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Virtual Worlds and the Transformation of the Web to 3D

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ABSTRACT

The notion that the Web will transform into a three-dimensional space and that an avatar will be involved in our "travels" through this virtual world has been voiced from a range of sources. One such vision is that Second Life or a similar virtual world will grow to become this if a common grid protocol were adopted and anyone who wished could connect a server running a "space" on a compatible engine. This is, of course, very similar to how the Internet itself grew and Linden Labs has taken some steps in the direction of making this a possibility. An alternate path is offered by a new three-dimensional web browser still in beta called ExitReality. Here an attempt is made to render an existing two-dimensional web site in 3D with some thought given to how a site could be made more three dimensional by its owners. As with virtual worlds, an ExitReality avatar representing the person using the browser is incorporated into the experience and it is possible to encounter others surfing three-dimensionally with the browser as well. This paper explores the feasibility, potential, and challenges to creating a three-dimensional Web. The role that rapidly-expanding social networking on the Internet (Facebook, MySpace, etc.) may play, either in encouraging the development of the three-dimensional Web or modifying the vision by making site-localized virtual "rooms" like Yoville or Google's Lively the only three dimensionality attached to sites, is explored. Diffusion of innovations theory is applied to address factors that are likely to affect the adoption of a three-dimensional web and which of the possible paths will be most likely to succeed.

Keywords

virtual worlds, three-dimensional Internet

INTRODUCTION

The notion of a three-dimensional Internet has arisen from a number of sources and circumstances. Crossley, Davies, Taylor-Hendry, and McGrath (1993) envisioned the potential of three-dimensional spaces, in which avatars could move and interact, as having potential in the presentation of information in a spatial organization that would reduce informational overload. With virtual worlds in many cases replacing web sites, they felt three-dimensionality would aid in the use of the Internet as an information source.

Internet, interactive games that were three-dimensional like EverQuest, rather than two dimensional games that simulated three-dimensions by having avatars walk on diagonals like Ultima Online or The Realm, arose in the late 1990s. With the conceptual divide between gaming-company-constructed games and user-constructed content such as web sites, few saw these games as embodying a three-dimensional Internet.

With the rise of player-constructed virtual worlds such as Second Life, the notion of a three-dimensional Internet has been used as a marketing strategy in which organizations are offered new opportunities to promote themselves and their services and products. Through the construction of a region within Second Life, organizations such as the Weather Channel and Dell Computer have marketed their services and products and even provided a company representative as an avatar to talk to should a virtual visitor wish to do so. Besides Second Life, There.com and ActiveWorlds have offered organizations opportunities to construct virtual spaces or regions for promotional and informational purposes.

As to the question of whether the 3D Internet has arrived or not, the situation very much resembles the debate about when the Information Age started. For some, the presence of Internet-accessed virtual worlds means that the 3D Internet is already here. For others, we are only in transition to a 3D Internet, that some coin, Web 3.0, in which virtual worlds will come to

replace web sites in a significant way much as Web 2.0 web sites have replaced older ones that were non-dynamic and non-socially-linked.

Certainly, some of the enthusiasm for interconnected virtual spaces on the Internet stems from the popularity of Neal Stephenson's (1992) book, *Snow Crash*, which coined the term, metaverse, for the Internet-based virtual world in which the adventures of the novel take place. Virtual worlds on the Internet were inspired by this notion of a large other world in virtual space in which human beings interact on their avatars in another reality in part of their own construction. In some sense, the name *Second Life*, plays off the concepts of this novel.

The metaverse concept, however, creates some conflict with alternative visions of a 3D Internet as a mirror world, a mirror of reality as in some sense Google Earth is, or a simple transformation of the existing web sites on the Internet into virtual spaces on the massive Internet grid. Linden Labs decision to minimize content restrictions in users' constructions of virtual spaces opened the door for every flight of fancy and fantasy, some of which many find objectionable. As a result, corporate and educational clients find themselves surrounded by a world that students and clients can at best partially screen out. Current interest in standalone, restricted access virtual work spaces, not publicly accessible on the Internet grid, has been in part fueled by these concerns.

In this paper, we explore the feasibility, potential, and challenges of creating a three-dimensional “web” widely-diffused across the Internet. We examine a range of emerging strategies and different conceptions of what it means to be three-dimensional.

What the important elements of being three-dimensional are varies in a number of ways. Avatars are a key component in most views. The Wikipedia (<http://en.wikipedia.org/wiki>) definition of an avatar is fairly typical – “an avatar is a computer user's representation of himself/herself or alter ego, whether in the form of a three-dimensional model used in computer games, a two-dimensional icon (picture) used on Internet forums and other communities, or a text construct found on early systems such as MUDs. It is an “object” representing the embodiment of the user. The term “avatar” can also refer to the personality connected with the screen name, or handle, of an Internet user.”

For some, creating avatars that jointly meet on web pages and interact as they move along the bottom of a web page (for example *Weblins* and *RocketOn*) would seem to be taking people into a three-dimensional realm with the Internet. For others, a three-dimensional space in which to move must be provided either through a two-dimensional simulation of three dimensions as in *YooWalk* or in the three-dimensional translation of a web page as with *ExitReality*.

A second view of three-dimensional Internet is the creation of virtual world spaces on a virtual world platform. There are two major possibilities here. In the first, the virtual space world such as *Second Life* would come to replace a web site on the Web or a separate virtual world grid would exist in addition to the Web, although both sites might be intertextual in the sense of making reference to one another. In the other case closely related to the second, virtual worlds might just be an add-on onto social-networking sites much as *Yoville* is on Facebook.

Both Linden Labs and *Active Worlds* appear to have had visions of the three-dimensional Internet growing in the first way as companies and organizations explored marketing and public relations with sims (simulators) or regions offered by the companies. We will discuss recent developments in which the growth of the three-dimensional Internet may instead grow much the way the Internet did with individually-owned virtual space linked on cooperative grids that overtime link up using common protocols.

A third-view of the three-dimensional Internet adds the experience of feeling one is actually in a virtual space. This “virtual reality” approach has been limited and, if the past is telling, may very well remain a novelty.

We will discuss each of the above conceptualizations of a three-dimensional Internet below. Next we will discuss factors which are likely to affect the adoption of the three-dimensional Internet. Finally, we provide our assessment of which of these approaches may be most likely to succeed.

THREE-DIMENSIONAL INTERNET AS WEB BROWSING WITH OTHER AVATARS

One conception of the three-dimensional Internet is web browsing with other avatars. In this conception, an avatar for oneself as well as avatars for others appear on the web page with the possibility of chatting with them and even executing some physical gestures.

The addition of these avatars to web browsing is typically done through an add-on to the web browser. In *Weblins* (<http://www.weblins.com>), which is the simplest of these implementations, avatars appear at the bottom of the browser screen and simply walk back and forth along a horizontal line.

With RocketOn (<http://www.rocketon.com>), a slightly more recent application, greater choices of avatars are offered and avatars can move all over the browser screen. This opens the possibility of drawing attention to a particular part of a web page by walking to the image or link to which one would like to draw attention.

Neither of these implementations is three-dimensional, although one is given an illusion of a shared space into which one can enter. ExitReality (<http://www.exitreality.com>) parts company with the two previous applications in actually creating a three-dimensional space in which avatars move. The implementation of three dimensions is accomplished not through a browser plug-in but rather through a new browser. On logging in, one enters a number of virtual world regions designed to give maximal three-dimensional effect. By entering the URL of an actual web site, one is taken to a three-dimensional space that displays some of the key graphics of the web site and offers page links as “clickable” objects in the three-dimensional space. Much of the space is filled with objects providing links to frequently-used web locations.

Another approach to simulating web browsing has been taken by YooWalk (<http://www.yoowalk.com>) in which three-dimensional space is simulated in two dimensions. Here avatars walk down “streets” with web sites as buildings and use “elevators” to go to different street levels. This is not web browsing but the avatar is given the option of creating a home and commercial web page owners may design buildings, the interior of which, provides access to different parts of the web site through clickable images. A three-dimensional Internet can only be rebuilt here through constructing a new spatially-laid-out environment that provides access to the conventional Worldwide Web.

What is difficult to assess for all these approaches is the impact that a large user base will have on how the implementation works. Avatar overcrowding may turn out to be a significant limitation even for high-traffic sites which switch users to alternate servers as load becomes heavy.

Only ExitReality is a serious implementation in a true three-dimensional sense. Here, however, the creation by the browser of a three-dimensional space corresponding to the two-dimensional page is quite primitive and doubtful in being able to actually aid the web surfer in handling information.

THREE-DIMENSIONAL INTERNET GRIDS AS TRULY THREE-DIMENSIONAL WORLDS

Most conceptions of the three-dimensional Internet focus on virtual worlds constructed through linking simulators of virtual spaces running across a grid of interconnected servers. Two of the largest virtual worlds (Active Worlds (<http://www.activeworlds.com>) and Second Life (<http://www.secondlife.com>)) have presented themselves as the three-dimensional Internet. Indeed, a Google search of “3D Internet” retrieves an entry for Active Worlds with the declaration of “home of the 3D Internet.”

The conception of companies like Second Life owner, Linden Labs, and Active Worlds has been that organizations and companies would purchase regions within their virtual worlds which would be custom-designed for promotion and marketing, if not direct sales. There.com (<http://www.there.com>), another virtual world, has also had some limited commercial exploration, notably by Coca Cola. Even virtual worlds that are still in beta such as Kaneva (<http://kaneva.com>), already have some commercial clients of this sort.

The resulting three-dimensional space might be a recreation of an actual physical site of a company or organization or an innovative layout of a space relating to different areas of information. The space might very well include, as was true for a while with Coldwell Banker in Second Life, an avatar representative of a company to field questions from visitors.

As Au (2008) has noted in his history of Second Life, the success of these spaces has been disappointing. Such spaces often receive little inworld traffic and become relatively “dead” zones. Without visitors, the marketing and public relations potential of such spaces is minimal.

It is not that virtual worlds have not grown. Second Life, in spatial terms, is about the size of greater metropolitan San Francisco and continues to grow. However, the growing pains and the nature of the population makeup of the virtual worlds create challenges of their own. At the time of the writing of this paper, Second Life was encountering repeated problems with asset and login servers as the population in the virtual world at times of day exceeded 72,000. Hardware may provide significant limits to the reliability of Second Life unless a new design is implemented.

Also, the large population of Second Life and the minimal content censoring policies of Linden Labs has resulted in large areas in which pornography and other objectionable content are encountered. Some organizations and companies find themselves wanting to dissociate from these aspects of Second Life.

Recognizing the limits that a single grid run by a single company might have on the growth of virtual world grids as the implementation of the three-dimensional Internet, the growth model for the Internet has been seen as being the means by

which this conceptualization of a three-dimensional Internet, a possibility that Linden Labs has itself realized as documented by Au (2008).

With open-source virtual space simulators running on different servers connected to grids that in turn are interconnected, a situation is created that could allow an explosion of growth that characterized the rise of the Internet. The two primary issues here are portability of avatars across the virtual spaces and enough commonality in the avatar viewer (client) software to be able to interact across a range of virtual worlds.

All eyes were on Linden Labs in 2007 when the Second Life viewer (client) was open-sourced (Official Second Life Blog Announcement, July 8, 2008), allowing the possibility of the design of alternate Second Life viewers but also, through the open sourcing of some Second Life software libraries, a peek into the internal workings of the server software itself. Linden Labs surprisingly followed with an announcement of its intentions to open source the actual server software as well concerning which they have subsequently changed their minds due to possible implications on Second Life security, in-world economy, and protection of intellectual property of Second Life users.

A surprise was the emergence of OpenSimulator (<http://www.opensimulator.org>), open-source server software designed by Adam Frisby in 2008, which implemented many features identical to those in Second Life. This triggered the emergence of another Second-Life-like grid run by a company under the name Openlife (<http://www.openlifegrid.com>) as well as the emergence of a number of grids like OSGrid and Frisby's own DeepGrid in which individuals installed the server software to offer their own virtual world space on a server they provided.

In late 2008, initiated by interest from major Second Life customer, IBM, a successful test was run demonstrating that the Second Life grid could be successfully connected to a grid based on OpenSimulator to allow movement of avatars across grid boundaries (Official Second Life Blog Announcement, July 8, 2008)). The possible potential for OpenSimulator to become the standard platform for the development of the three-dimensional Internet was certain. But there have been some unexpected challenges, such as RealXtend (<http://www.realxtend.org>) taking advantage of the open source nature of OpenSimulator to create its own modified version which enhances the ability to create custom avatars. Clearly, RealXtend is bidding to become the particular "flavor" of OpenSimulator that might be more appealing.

OpenSimulator software, however, is now only in alpha status and lacks many of the key features of the Second Life server implementation (voice, multimedia server, etc.). While OpenSimulator developers hope to take the server software in directions that will exceed the capabilities of Second Life, such as a wider choice of scripting languages, the software is highly unreliable. Of course, the software can be installed on a privately-owned server or even a home computer and can be connected to a free grid, so in terms of cost this seems to be an attractive alternative to land purchase in Second Life and monthly maintenance fees.

It is, however, still not clear whether another open-source server platform might yet dominate growth in the area. At the moment, Duke University's Croquet (<http://www.opencroquet.org>) and Sun Microsystems' Wonderland (<https://lg3d-wonderland.dev.java.net/>) are both open-source server code for creating virtual spaces but neither of these is particularly oriented toward building large worlds by connecting servers on a grid. IBM's intention to develop its own virtual world server software may hold a major surprise. Platforms such as the Olive platform on which There.com runs and which is the basis for work spaces designed for clients by Forterra (<http://www.forterrainc.com>) will be no threat to OpenSimulator so long as they are not made open source.

THREE DIMENSIONAL INTERNET AS ADD-ONS TO SOCIAL NETWORKING SITES

Much of the traffic on the Internet these days is focused on social networking sites such as MySpace and Facebook and even sites such as Google have added social networking features such as chat rooms and interactive media. Virtual worlds in these cases are likely to be integrated off of the web pages of the social-networking site and can be implemented as Adobe FLASH applications.

For FaceBook there are presently two virtual worlds run as add-ons off the Facebook web site. These are Yoville (<http://apps.facebook.com/yoville/>) and Vivaty (<http://www.vivaty.com>). Of the two, Yoville has the more child-like avatars and is less social-activity-oriented than Vivaty which takes the user to dance locations. In a sense, Google's Lively (<http://www.lively.com>) back as New Lively after protests over scuttling it, belongs in this genre as well.

In this conceptualization of the three-dimensional Internet, virtual worlds take a back seat to the social networking web sites themselves. For those enthused with the potential of virtual worlds, this secondary role is likely to be seen as disappointing.

THREE DIMENSIONAL INTERNET AS SENSORY EXPERIENCE

The notion of visually experiencing a virtual reality has appealed to electronic gamers for many years and has tempted movie goers with 3D glasses from time to time. Working through an avatar from first or third person view is very different than an experience of three dimensional depth or feeling surrounded by a perceptual field.

Google's exploration of a three-dimensional visor (Google Goggles) in 2007 tied with a three dimensional world space (3DLife) has seemingly fizzled out (<http://www.internet3D.org>). Physical spaces that project three dimensional imagery around a person like Elumens Visionstation or the University of California's StarCave virtual world are other virtual reality experiments (<http://www.internet3D.org>).

If the past success pattern of virtual reality devices predicts the present and future, then virtual reality devices are not likely to be a major component of the three-dimensional Internet.

THE ADOPTION AND DIFFUSION OF THE THREE DIMENSIONAL INTERNET

The growth of the three-dimensional Internet depends on a dual diffusion process in most visions of how it would develop. Virtual worlds are an innovation which may or may not succeed in widespread adoption. With the exception of approaches that just use existing Internet pages or that attempt to map existing pages into a three-dimensional space like ExitReality, the successful growth of the three-dimensional Internet depends on the creating of three-dimensional spaces as well as growth of a consumer audience that wishes to enter the space. There are different factors that are likely to affect the adoption/diffusion of a three-dimensional Internet by both groups, although long-term successful diffusion is critically affected by the adoption by consumers.

We discuss the likely factors affecting diffusion and adoption of three-dimensional Internet from a number of perspectives using diffusion of innovations theory. Using a perspective on diffusion which emphasizes the role of mass and interpersonal communication, Everett Rogers (1962) has proposed that the perceived attributes of an innovation are likely to affect the extent of diffusion and adoption. These are: relative advantage, compatibility, trialability, observability, and complexity. As an alternative, Brown (1982) has offered a market and infrastructure perspective which sees diffusion at the consumer level limited by market and infrastructure. Grant (2004) has suggested a more comprehensive examination of diffusion factors in terms of the four groupings: prohibiting, inhibiting, enabling, motivating and in terms of five levels of influence: hardware, software, organizational infrastructure, social and individual users.

In discussing Rogers' perceived attributes of an innovation, it is important to note what people believe about virtual worlds may be more important than what is actually true. Trialability is the ability to experiment with virtual worlds without great risk. For those who potentially might consider trying out constructing a virtual world space and experimenting with its uses, the emergence of open source versions of server code increases both the perceived and actual trialability, since costs are greatly reduced by not paying for virtual land and maintenance and not entering into a binding contract. Complexity, how difficult an innovation is seen as being to use, whether perceived or real, is an issue in that the open source code is constantly in flux and documentation is often poor. For commercial applications, relative advantage, the perceived advantage of adopting the innovation, is likely to depend on the perceived gain access to potential customers.

For consumers, the browser approach to the three-dimensional Internet is likely to appear the least complex and would seem to have an edge. Indeed, the learning curve in virtual worlds like Second Life seems to discourage many would-be users. Relative advantage of using virtual worlds for consumers is likely to hinge on the experience being fun or in giving access more easily to information or goods and services that are desired. Observability, the ability to observe others using the innovation, gives an edge to the social network site implementation since one can see which virtual worlds friends on the site are enrolled in.

Brown's market and infrastructure perspective reminds us that marketing and infrastructure affect whether or not people can adopt an innovation. Much of the emerging virtual world innovations are being created only on the Windows computing platform, shutting out Macintosh and Unix users. High speed Internet connection is essential for applications like Second Life and OpenSimulator, a service which may not be available to some potential users. Younger consumers are also more likely to be exposed to marketing of the three-dimensional Internet through greater use of the Internet than older individuals and through youth-oriented sites that are likely to promote such applications.

Grant's umbrella model draws attention to a broad range of factors. A prohibiting factor for widespread creation of virtual worlds that are designed by companies and organizations as well as innovative individuals is the greater hardware demands that are required to run a virtual space on a server. These demands are much greater than what is required for web pages.

(NOTE DO NOT INCLUDE AUTHOR NAME IN THE REVIEW VERSION – REVIEWS ARE BLIND)

Most web hosting accounts cannot be used to run a virtual world server like OpenSimulator, particularly if considerable demand occurs through traffic to the space. It has been suggested that cloud computing may offer a solution to the much greater demands that a three-dimensional Internet will place on Internet hardware. Patent challenges to the implementation of the three dimensional Internet may soon be seen made the challenge recently seen to virtual worlds in general (Virtual Worlds News, Dec. 29, 2008). The emergence of a viable open source virtual world platform like OpenSimulator likely will enable more widespread and innovative experiments with virtual worlds as modification of the code goes forward.

Motivating factors will depend on genuine advantages to using the Internet in a three-dimensional mode. The notion of Crossley et al. (1993) that three-dimensional spaces reduce information overload as compared to web pages has yet to be demonstrated in a compelling way. Notions of a three-dimensional Internet as increasing interpersonal contact with company representatives seems to run counter to trends to automate human interaction through web interfaces and recorded phone systems. Perhaps, if navigating the Internet and at the same time meeting and interacting with people comes to be seen as attractive, a new motivation will emerge.

Of all the visions of how the Internet might become three dimensional, strategies like that of ExitReality may long term have an edge in that much of the work is done by a browser. If sites could optionally be designed to enhance this three-dimensional viewing, then a gradual process could occur in which increasing three-dimensionality happened over time. The alternative view of virtual spaces connected on interconnected grids will likely require greater incentives to succeed.

Summary and Conclusion

We have discussed a number of different conceptualizations of what it would mean for the Internet to be three-dimensional. Widespread belief in the genuine advantage of a three -dimensional Internet seems essential. While the door has been opened by OpenSimulator for innovation and low-cost experimentation with virtual worlds either standing alone or connected on a grid, it may be the case that a three-dimensional browser that, to a greater or lesser degree, displays web sites as three-dimensional may very well have the greatest likelihood of succeeding.

These projections may all possibly be upset by unexpected innovations from either IBM or Google, both of which are actively-involved and genuinely-interested in the potential of virtual worlds. While Lively seemed an embarrassment for Google, Google Earth as the basis for virtual world platforms could have a profound effect if people are more drawn to mirror world spaces than the unlimited spaces created by human imagination in Second Life.

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