

Cooperative virtual worlds—a viable eCollaboration pathway or merely a gaming trend?

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Abstract With research and technology advances in networking and computer graphics, cooperative virtual environments (CVEs), 3D virtual worlds, which can be used by multiple persons that are represented in the virtual world through avatars, are becoming increasingly popular. In this short position paper we discuss whether or not CVEs are a lasting phenomenon with impact on eCollaboration practice and CSCW research or just an isolated phenomenon in the gaming community. In doing so, this paper outlines four application areas that CVEs are successful in (games, leisure, education, business) and presents opportunities, risks and research challenges that are associated with using CVEs as eCollaboration tools.

Keywords CSCW · Cooperative virtual worlds

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Virtual worlds—a current technology trend

As of today, by far most the prevalent application area for CVEs is *gaming*. In fact, the market for computer games without 3D visualization and some kind of group function (be it competitive or cooperative) has become almost non-existent. So-called MMORPGs (Massive Multiplayer Online Roleplaying Games) like World of Warcraft, to

name just one of the successful systems, draw millions of gamers. According to a press release of Blizzard Entertainment in December 2008, World of Warcraft alone is being used by more than 11.5 million (monthly paying!) users.¹ This system is an ideal-type example of a cooperation system: players have to coordinate and even need to work together in order to succeed. The cooperative and social aspects of the game and in particular its longer-term player associations (guilds) contributed in a major way to its success (Ducheneaut et al. 2006; Ng and Wiemer-Hastings 2005).

Apart from gaming, another prominent application area for CVEs is *recreational and social usage*. Second Life is a well-known example of this genre, and with approximately 1 million logins per month² (as of August 2009) most likely the one with the largest user base. A big difference between 3D games and recreational/social CVEs like Second Life lies in the missing explicit goals for users that operate the recreationally oriented environments. While Second Life provides users with a lot of options for creating content and for communicating with others, a central “mission statement” or a process or rule specification (who can/must do what when?) is missing in this system that calls itself “an online, 3D virtual world imagined and created by its inhabitants”.³

Another major field of study and application for CVEs is *education*. Second Life alone triggered various studies about the use of virtual campuses (Livingston and Kemp 2006). Moreover, a considerable number of CVEs exist that were specifically designed for use in education, such as

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¹ <http://eu.blizzard.com/en/press/081223.html> (accessed August 25, 2009)

² <http://secondlife.com/statistics/economy-data.php> (accessed August 25, 2009)

³ <http://secondlife.com/> (accessed August 25, 2009)

Fig. 1 A virtual meeting in Qwaq Forums. source: <http://www.qwaq.com/>



Whyville⁴ with its more than 4 million users (Mayo 2009). A number of colleges and educational researchers have already begun using CVE platforms to facilitate online lectures and to investigate the pedagogical usefulness of this novel medium. Educational use of CVEs has a lot of potential, since CVEs can be applied to facilitate educationally beneficial group discussions and at the same time provide 3D visual representations that are better suitable for certain complex topics (e.g., think of molecule structures in chemistry!).

Finally, a number of companies have recently started using or developing CVEs for *business* purposes, including online sale and meeting support. While major advantages in sales through this new medium, as compared to traditional web shops, have not been reported yet, it is at least interesting to notice how many companies from different fields, as varied as IBM, ABC.com, Toyota and Deutsche Telekom (and many more), are early adopters of this technology and how they use it to promote their products. In addition, initiatives such as the Croquet/Cobalt platform,⁵ a virtual workspace browser and construction toolkit for accessing, creating, and publishing hyperlinked multi-user virtual environments, the “MPK20/Project Wonderland” initiative⁶ by Sun Microsystems, aimed at supporting virtual meetings and sharing applications, or the Qwaq Forums, an explicitly business-oriented 3D cooperation space, illustrate the trend towards using CVEs for business and work applications. Figures 1, 2, and 3 illustrate some typical cooperation scenes—from whiteboard discussions to round-table meetings and application sharing—and how they look in different CVEs.

What are implications for eCollaboration practice and CSCW research?

Overall, the basic enabling CVE technology exists by now, and the apparent trend towards using it for a variety of

⁴ <http://www.whyville.net/smmk/nice> (accessed August 25, 2009)

⁵ <http://www.duke.edu/~julian/Cobalt/Home.html> (accessed August 25, 2009)

⁶ <https://lg3d-wonderland.dev.java.net/> (accessed August 25, 2009)

purposes and application areas can hardly be ignored. Against this background we need to take a look at opportunities and risks associated with using these environments as eCollaboration tools. While a comprehensive answer to this is beyond the scope of this paper (and, as we shall argue, will involve a great amount of research), there are some benefits and downsides of CVEs as cooperation tools—some more or less obvious, others the result of systematic investigations—that are worth mentioning here.

On the positive side, it almost goes without saying that a use-case for CVEs lies in the support of group tasks where a 3D spatial design is the result of a work process or at least important for it, such as for 3D CAD applications. Besides task-specific aspects where the 3D visualization might play out its advantages, another plus of CVEs, when compared to text and audio based communication, is the additional communication channel they offer. In CVEs, it is possible to use gestures (e.g., to point to certain artefacts in the world), to move around in the world (thereby generating awareness information about “who is doing what”), and to express emotions through the avatar (e.g., Fabri et al. 1999). Most of these functions are principally feasible with other communication tools, in particular with video communication, as well. Yet, one can argue that CVEs have the additional benefit of preserving privacy and user control in a better manner since the avatar only exhibits the characteristics that the user explicitly wants (compared to a video communication, where also undesired emotional expressions are transmitted). Also, CVEs are applicable for more situations than video based tools: the virtual world can, for instance, serve as a scenario within which a team “practices cooperation”—an ideal solution if training scenarios might be too expensive, too dangerous or even impossible to conduct in the real world (think of medical training or training for dealing with large emergencies!).

A further advantage of CVEs is that experiences, in particular from the games sector, suggest that many people enjoy using CVEs, as cooperating via rich 3D worlds seems to be motivating for many users (Ducheneaut et al. 2006). Beyond this, research results show that indeed these systems have some unique credentials that make them



Fig. 2 A round-table discussion in Second Life

valuable as eCollaboration tools. Many of these are related to social factors. For example, Vasalou et al. (2007) have shown that customizable avatars lead to a stronger identification of the users with the avatar and also to a stronger bonding with other participants (as compared to a text chat), which of course is an effect that is welcome in most eCollaboration scenarios.

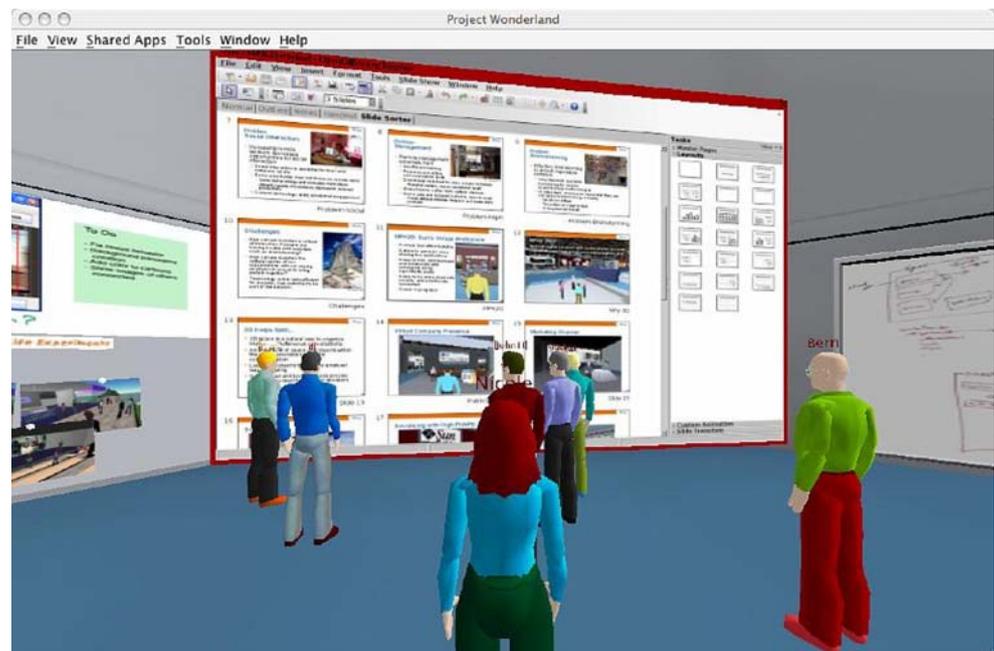
But, clearly, CVEs are not the one-size-fits-all eCollaboration solution. For many group tasks, the rich CVE-typical interaction options with other users and with the spatial environment might just be breaking a butterfly on a wheel. If the group task is, for instance, to jointly write a text document, where then is the additional benefit of a CVE as compared to a simple collaborative text editor? In fact, the

richer interface might even hurt group performance by making irrelevant information salient and thereby distracting and confusing users. This is not to say that CVEs do not have *any* application potential in this case (e.g., for coordination and awareness provision); it is just that it is not self-evident. In addition, the required training time for getting users “up to speed” with CVEs is considerably larger than with using conventional user interfaces. If, especially in professional usage contexts, people do not perceive an immediate value of this different interaction technique that requires some time and effort to get started with, CVE technology might face an acceptance problem that could effectively hinder their wide-spread adoption. Finally, with CVEs becoming (hypothetically) more ubiquitous and interoperable (which seems a likely direction of technology evolution), one other problem might emerge. Research has already shown that interacting in CVEs is part of the wider problem of Internet addiction and that a growing number of people are getting addicted to the Internet and in particular to online games (Ng and Wiemer-Hastings 2005). If, with more pervasive CVE technology, the favorite online game is always “just a teleport away”, this might turn out to increase this addiction problem.

Where is this journey headed?

Cooperative virtual environments are not entirely new. They have a tradition of (almost) 20 years, starting with the Distributed Interactive Virtual Environment system (Hagsand 1996), which has been continuously developed

Fig. 3 Discussing presentation slides in Project Wonderland. source: <http://blogs.sun.com>



since the early 1990s. However, as can be seen with systems like Qwaq and Project Wonderland, CVEs are gradually becoming “grown up”, with technology getting more stable and reliable, ready for professional usage. We believe that CVEs can indeed become a prominent piece in the eCollaboration toolset—much more than they have been so far. The variety of systems that enter the market in different application areas including leisure, learning and business is impressive, their potential for supporting cooperation is evident, and some investigations have already confirmed aspects of the utility of cooperating via 3D virtual worlds.

However, a cohesive body of research is still missing. We see open challenges in relation to at least four areas. First, there is a lack of systematic empirical research investigating the risks and chances of the new options that CVE technology offers within collaborative work contexts. Future questions include, but are certainly not limited to the following: For which classes of group work can CVEs prove to be efficient, where do the rich interaction options that they offer actually make a difference in practice? While in recent years some findings have been presented in this regard, the “big picture” is still largely missing. Second, the potential of CVEs as eCollaboration tools could even be enhanced if the input channel to the CVE was richer than just keyboard and mouse (plus, potentially, audio) based. Recognizing gestures and facial expressions of the user and projecting them into the virtual world through the avatar is generally feasible today—but this technology needs to be advanced and the full potential of this interaction technique needs to be explored through ongoing CSCW research. Taking this point further, the connection of CVEs to the real world towards “mixed reality” systems that bridge between physical and virtual objects and thereby enable entirely new forms of cooperation (in mixed presence/remote settings, connected via CVEs) is an open challenge—one that the European Union explicitly mentions in the Information and Communication Technology theme of their current work programme. Third, speaking in terms of performance, there are still some technology issues that need to be dealt with. Despite advances in graphics and networking that have made CVEs accessible to many people, the system requirements of many existing CVEs (especially the non-gaming ones) are still beyond the “standard office PC”. This

probably needs to be changed for achieving a real widespread usage of CVEs as eCollaboration tools. Finally, beyond basic HCI-related research and technological advancement, one open issue is concerned with the adoption of CVEs in organizations. While there is some notable progress (e.g., IBM and Hewlett Packard are currently using Qwaq Forums in some pilot projects), it is not generally clear what needs to be done for CVEs to make inroads into the everyday work practices of users. Probably one of the most crucial aspects to deal with is privacy. While CVEs tend to become more and more immersive, the resulting higher identification of the users with their avatars may be problematic: If the avatar mirrors the user very closely, this may easily lead to providing too much awareness and visibility of what one is doing, in light of the appropriate level of privacy in everyday workplace settings. On the other hand, if users model avatars in ways very different to their own characteristics than this might compromise the very purpose of applying CVEs in work-group settings—to closely remodel real-life interactions among real people. Here, creative approaches to retaining privacy while not generally dispensing with the new interaction options of CVEs are still largely missing.

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