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TOWARDS: 3D INTERNET

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Abstract: In today's ever-shifting media landscape, it can be a complex task to find effective ways to reach your desired audience. As traditional media such as television continue to lose audience share, one venue in particular stands out for its ability to attract highly motivated audiences and for its tremendous growth potential the 3D Internet.

The concept of '3D Internet' has recently come into the spotlight in the R&D arena, catching the attention of many people, and leading to a lot of discussions. Basically, one can look into this matter from a few different perspectives: visualization and representation of information, and creation and transportation of information, among others. All of them still constitute research challenges, as no products or services are yet available or foreseen for the near future. Nevertheless, one can try to envisage the directions that can be taken towards achieving this goal.
People who take part in virtual worlds stay online longer with a heightened level of interest. To take advantage of that interest, diverse businesses and organizations have claimed an early stake in this fast-growing market. They include technology leaders such as IBM, Microsoft, and Cisco, companies such as BMW, Toyota, Circuit City, Coca Cola, and Calvin Klein, and scores of universities, including Harvard, Stanford and Penn State.

KEYWORDS: 3D, WEB, USER INTERFACE, VISUALIZATION, NAVIGATION, REAL-TIME.

I. INTRODUCTION

The Internet is evolving to become the de-facto cyberspace or virtual environment facilitating communication, business, and entertainment on a global scale. On the other hand, met verses or virtual worlds such as Second Life (SL) or World of War craft (WoW) are much younger when compared to other Web technologies. Today, the success and momentum of virtual worlds are undeniable. The market for MMOGs is estimated to be worth more than one billion US dollars and such metaverses are fast becoming "significant platforms" in the converged media world according to some analysts. Virtual worlds are increasingly seen as more than game and interpreted within a business context rather than entertainment. The view that met verses will play a significant role in the future is shared by many researchers and professionals in the field. Among them are the participants of the metaverse roadmap (MVR) who aim to Explore multiple pathways to the 3D enhanced web [2], the Croquet Consortium [1], as well as the VRML and X3D communities. We envision a 3D Internet which will be to 2D graphical user interface (GUI) and Web of today what 2D GUI and World Wide Web (WWW) were to command line interface (CLI) and gopher two decades ago. While the concept seems incremental in the sense that it merely adds 3Dgraphics to the current Web, it is in fact revolutionary for it provides a complete virtual environment that facilitates services, interaction, and communication. From this perspective, the 3D Internet can be seen as the evolutionary end point of ongoing efforts such as Web 2.0 and Semantic Web. Our objective in this paper is to define the 3D Internet concept and discuss why it is a goal worth pursuing, what it does entail, and how one can realize it. Along with its enormous potential the 3D Internet also opens many research challenges in order to become a reality. Metaverses have recently caught the attention of gaming, advertisement, 3Ddesign, and performing arts communities among others. However, it is difficult to claim that the same level of interest has been raised in the areas of networking, machine earning, and distributed computing. Without overcoming these engineering challenges and making a business case to stakeholders the 3D Internet is destined to be an academic exercise and remain in the realm of science fiction; a fate experienced by many initially promising concepts such as artificial intelligence or virtual reality. We discuss in the next section why stakeholders such as communication and computing companies, research institutions, and online businesses should be interested and participate in the 3D Internet. In Section 3, we present an example architecture as a starting point for the 3D Internet. Section 4 summarizes the engineering challenges and explores research directions in various fields. The paper concludes with remarks in Section5.

II. 3D INTERNET: WHY?

One of the often heard arguments against the 3D Internet is in the form of the question "why do we need it?" For most of its users the Internet is a familiar, comfortable medium where we communicate with each other, get our news, shop, pay our bills, and more. We are indeed so much used to and dependant on its existence that we don't think about its nature anymore just like we do not think about Ohm's law when we turn on the lights. From this perspective what we have, i.e. the 2D version, seems "sufficient" and the 3D Internet is yet another fad. However, if we stop and think about the nature of the Internet for a moment we realize that it is nothing but a virtual environment (cyberspace) where people and organizations interact with each other and exchange information. Once this fact is well understood, the question can be turned on its head and becomes "why do we restrict ourselves to 2D pages and hyperlinks for all these activities?"

Navigating hierarchical data structures is often cumbersome for large data sets. Unfortunately, the Internet as we know is organized as a flat abstract mesh of interconnected hierarchical documents. A typical 2D website is an extremely abstract entity and consists of nothing but a bunch of documents and pictures. Within the website, at every level of the interaction, the developers have to provide the user immediate navigational help. Otherwise, the user would get lost sooner or later. Since this is a very abstract environment, there is no straightforward way of providing a navigation scheme which would be immediately recognizable to human beings. The situation is not any better when traveling between websites. Although the domain name system is somewhat helpful, using the web today is no different than reading a telephone directory. Given the current situation the term web surfing is rather appropriate as we have no control over where the web takes us with the next click. This has profound implications such as the reliance on back button in browsers which tantamount to admitting that navigating on the web is no different from a random walk. Another consequence is the emergence of search engines as a fundamental element of the Internet. It is no surprise that Google is the most powerful Internet Company of our times.

There is actually a much better alternative way of organizing data which everybody knows and uses. We spend all our lives in a 3D world navigating between places and organizing objects spatially. We rarely need search engines to find what we are looking for and our brains are naturally adept at remembering spatial relationships. Let us consider the following fictitious scenario on the 3D Internet. Instead of a flat 2D desktop I can put my documents on my desk at home, where documents, desk, and home are "virtual" entities that are 3D representations of real-world counterparts with spatial relationships. Later, when the need of finding these documents arises, there is a high probability that I can easily remember their location without resorting to additional processes such as search engines or a "recent documents" folder.

Obviously, it is very difficult -if not impossible- to realize this scenario on the current Internet. We are there like 2D creatures living on flat documents not knowing where we are or what is next to us. We teleport constantly from one flat surface to another, each time getting lost, each time asking for directions or help. In contrast, the ease of use and intuitiveness of 3D GUIs are an immediate consequence of the way our brains work, a result of a long evolutionary process ensuring adaptation to our world. Although the 3D Internet is not a solution to all problems, it provides an HCI framework that can decrease mental load and open doors to rich, innovative interface designs through spatial relationships. Another important point is the Web place metaphore of the 3D Internet which enables interaction between people in a natural way. In this sense, the 3D Internet can be seen as a natural successor of Web 2.0.

The metaverses such as SL can be considered as pioneering precursors of the 3D Internet. Yet, they already indicate its significant business opportunities. Not only existing online businesses would benefit from the inherent interactive nature and spatial HCI paradigms of the 3D Internet but also a whole range of businesses such as fashion, real estate, and tourism can finally start using the Internet effectively. We expect that the possibility of providing faithful 3D representations of products and services will have revolutionary effects on online business to business and business to customer commercial activity. From virtual "try before buy" to "interactive shopping" the commercial potential of the 3D Internet is enormous.

III. 3D INTERNET: WHAT?

3D Internet shares the time-tested main principles and underlying architecture of the current Internet as well as many semantic web concepts. The operational principles the 3D Internet shares with its predecessor include open and flexible architecture, open protocols, simplicity at the network core, intelligence at the edges, and distributed implementation. We adopt here the terms universe, world, and web place as 3D counterparts of WWW, website, and sub domain, respectively. We describe each component's functionality briefly below:

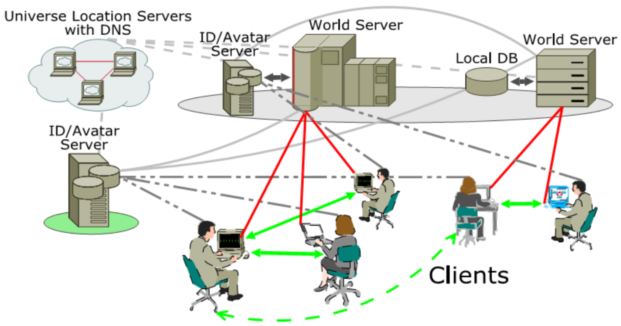

Figure 1. A Graphical depiction of the proposed 3D internet architecture.

A. *World servers*:

Provide user- or server-side created, static and dynamic content making up the specific web place (3D environment) including visuals, physics engine, avatar data, media, and more to client programs. A world server has the important task of coordinating the co-existence of connected users, initiating communication between them, and ensuring in-world consistency in real time. They may also facilitate various services such as e-mail, instant sagging, and more.

B. *Avatar/ID servers*:

Virtual identity management systems containing identity and avatar information as well as inventory (not only in world graphics but also documents, pictures, e-mails, etc.) of registered users and providing these to individual world servers and relevant client programs (owner, owner's friends) while ensuring privacy and security of stored information. Avatar/ID servers can be part of world servers.

C. *Universe location servers*:

virtual location management systems similar to and including current DNS providing virtual geographical information as well as connection to the Internet via methods similar to SL url. They can also act as a distributed directory of the world, avatar servers and users.

d) Clients:

Browser-like viewer programs running on user's computers with extensive networking, caching, and 3D rendering capabilities. Additional components of the 3D Internet include web places (replacing websites) and 3D object creation/editing software, i.e. easy-to-use 3D modeling and design programs such as Sketch-Up and standardized mark-up languages and communication protocols. Emergence of new software and tools in addition to the ones mentioned should naturally be expected.

IV. 3D INTERNET: HOW?

A. *Networking and Distributed Computing*

The conventional web caching approaches will not be adequate for the needs of the 3D Internet environment consisting of 3D worlds, which may be hosted on different servers. One challenge stems from the fact that avatars contain significantly more information about the user who is visiting a 3D world than cookies do about a 2D web site visitor. For instance, avatars contain information about appearance (e.g. height, clothing) and behavior (e.g. visible, open for conversation). As avatars move between worlds, caching will be needed in server-to-server interactions to enable fast and responsive transition between worlds. This will be intensified by avatars carrying objects (e.g. a bicycle) or virtual companions (e.g. a virtual dog) with them, which will require the transfer of large volumes of information in a short time when changing world.

Another challenge is related to the fact that some virtual objects or companions are essentially not static documents but running programs. They have code that defines how they react to certain inputs, and they have a partly autonomous behavior. Thus, when an avatar and its companions move to a world, the world server (or servers) needs to execute the corresponding code. This raises a number of interesting research problems: how can we safely run potentially untrusted code (for instance, when the virtual companions are user-generated and custom built)? How will the economics of such transactions be handled? How can we move running code between different world servers without fatally disrupting its execution? Platforms will be needed that allow the dynamic deployment of potentially untrusted computation at globally dispersed servers, in a fast, secure and accountable manner [6].

B. *Latency Minimization*

As the 3D Internet will increase the reliance on graphics and Inter activity, it will be crucial that the latency that client observe when interacting with servers is minimized. It has been known from existing implementations such as SL that high latency incurs low responsiveness and reduced user satisfaction. Therefore, the network has to be designed intelligently to overcome these challenges.

We propose a hybrid peer-to-peer (P2P) approach to reduce server load and ensure scalability of the 3D Internet infrastructure. It consists of three types of communications: client to server (C2S), server to server (S2S) and client to client (C2C) each with different latency and bandwidth requirements. C2S communications (see Figure 1 red lines) are bandwidth limited, frequently updated, and synchronous. Location and activity data as well as use of in-world services will spend substantial amount of resources both at the client and world servers. The avatar/ID server-client C2S communications (dash-dotted gray lines) are less frequent and asynchronous. As an optimization, some portion of this communications can be pushed to the backbone by facilitating S2S links between ID and world servers (solid gray lines) triggered by clients and through intelligent caching. Additional S2S communications will also take place on the backbones. The S2S in the case of universe location servers (dotted gray lines) are expected to be relatively low load.

Improving server independent C2C (P2P) communication is one of the main solutions to the scalability problems. One example is the information about avatars in the same space, which can be communicated more efficiently if exchanged directly between the avatars' hosts, instead of through a central server. When the user moves around other avatars can send their information as well as of others within the range in a P2P fashion as depicted in Figure 2. For example, the avatars in circle L1 can send information about the ones in L2 and they in turn about L3 as a dynamic intelligent caching scheme.

C. *Security and Trust*

There is an array of alternatives for enabling the seamless and transparent authentication of users, avatars, and other objects in the 3D Internet world. The *Single Sign On* concept envisages users logging in only once, for example on a web page of an on-line service, and visiting further services or web-based applications without the need to log in again. The user can thus experience an unhindered, seamless usage of services. The key concept behind Single Sign On is federation, denoting the establishment of common references between accounts or identities in different repositories or services. Microsoft Passportas well as several other systems have been developed based on this concept [9]. Earlier on, role based access control (RBAC) had been devised to allow authentication not based on user identities, but rather based on the class (or classes) they belong to. The studies [5,8] are closer to the 3D Internet paradigm as they focus on challenges imposed by applying RBAC to open, large scale systems. Attribute-based access control makes access control decisions based on user attributes and their combinations, allowing more fine-grained access control. Driven by the users' growing privacy concerns regarding the handling of their authentication information, user-centric identity management approaches such as CardSpacehave recently gained popularity. These go beyond the federation concepts to allow individual users to retain full control over their own identity management, without requiring the presence of an external provider.

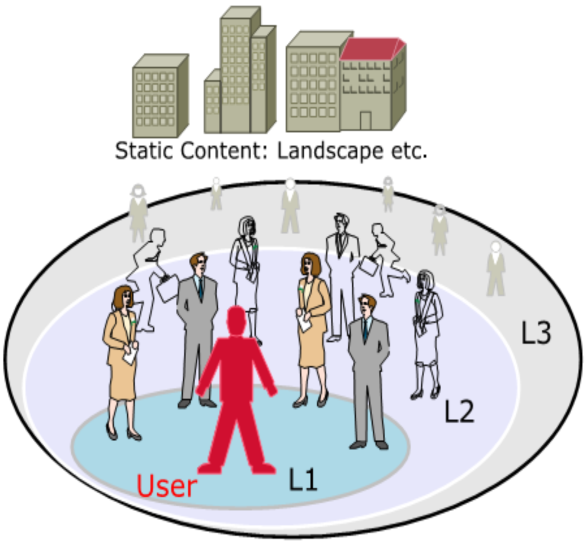

Figure 2. A P2P communication scheme on a world in the 3D Internet.

V. Intelligent Environments

Emerging fields such as ubiquitous computing and ambient intelligence draw heavily from adaptive and intelligent algorithms. They are concerned with computing and networking technology that is unobtrusively embedded in the everyday environment of human users. The emphasis is on user-friendliness, efficient and distributed services support, user empowerment, and support for human interactions. All this assumes a shift away from desktop or portable computers to a variety of devices accessible via intelligent interfaces.

The 3D Internet, which is a virtual ubiquitous computing environment, provides the perfect test bed for developing these ideas and emulating them in realistic 3D settings with real users.

A. Intelligent Services

In the case of the 3D Internet, the concept of intelligent environments naturally extends to underlying communication protocols and enabling services as well as to user centered services. Given its inherent P2P nature, the 3D Internet can make use of paradigms such as intelligent routing where mechanisms being aware of the network topology and information structure allow for flexible and context-dependent distribution of traffic. As in the real world, one could think of adaptive algorithms that control traffic flow depending on the time of day, user-behavior patterns, or a variety of global and local events.

Since the 3D Internet provides an environment that closely resembles the physical world, it calls for intelligent interfaces that extend the conventional desktop metaphors such as menus and sliders. This may include speech- and gesture recognition, but also implies interaction with virtual objects and tools inspired by things existing in the real world. Learning and ambient intelligence on this level will then have to be concerned with typical usage patterns, anticipations

of user activities, and convincing simulations. In terms of user-centered services, it is not hard to imagine applications of machine learning that would facilitate social interaction of users as well as increase usability of core functionalities of the virtual environments on the 3D Internet. Examples of such services are recommender systems for e-commerce or social networking that rely on collaborative filtering. Based on user provided ratings or an analysis of typical usage patterns, goal directed, intelligent searches and recommendations are possible. This of course facilitates personalization of individual users' avatars and improves multimedia-information retrieval.

B. Intelligent Agents and Rendering

In order to increase the users' acceptance of services like the ones just mentioned, they will not just have to be personalized but also be presented and accessible in a way users will consider natural. This leads to the problem of modeling artificial agents and avatars that act life-like and show a behavior that would be considered natural and human-like. First attempts in this direction have already been made in the context of computer games. Here, machine learning has been shown to provide an auspicious avenue. The network traffic generated by a group of people playing a multiplayer game contains all the data necessary to describe their activities in the virtual game world. Statistical analysis of this traffic and a derivation of a generative model there from allows for implementing agents that are perceived to act more human-like. Corresponding approaches can be applied to improve on the quality of virtual clerks and information personnel.

VI. TECHNICAL IMPLICATIONS

A. Speed:

Internet speed is one of the most significant implications that are being faced by the 3D Internet. A research shows that not many countries in the world are in a state to fulfill the internet speeds that are required for the implementation of the 3D Internet. Here, in the below chart we can see the average broadband speed in various countries.

B. Hardware:

Hardware implications are not quite serious implications to be thought of, because the main Hardware implication that we face to implement the 3D Internet is that the display device used to display the images are 2D in nature, but with the inclusion of the 3D internet there would be great difficulty to view the 3D objects in the 2D devices.

VII. SOLUTION

A. Speed:

3G is the *third generation* of tele standards and technology for mobile networking. 3G networks are wide-area cellular telephone networks that evolved to incorporate high-speed Internet access and video telephony. It is expected that 3G will provide higher transmission rates: a minimum speed of 2Mbit/s and maximum of 14.4Mbit/s for stationary users, and 348 kbit/s in a moving vehicle. Hence, with the introduction of the 3G technology, the speed implications involved with the 3D Internet would be solved in the near future.

B. Hardware

Use of 3D goggles is one solution that can be employed to overcome the problem of the Hardware implications. As we know there are various range of 3D goggles available in the market, we can select from these wide variety of 3D goggles. And the cost of these goggles is even very less, so this prospect can be considered in the preliminary stages of the 3D Internet, later on these could be upgraded with the latest technologies which could be used to implement/ display the 3D data.

Use of Vision Station as a monitor / display for the 3D Internet, Vision Station is a computer display technology developed by Elumens that provides 180 degrees of viewing angle for its users. Current computer screens have at most a 50-degree field of view and needs the user to move the controller in order to see the images that are not on the screen. This motion is unnatural because in the real world, users use their peripheral vision to see things beyond the direct line of sight. This new display technology will address this limitation of standard computer monitors.

VIII. OBSTACLES TO COMMERCIAL SUCCESS IN 3D INTERNET

Advertisers, marketers and organizations have yet to capitalize on the vast potential of the 3D Internet. Factors inhibiting the commercial usability of virtual worlds include:

The limited effectiveness of traditional media techniques such as fixed-location billboards when applied to virtual worlds. In the 3D Internet, participants have complete control over where they go and what they do — and can move their avatars instantly through virtual space. What is required is a means for making content readily available to people not only at specific points, but throughout virtual worlds.

Lack of an effective way for enabling people in virtual worlds to encounter commercial content that enhances their virtual experience. Because participants have a choice in whether to interact with an offering, it is essential that it be viewed as relevant and valuable to their particular goals in the 3D Internet.

An inconsistent means for enabling in-world participants to easily interact with and access video, rich multimedia, and Web content.

IX. APPLICATIONS OF 3D INTERNET

A. Education

3D Internet can be used as a platform for education by many institutions, such as colleges, universities, libraries and government entities. There are subjects such as chemistry and English in which Instructors and researchers would favor 3D Internet because it is more personal than traditional distance learning.

B. Religion

Religious organizations can make use of the 3D Internet to open virtual meeting places within specified locations.

C. Embassies

We could create embassies in 3D Internet, where visitors will be able to talk face-to-face with a computer-generated ambassador about visas, trade and other issues.

D. Live sport entertainment

Popular forms of live entertainment could also be placed into the 3D Internet. Many sports allow the users to watch or participate in many popular activities. Sporting leagues like Cricket, Football, Professional Wrestling, boxing, and auto racing could be placed in the 3D Internet for its users to play in the 3D environment.

E. Arts

The modeling in 3D Internet would allow the artists to create new forms of art, that in many ways are not possible in real life due to physical constraints or high associated costs. In 3D Internet artists could display their works to an audience across the world. This has created an entire artistic culture on its own where many residents who buy or build homes can shop for artwork to place there. Gallery openings even allow art patrons to "meet" and socialize with the artist responsible for the artwork and has even led to many real life sales. Live music performances could also be enabled in the 3D Internet.

X. CONCLUSION

3D Internet, also known as virtual worlds, is a powerful new way for you to reach consumers, business customers, co-workers, partners, and students. It combines the immediacy of television, the versatile content of the Web, and the relationship-building strengths of social networking sites like Face book. Yet unlike the passive experience of television, the 3D Internet is inherently interactive and engaging. Virtual worlds provide immersive 3D experiences that replicate (and in some cases exceed) real life.

XI. REFERENCES

[1] http://www.i3dnow.com/3dinternet.php5 http://www.eurescom.eu/message/messageMa...lenges.asp
[2] http://www.activeworlds.com
[3] http://www.computer.howstuffworks.com
[4] http://www.web3event.com
[5] http://www.pcmag.com
[6] http://en.wikipedia.org
[7] http://secondlife.com
[8] http://world.std.com/~walthowe/
[9] http://netways.shef.ac.uk/index.htm
[10] http://www.science.widener.edu/~withers/pyramid.html
[11] ftp://ftp.uwashington.edu/public/Internet