1	5
6	shedwall_bottomdoor	1	4
7	shed_top	1	3
8	smallshed_top	1	2
9	smallshedwall_window	1	3
10	smallshedwall_door	1	2
11	smallshedwall_plainlarge	1	2
12	smallshedwall_plainsmall	1	2
13	stairpillar_top	2	1
14	stairpillar_bottom	2	0
15	stairmodule_base	2	1
16	stairmodule_steps	4	7
17	stairmodule_bottom	2	2
18	stairmodule_side	2	3
19	platformpillar_top	4	2
20	platformpillar_bottom	4	1
21	glassrail_tallsmall	6	3
22	glassrail_talllarge	4	3
23	glassrail_standard1	5	4
24	glassrail_standard2	5	4
25	glassrail_standard3	4	4
26	glassrail_standard4	5	4
27	bleacherbase_small	12	3
28	bleacherbase_large	12	3
29	bleacher_large	56	8
30	bleacher_small	12	5
31	glasspanel1	1	2
32	glasspanel2	1	2
33	glasspanel3	1	2
34	glasspanel4	1	3
35	glasspanel5	1	2
36	glasspanel6	1	3
37	glasspanel7	1	2
38	glasspanel8	1	1
39	glasspanel9	1	1
40	glasspanel10	1	2
41	glasspanelframe1	1	1
42	glasspanelframe2	1	1
43	glasspanelframe3	1	1
44	glasspanelframe4	1	2
45	glasspanelframe5	1	1
46	glasspanelframe6	1	3

Reference number	Name	Frequency	Number of submissions that used this piece at least once
47	glasspanelframe7	1	3
48	glasspanelframe8	1	1
49	glasspanelframe9	1	1
50	glasspanelframe10	1	2
51	beam_short	18	4
52	beam_long	18	5
53	box_frame	12	5
54	box_side1	12	6
55	box_side2	12	6
56	box_top	14	5
57	box_front1	12	6
58	box_front2	10	4
59	cladding_middle	64	5
60	cladding_end	64	3
61	pillar_cap	4	5
62	pillar_rotula	4	3
63	pillar_base	4	6
64	pillar_head1	1	4
65	pillar_head2	1	3
66	pillar_head3	1	1
67	pillar_head4	1	3
68	pillar_head5	1	4
69	pillar_head6	1	2
70	pillar_topbase	2	3
71	pillar_beammale	2	4
72	pillar_beamfemale	2	3
	TOTAL	441	

Comments

Submission 1

Author: REX
Comment: I really like the stage/catwalk area, it's very exciting, but the other ones leave me guessing.

Author: Funky Fresh
Comment: Really interesting overall with dynamic geometry, I think the chekked arrangement of timber panels is nice (this idea will be stolen).
Unfortunately the arrangement of spaces isn't convincing i.e. have to walk though the playground to get to the cafe & stage.
The stage also feel very trapped, is there an opportunity to open it up a bit more?

Author: Hitlad
Comment: I like the overall usage of space, particularly with the play area visible from both the cafe and stage but still allowing some separation between the cafe and stage

Submission 2

Author: J-Dizzle
Comment: Love the material transition from the steel and glass side of the stage to the timber toward the playground. Also, the mezzanine-type space above the stage provides a different persepective on the performers - nice.

Author:TM
Comment:
The volume seems nicely compact (in plan), and the translucency of the glass panel has some nice effect on the solidity/ transparency of the structure. In plan the blue perimeter seems a little crooked, although defining a larger area for generating points, it does not add overly to the architectural experience. Structurally it seems sound, with an interesting use of a number of parts of differing material properties. It has a good use of height (I will probably steal this idea).

Author: Funky fresh
Comment:
The double height is an interesting idea with a stage above and a cafe below (this.... may be stolen). Not sure if this would be an ideal environment for patrons or staff to sit under with a band blaring above, none the less it looks good!
Is there an opportunity to integrate some of the architecture to define the perimeter?

Author: J-Dizzle
Comment: Love the use of volume above the stage with more intimate spaces for the cafe! Like the thought around the perimeter fence, stepped pryimad-type aesthetic almost mimicks the overall centre structure.

Submission 3

Author: REX
Comment: COOL. I love the little seats - can I steal them! And I really enjoy the last perspective view - I think everything works in a very controlled and sophisticated way. very cool!!!

Author: J-Dizzle
Comment: I love the use of components for their redefined use but the spaces seem quite separate - intentional or not?

Author:Thom Pye
Comment:This looks pretty cool there is good use of spatial planning and a strong architectural grounding

Author: Funky Fresh (Author of this submission)
Designers Comments: The architecture and spatial planning was defined by the program and sightlines as opposed to a focus on unified structure, The spaces were divided to accomodate various tresholds of expriences (for a lack of a better word at 5pm on friday). Considering various scenario's:
1. A parton that wishes to have a coffee in relative isolation away from the playground and stage.
2. Seating is provided for parents at the playground where they can minitor the children but also have sight lines into the stage.
3. Ample space is provided in front of the stage for dancing and gathering
4. Patrons may gather at the back of the cafe in order to enjoy a coffee and the music
5. If the boundary facing the cafe's facade is treated as the entrance, The program is designed to be easily identified and the cafe roof's extension unifies the three distinct programs as a whole visually.

- That is all... (Thank you).

Submission 4

Author: Funky Fresh
Comment: I think your design has evolved significantly! It looks really interesting! I really like the flag in the playground (this will be stolen !),What do you think about the quality of the spaces? Too hectic with children yelling, band playing in the background.
What if someone just wants to chillout and have a coffee? Should the installation be spread out a bit more?.. Just a thought..

Author: J-Dizzle
Comment: Oh I like this! A lot more texture and free-flowing spaces.Do the viewers look through the glass roof to view the stage? Restricted views could be clever but also annoying?

Author:Thom Pye
Comment:This design is interestign good use of repitition and proportio... the lay out tends to manouver the design to a single point and back again so there is consideration for circulation patterns

Submission 5

Author: James (aka Hitlad, author of submission)
Comment: The spiral platform is the cafe, with the bar halfway up. The covered area is the stage while the enclosed area is the sandbox for kids. The parents can view the stage from above in a reverse pit-like fashion, which is all the rage in Northern Europe (so says I) while keeping an eye on the kids without having to turn their heads.

Author: J-Dizzle
Comment: Nice visual cohesion. Perhaps more defined boundaries to the spaces could help the aesthetics? Its cool but I think it could be EXTREME!

Author:Thom Pye
Comment:loose spatial arrangement, and interestign use for covered structures

Author:tmatvuw
Comment: The project looks like it would work in plan, but seems overly slender in section. Somehow, the mess of the site bothers me in this submission. Possibly a little too open for me at this stage.

Submission 2

Author: J-Dizzle (author of this submission)
Comment: Single view shafts to see both the playground and super stage exist one above the other to maximise supervison and create a theater-type experience.

Author:tmatvuw
Comment:Great transition of materials, the shift from a 'closed type of translucency' to the more open porous timber enclosures works well. Interesting siting, putting it up so close to the existing building.

Submission 2

Author:tmatvuw
Comment:Works really well in section. This project has probably the most developed sculptural qualities. Perspective/ interior views well developed. Use of material and color somehow seem quite sensitively worked through. Nice that you cleaned up the site before submission

Submission 2

Author:tmatvuw
Comment:Spatially this seems to gel well. The perspective view has a very complete architectural feel to it. Looks build-able, and inhabitable. Not convinced by the arrangement of the plan. Inclusion of the weld tool in the final perspective brings in a human dimension - nice work Mr.Researcher. Materials are well composed.

Questionnaire

Answers	Questions
	1 What is your age?
2	☐25 or under
4	☐26-40
0	☐41-55
0	☐56 or older
	What is your gender?
1	☐Female
5	☐Male
	2 What kind of desigher are you?
4	☐Architecture
2	☐Interior Architecture
1	☐Industrial design
0	☐Design
0	☐Videogame Design
1	☐Other
	3 What is the highest level of qualification completed?
0	☐High school or equivalent
0	☐Vocational/technical school (2 year)
0	☐ Some college
0	☐ Bachelor's degree
6	☐ Master's degree
0	☐ Doctoral degree
0	☐Professional degree (MD, JD, etc.)
0	☐Other
	4 Which of the following best describes your role in the design industry?
0	☐Upper management
0	☐Middle management
0	☐Junior management
0	☐Administrative staff
0	☐Support staff
2	☐Student
3	☐Trained professional
0	☐Skilled labourer
0	☐Consultant
0	☐Temporary employee
2	☐Researcher

0 ☐Self-employed

0 ☐Other

5 The organization you work for is in which of the following:

2 ☐Public sector

3 ☐Private sector

0 ☐Not-for-profit

1 ☐Other

6 Are CAD softwares your main design tools?

3 ☐Yes

3 ☐No

7 How many hours a day do you spend using a computer for design purposes?

0 ☐Less than 2

3 ☐2 to 4

2 ☐4 to 6

1 ☐More than 6

8 Which CAD software do you use the most often(several answers accepted)??

2 ☐AutoCAD

2 ☐ArchiCAD

2 ☐Revit

6 ☐SketchUp

1 ☐SolidWorks

1 ☐VectorWorks

1 ☐Other

9 How many hours a day do you spend being online for leisure purposes?

3 ☐Less than 1

1 ☐1 to 2

2 ☐2 to 3

0 ☐3 to 4

0 ☐More than 4

10 Are you involved in any of these online activities on a regular basis (several answers accepted)?

5 ☐Social networking

1 ☐Image Sharing

1 ☐Blogging

1 ☐Forums

0 ☐Chat Rooms

0 ☐None of these

11 In the activities you are involved in, what is your level of content consumption?

1 ☐High, I wouldn't miss the last update/image upload/post/article.

2 ☐Average, I would only look at content relevant to my interests.

3 ☐Low, I only access the content I'm looking for in the first place.

0

12 In the activities you are involved in, what is your level of content contribution?

0 ☐High, I post content often.

2 ☐Average, I post content sometimes.

4 ☐Low, I hardly post any content.

13 In the activities you are involved in, what is your level of discussion contribution?

0 ☐High, I partake in many discussion and comment often.

4 ☐Average, partake in some discussions and comment sometimes

2 ☐Low, I hardly post any comment.

0

14 How many hours a day do you spend playing video games (all platforms included)?

2 none

2 ☐Less than 1

0 ☐1 to 2

0 ☐2 to 3

0 ☐3 to 4

1 ☐More than 4

15 On what platform do you play most?

3 ☐Computer

1 ☐Tablet

2 ☐Phone

1 ☐Console

16 What genre of game do you play most (several answers accepted)?

2 ☐Action

2 ☐Adventure

2 ☐Role-Playing

2 ☐Simulation

3 ☐Strategy

1 7 Out of the genre(s) you picked, do you play them for their online social component (if any)?

0 ☐Yes specifically for this

0 ☐Yes, among other things

4 ☐No

18 Out of the genre(s) you picked, do you play them for their online competitive component (if any)?

0 ☐Yes specifically for this

1 ☐Yes, among other things

3 ☐No

0

19 You partook in the Open Communition Pilot Study in March 2013.

0 If you had more time, would you keep being part of the study to:

3 ☐Y ☐N Try and win?

3 ☐Y ☐N Review the upcoming submissions?

6 ☐Y ☐N Improve your designs?

20 Was your knowledge in Design helpful for the completion of the study?

2 ☐Yes, very

3 ☐Yes, moderately

1 ☐No, not really

0 ☐Not at all

0 ☐No opinion

21 Have your design skills and abilities been challenged?

0 ☐Yes, a lot

4 ☐Yes, moderately

2 ☐No, not really

0 ☐Not at all

0 ☐No opinion

22 Over time, how improved:

1 The quality of submissions?

3 ☐Improved significantly

1 ☐Improved moderately

0 ☐Did not really improve

0 ☐Did not improve at all

The quality of comments and ratings?

0 ☐Improved significantly

2 ☐Improved moderately

1 ☐Did not really improve

0 ☐Did not improve at all

1 dunno

23 Was looking at the submissions on the webpage helpful to improve the quality of your own submissions?

2 ☐Yes, a lot

1 ☐Yes, moderately

2 ☐No, not really

0 ☐Not at all

0 ☐No opinion

24Was looking at the ratings on the webpage helpful to improve the quality of your own submissions?

0 ☐Yes, very

3 ☐Yes, moderately

2 ☐No, not really

0 ☐Not at all

0 ☐No opinion

25 Was looking at the comments on the webpage helpful to improve the quality of your own submissions?

1 ☐Yes, very

2 ☐Yes, moderately
2 ☐No, not really
0 ☐Not at all
0 ☐No opinion

26 What did you prefer to do?
0 ☐Commenting on other's submissions
5 ☐Submitting designs
1 ☐Visiting other's pavilions
1 ☐Reading comments
0 ☐None of the above

27 What do you think helped the community to improve the quality of their submissions?
2 ☐The comments you posted
2 ☐The designs you submitted
2 ☐Both
0 ☐None

28 What helped you to improve the quality of your submissions?
1 ☐The comments posted by the community
3 ☐The designs submitted by the community
1 ☐Both
0 ☐None
0

29 You would rather see your design being rated:
2 ☐Better than all the other designs
2 ☐Better than most of the designs
1 ☐Better than your previous designs
2 ☐No particular expectations
0

30 You partook in the Open Communition Pilot Study in March 2013.
How many designs did you submit?
3 ☐1
2 ☐2
1 ☐3
0 ☐4
0 ☐5

31 How many submissions did you look at?
1 ☐2 or less
3 ☐2-4
2 ☐5-7
0 ☐8-12
0 ☐More than 12

32 How many submissions did you rate?

1 ☐2 or less
3 ☐2-4
2 ☐5-7
0 ☐8-12
0 ☐More than 12

33 How many comments did you post (rating excluded)?
1 ☐2 or less
3 ☐2-4
2 ☐5-7
0 ☐8-12
0 ☐More than 12

34 On opening the web page, what were you most curious about (several answers accepted)?
5 ☐New submissions
2 ☐Changes in the general ranking
1 ☐Comments and ratings related to your designs
1 ☐All Comments and ratings

35 On the submission pages, did you find the visual content
Sufficient to understand the design intentions
4 ☐Yes
2 ☐No, not really
0 ☐No, not at all
0 ☐No opinion
Sufficient to comment the design in a constructive manner
5 ☐Yes
1 ☐No, not really
0 ☐No, not at all
0 ☐No opinion
Sufficient to rate the design
5 ☐Yes
1 ☐No, not really
0 ☐No, not at all
0 ☐No opinion
Sufficient to examine assemblies and details
2 ☐Yes
4 ☐No, not really
0 ☐No, not at all
0 ☐No opinion

36 Did you write a comment:
6 ☐Y ☐N About someone's design
3 ☐Y ☐N About one of your designs
1 ☐Y ☐N To respond to comments about your design

0 ☐Y ☐N To respond to another comment

37 Would you grant more value to a comment if it was (several answers accepted)

3 ☐From a participant who submits a lot of designs

3 ☐From a participant who is generally well rated

1 ☐From a participant who comments often

0 ☐From a participant who comments rarely

2 ☐It doesn't matter who posted the comment

0

38 Would you rather :

comment anonimously?

2 ☐Yes

1 ☐No

3 ☐Sometimes

Rate anonimously?

2 ☐Yes

1 ☐No

3 ☐Sometimes

39 When rating a submission:

Did the quantitative rating influence your marking?

0 ☐Yes, a lot

3 ☐Yes, moderately

0 ☐No opinion

1 ☐No, not really

2 ☐Not at all

Did the other ratings influence your marking?

0 ☐Yes, a lot

2 ☐Yes, moderately

1 ☐No opinion

2 ☐No, not really

1 ☐Not at all

Did the other comments influence your marking?

0 ☐Yes, a lot

2 ☐Yes, moderately

1 ☐No opinion

2 ☐No, not really

1 ☐Not at all

40 When designing, were you concerned about

0 ☐Score well in the quantitative assessment (program points)

3 ☐Score well in the qualitative assessment (community rating)

2 ☐Both

1 ☐None

41 What do you think was the most limiting factor to creating compelling design with this game?

6 ☐The gameplay

1 ☐The obligation to follow the program
0 ☐The level of graphic aesthetics
0 ☐The variety of the kit of parts
0 ☐Nothing was really limiting my creative will

42 Did you reuse many combinations of parts seen in other submissions?
0 ☐Yes, often
3 ☐Yes, sometines
3 ☐No
0 ☐No opinion

43 Did you reuse many combinations of parts from your previous submissions?
3 ☐Yes, often
1 ☐Yes, sometines
1 ☐No
0 ☐No opinion

44 In all your designs, have you ever:
2 ☐Y ☐N focused on only one part of the program (playground, cafe or stage)?
3 ☐Y ☐N Neglected a part of the program (playground, cafe or stage)?

45 How many hours have you ever played First Person Shooters (Doom, Quake, Half Life, Unreal Tournament, Halo, Call of Duty, Battlefield…)?
2 ☐Less than 5 hours
0 ☐5-15 hours
3 ☐15-100 hours
1 ☐More than 100 hours

46 How comfortable were you with the classical FPS controls (mouse+WASD or mouse+arrows) at the beginning of the study?
2 ☐Very comfortable, intuitive approach to this type of controls.
2 ☐Comfortable, can fluidly evolve in space.
1 ☐Okay, can go from point A to point B.
0 ☐Not comfortable, takes effort to do what desired.
1 ☐Never used this type of controls before.

47 In this game, did you find moving your character around easy?
1 ☐Yes, very easy
3 ☐Yes, moderately
0 ☐No opinion
2 ☐No, not really
0 ☐Not at all

48 How long do you think it took you to grasp the basics of moving around and placing pieces?
1 ☐Less than 5 minutes
1 ☐5-10 minutes
1 ☐11-15 minutes
0 ☐16-20 minutes

3 ☐21-30 minutes
0 ☐More than 30 minutes
0 ☐I haven't mastered the basic actions yet

49 And would you qualify this time spent:
4 ☐Y ☐N Challenging?
3 ☐Y ☐N Frustrating?
1 ☐Y ☐N Boring?
0 ☐Y ☐N Disorientating?
4 ☐Y ☐N Exciting?

50 Did you find the laser gun:
0 Useful?
3 ☐Yes, very
2 ☐Yes, moderately
0 ☐No opinion
1 ☐No, not really
0 ☐Not at all
0 Easy to use:
1 ☐Yes, very
4 ☐Yes, moderately
0 ☐No opinion
0 ☐No, not really
0 ☐Not at all

51 Did you find the Welder:
Useful?
5 ☐Yes, very
1 ☐Yes, moderately
0 ☐No opinion
0 ☐No, not really
0 ☐Not at all
Easy to use:
2 ☐Yes, very
3 ☐Yes, moderately
0 ☐No opinion
0 ☐No, not really
0 ☐Not at all

52 Did you find the tools:
1 ☐Precise enough
5 ☐Not precise enough

53 How good are you with the tools?
1 ☐Very good: I am quick, efficient and precise
1 ☐Rather good, I have a steady workflow
3 ☐Not bad, I can build what I want to build

1 ☐Bad, I struggle with the basics

54 Considering your last answer, how long do you think it would take you to become very good?

3 ☐1-2 more hours
0 ☐3-4 more hours
2 ☐5-10 more hours
0 ☐More than 10 hours
1 ☐I don't know

55 Regardless of your own performance, how long do you think it would take anyone to become very good?

0 ☐1-2 more hours
2 ☐3-4 more hours
1 ☐5-10 more hours
1 ☐More than 10 hours
2 ☐I don't know

56 Have you discovered tricks and handy methods to use with the tools?

1 ☐Yes, many
1 ☐Yes, a couple
2 ☐Probably uses that everyone else has discovered as well
0 ☐No
0 ☐I don't know

57 Would you share these tricks, if asked to?

5 ☐Yes, to any participant
0 ☐Yes, only to some participants
1 ☐No, I keep them for myself
0 ☐I have not discovered any tricks worth sharing

58 Do you think the limitations in the tools influence the quality of your submissions?

2 ☐Yes, drastically
3 ☐Yes, quite a bit
1 ☐Yes, moderately
0 ☐Not really
0 ☐Not at all
0 ☐I don't know

59 Was finding the pieces you were looking for easy?

1 ☐Yes, very easy
2 ☐Yes, moderately
1 ☐No opinion
2 ☐No, not really
0 ☐Not at all

60 How would you qualify the variety in pieces

1 ☐High, there are many types of pieces
4 ☐Average, there are enough types of pieces

0 ☐Low, there are not enough types of pieces

1 ☐I don’t know

61 Do you think the number of pieces at your disposition limits the quality of your submissions?

1 ☐Yes, drastically

1 ☐Yes, quite a bit

1 ☐Yes, moderately

3 ☐Not really

0 ☐Not at all

0 ☐I don’t know

62 Did you feel like being at the Serpentine Pavilion in London?

0 ☐Yes, absolutely

0 ☐Yes, moderately

4 ☐No, not really

0 ☐Not at all

2 ☐No opinion

63 Were you satisfied by visuals of the virtual environment?

0 ☐Yes, absolutely

4 ☐Yes, moderately

1 ☐No, not really

0 ☐Not at all

1 ☐No opinion

64 Were you satisfied by the physics engine?

1 ☐Yes, absolutely

2 ☐Yes, moderately

1 ☐No, not really

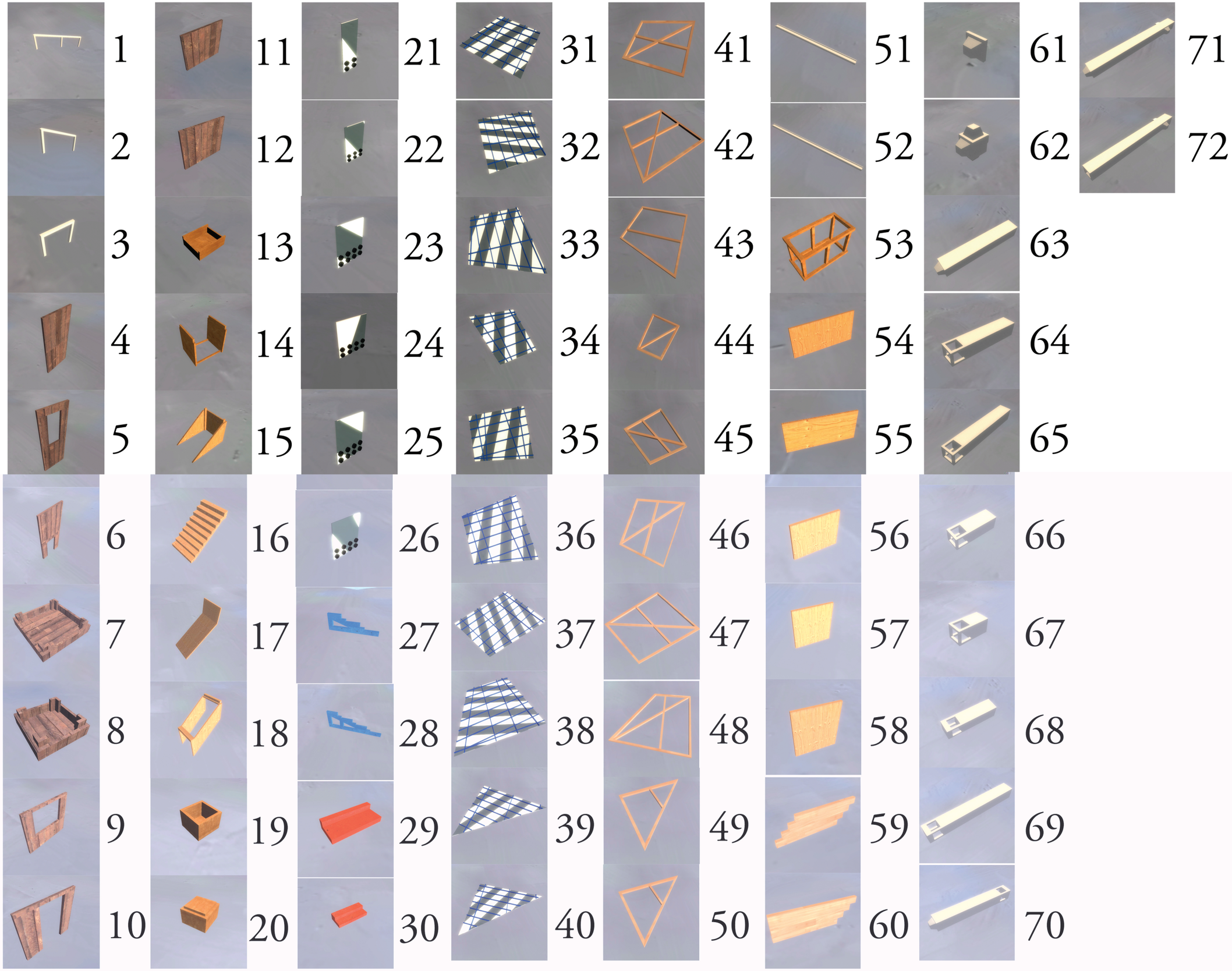
0 ☐Not at all

0 ☐No opinion

65 Did you like to run around and smash things for no purpose?

6 ☐Yes

0 ☐No



Kit of Parts Reference Sheet

1	handrail_large	2
2	handrail_small	2
3	handrail_flat	4
4	shedwall_plain	2
5	shedwall_topdoor	1
6	shedwall_bottomdoor	1
7	shed_top	1
8	smallshed_top	1
9	smallshedwall_window	1
10	smallshedwall_door	1
11	smallshedwall_plainlarge	1
12	smallshedwall_plainsmall	1
13	stairpillar_top	2
14	stairpillar_bottom	2
15	stairmodule_base	2
16	stairmodule_steps	4
17	stairmodule_bottom	2
18	stairmodule_side	2
19	platformpillar_top	4
20	platformpillar_bottom	4
21	glassrail_tallsmall	6
22	glassrail_talllarge	4
23	glassrail_standard1	5
24	glassrail_standard2	5
25	glassrail_standard3	4
26	glassrail_standard4	5
27	bleacherbase_small	12
28	bleacherbase_large	12
29	bleacher_large	56
30	bleacher_small	12
31	glasspanel1	1
32	glasspanel2	1
33	glasspanel3	1
34	glasspanel4	1
35	glasspanel5	1
36	glasspanel6	1
37	glasspanel7	1
38	glasspanel8	1
39	glasspanel9	1
40	glasspanel10	1
41	glasspanelframe1	1
42	glasspanelframe2	1
43	glasspanelframe3	1
44	glasspanelframe4	1
45	glasspanelframe5	1
46	glasspanelframe6	1
47	glasspanelframe7	1
48	glasspanelframe8	1
49	glasspanelframe9	1
50	glasspanelframe10	1
51	beam_short	18
52	beam_long	18
53	box_frame	12
54	box_side1	12
55	box_side2	12
56	box_top	14
57	box_front1	12
58	box_front2	10
59	cladding_middle	64
60	cladding_end	64
61	pillar_cap	4
62	pillar_rotula	4
63	pillar_base	4
64	pillar_head1	1
65	pillar_head2	1
66	pillar_head3	1
67	pillar_head4	1
68	pillar_head5	1
69	pillar_head6	1
70	pillar_topbase	2
71	pillar_beammale	2
72	pillar_beamfemale	2