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COLLABORATIVE DESIGN IN SECOND LIFE

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Abstract. *Design is, more than ever, a collaborative process. Design teams who can join their discipline-specific forces have the best chances for success. With the emergence of geographically distributed design team members, the management of multidisciplinary collaborative design processes has become even more important. But integration of design disciplines is still one of the hardest tasks in design projects. And to date, ICT tools have not provided much support for this: while stand alone applications are often functioning quite well, knowledge exchange and sharing and collaborative work are areas where still a lot of work has to be done.*

New developments in ICT-based collaboration can be found in the area of virtual worlds, especially in the Second Life environment, where users as avatars can walk, fly, communicate with others, express themselves, do business, make friends, but also: design and build together with others. This paper discusses possibilities and limitations of virtual worlds such as Second Life for support of multidisciplinary design processes.

1. INTRODUCTION - THE IMPORTANCE OF COLLABORATIVE DESIGN

Design projects are often characterized by the co-operation of multiple participants from different disciplines. Large and/or complex design projects cannot be executed any more by a single designer, since expert knowledge on various domains needs to be combined to develop a successful design. The importance of collaboration in design is still increasing, as a result of the emergence and growth of “virtual project teams” with geographically distributed participants that mainly communicate over the internet.

Design tools have dramatically changed in the last decades. Many design offices only use CAD-systems since 15-20 years but it is hard to imagine how they would do their design projects without CAD. More or less the same can be said for other disciplines such as structural engineering, building performance analysis etc. But when it comes to integration of such disciplines, then ICT support is much less sophisticated. In fact, in many cases the output of one discipline is sent in an e-mail message to other disciplines, who re-type the data into their own application. Sometimes there are tools in use in a design consortium such as groupware or computer-supported collaborative work (CSCW) software, sometimes there is a project website and/or a project extranet. But seamless integration of design information is still far away.

2. BUILDING INFORMATION MODELS FOR COLLABORATIVE DESIGN

A technology that specifically aims at integration and collaboration of different design disciplines is Building Information Modelling (BIM). A Building Information Model (BIM) is an information model of a building in which all relevant information of the building (or civil work) is stored in a meaningful way. This can include shape, material, decomposition structure, functional and physical properties, life cycle information etc. The idea is that such a BIM can serve as a shared model for information exchange and sharing by multiple disciplines such as architectural design, structural engineering etc.

Although the term Building Information Modelling is only a few years old (probably first used by Autodesk in their white paper on the subject [1]), the concepts and the technology date from the eighties when some people involved in the IGES-standard for graphics exchange decided to start a new effort referred to as STEP ("(ISO) Standard for the Exchange of Product Model Data" [2]). Within STEP, the AEC community was very active around 1990, but slowed down after a couple of years and finally stepped out of STEP to start the International Alliance for Interoperability (IAI) in 1995. Important differences with STEP are (1) commitment from large vendors such as Autodesk, Bentley and GraphiSoft, and (2) no more formal relationships with ISO and other industries (automotive, aircraft etc.).

Nowadays, a number of IAI standards (called Industry Foundation Classes, IFCs) are available [3]. Many companies have done pilots with IFCs and some are using IFCs intensively. Further development of the IAI work is going steady but not fast. Serious problems have been reported with respect to the exchange of building data using IFCs (see e.g. [4] and [5]). These reports confirm that the conversion or mapping of information models related to different discipline views is a complex and difficult job, especially when it comes to flawless conversion of different shape descriptions (e.g. from boundary representation to solid model representation and back). These problems have already been encountered in the early nineties in projects such as ATLAS [6] and COMBINE [7] and it looks like they can only be solved in a BIM-context with a lot of work and patience.

3. SECOND LIFE

A technology that can also be used for integration and collaboration of different disciplines, but that is quite different from Building Information Modelling, is the technology of virtual worlds. Virtual worlds are common in the gaming industry, but are currently also used for "serious gaming", i.e. games used for simulation of management processes, for the purpose of education and/or collaborative decision-making processes.

Recently virtual worlds technologies have gained much attention with the fast growth of Second Life. Second Life, by Linden Lab, is a "Multi-User Virtual Environment" (MUVE), played on the Internet[1]. Users can create avatars for themselves and as avatar, they can walk, fly, communicate with others, express themselves, do business, make friends, etc. In fact, Second Life is not really a game, because there is no goal or end of life for the players, they

[1] Second Life is also often characterized as a Massive(ly) Multiplayer Online Role-Playing Game (MMORPG), but, as Linden Labs (the creator of Second Life) puts it, Second Life is in fact not a game.

can just do whatever they want and “live forever”. Second Life has been in the news quite regularly, often with sensational stories on doing business and making money (“Linden dollars”) in Second Life, on sex in Second Life, or on users that spent excessive time in Second Life.

But would it not be possible to use virtual worlds such as Second Life as a platform for multidisciplinary design and construction? It is indeed possible to design and build something in Second Life, and also to do that together with others. You can see each other’s avatars and communicate using chat and instant messages. A lot of virtual buildings and structures have already been built and probably many of them by collaborative teams. In fact the architecture of Second Life is well suited for collaborative design: one must start with the acquisition of an empty piece of land (island), and then build things using the building toolset, and the primitive objects “prims”, that can be modified to form any shape. In practice the development of complex constructions is typically something to do collaboratively since construction in Second Life is very time-consuming.

Fig 1. Mies van der Rohe’s Farnsworth House on Architecture Island in Second Life

So there are indeed possibilities to perform collaborative design and construction in Second Life. This raises a number of new questions: is building in Second Life useful for building practice? Is it useful for building education? What are the possibilities and limitations of building in Second Life from a professional and/or an educational point of view? This will be discussed in the next section.

4. COLLABORATIVE DESIGN IN SECOND LIFE

As stated above, collaborative design and construction is indeed possible in Second Life. But how useful is it, for practice and/or education? In order to find this out we have done a literature survey and we have of course tried Second Life ourselves. Furthermore, we gave a group of around twenty students a small assignment in Second Life and asked them about their experiences. From our own findings and from the students feedback, we can make the following observations.

Generally said, the value of designing and building in Second Life is largely dependent on the viewpoint of the observer. Therefore we will discuss the value of Second Life from three viewpoints: design, engineering and collaboration. From a design viewpoint with an emphasis on watching and experiencing the appearance of architectural compositions, Second Life can be very useful. You can look at the composition from all sides, walk around it, walk inside, etc. Also the development process of the compositions is an interesting and valuable process, although the process is rather time-consuming in Second Life, especially when compared to dedicated 3D-modellers such as Maya, Revit or SketchUp.

If the observer mainly has an engineering viewpoint, then Second Life is less useful. As our students noted, there is no gravity, no wind, no bad weather, no water flows or tidal waves other than "standard water"[2]. Indeed, it is possible to add some realistic physical characteristics to objects in Second Life, such as gravity and wind from the weather system [8]. And the definition of such additions may have some educational value. But it is unlikely that all this will result in a useful and user-friendly engineering simulation environment that can compete with more conventional tools.

Finally, if we consider the third viewpoint, collaboration, then Second Life again can be very useful. Since you can see each other's avatars and their actions, chat with them, send messages to them etc., there are good opportunities for collaboration – better than conventional design systems. In addition, it is possible to use Second Life in combination with e.g. messenger services and webcams, as already shown in Australian research on collaborative design using virtual environments [9]. Furthermore, opportunities for "serious gaming" for the simulation of complex planning and decision processes in Second Life are currently investigated at the Faculty of Technology, Policy and Management [10].

[2]In fact, almost everything is "perfect" in Second Life: not only the weather is always nice, but also the population mainly consists of goodlooking young people in the prime of their life; sickness and death do not exist; everyone can fly; nobody needs a home to live in, etc. On the other hand, boredom is just around the corner, as are disappointments, broken harts, and so on [13].

5. DISCUSSION, CONCLUSION AND FURTHER WORK

From the above we may conclude that Second Life has good opportunities for collaborative design from an (architectural) design viewpoint (with emphasis on shape and appearance) and from the viewpoint of collaboration, group processes and teamwork, but less for engineering purposes.

A few additional remarks must be made to this. First, the 3D modelling functionality in Second Life is by far not as sophisticated as dedicated 3D modellers such as Revit, SketchUp or Maya. Furthermore, Second Life has no import capabilities for 3D models created in other applications. But third parties are working on conversion tools, for example a TU Delft team working with Maya [11]. Secondly, the critic that Second Life does not support engineering viewpoints can be put in another perspective if we think about the fact that it is still very common for civil engineers to use hardcopy maps of the site, without any engineering knowledge.

This brings us to rumours that might be very relevant for the subject of this paper: rumours say that Google will launch an environment in the near future that combines the functionality of environments such as Second Life with Google Earth [12]. This environment is referred to as Second Earth. It would mean that you could design and build new structures and place them in real life sites...

Whether this is soon going to happen is unclear to us. In any case, we foresee good opportunities for collaborative design in virtual environments such as Second Life, both for practice and education. Maybe not so much for detailed sophisticated 3D-models, nor for engineering analyses and simulations, but indeed for small collaborative design studies with emphasis on communication and collaboration among the design team members. More specifically, we hope to develop a design course at our faculty in which we let our students develop a design in Second Life in the coming months.

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