Designing for the spatial context of 3D online communities

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Introduction

This paper considers the issue of designing the spatial context within which 3D online communities can function and evolve. Firstly, the current state of 3D on-line communities is taken into account, particularly focusing on the way space is conceptualised, organised and depicted in them. A series of such communities is studied and analysed and an attempt to identify possible spatial design criteria is made. On the basis of this analysis and relevant work on designing space in Virtual Environments (V_s), a series of suggestions on the way that the spatial context of 3D online communities can be designed and developed are made.

Current state of 3D on-line communities

The idea of on-line communities is almost as old as the concept of computer networks – in one form or another. It was initially implemented asynchronously via ftp, email and Usenet. Soon it was replaced by text based Multi User Dungeons (MUDs) and Multi-User Object Oriented systems (MOOs) to be followed by Internet Relay Chat (IRC) and its proprietary equivalents. As computing power grew, graphic systems' performance improved, networks became faster, better-organised, cheaper and more accessible to lay people, the advents and implications of Virtual Reality gained wider interest. As a result the first interactive 3D environments were created and the concept of community led to the first shared virtual worlds.

3D on line communities can be broadly classified into **scientific/professional** and **entertainment oriented** based on their application area and functionality. *Scientific/professional* ones deal with psychological and sociological research issues as well as computer supported collaborative work (CSCW), teleworking and teleconferencing applications. *Entertainment* online communities are mainly meeting spaces where users gather in shared interest areas (or not necessarily) and interact. The concept of community evolves out of interaction within a context with "*locals*" (residents) and "*newcomers*" (visitors). In reality (no pun intended) the longest running and more successful 3D online communities lack a strong context or theme.

The issue of **user involvement** in terms of form and shape, evolution and development of 3D space

is critical. What possibly motivates people to return and "*inhabit*" the space is the ability to "*buy*" their own land, and built their own space (Alphaworld[1], Cybertown [2], Holodesk [3], etc.) – their 3D homepage.

Interface design and mode of interaction are other important criteria for further classifying existing 3D online communities. Toolbars, menus, heads up display systems (HUDs) are in most cases provided by the software company. Building your own interface tools is usually not supported as well as being both difficult and pointless – having to teach and force visitors to use a different interface model is not an attractive option for most people. Besides, it is questionable whether a coherent spatial experience could be achieved when a visitor has to change modes of interaction when crossing boundaries of continuous areas.

Spatial characteristics of current 3D on-line communities

Spaces in the first 3D on-line worlds comprised of few simple geometrical entities, mainly primitives (cubes, spheres, lines, planes) whereas the "*users*" were represented by upright prisms or T shaped coloured blocks. Nowadays, spaces are more complex yet crude, abstract, full of dubious metaphors, multi-textured billboards and loosely resembling real spaces or science fiction constructs. Users' representations are widely known as **avatars** [4] and range from complex polygon constructs to realistic human models together with behavioural patterns expressed by inverse kinematics gestures. Since this paper deals with the design of space in 3D online communities, avatars and other actors will not be dealt with.

There are very few **structural rules** for organising all spatial units within a 3D on-line community. In Active Worlds (AW), for example, "land for sale" is segmented into orthogonal lots surrounded by roads or other urban features. In order to aid navigation within these worlds, an orthogonal grid system is implemented, enabling co-ordinate based teleportation. Although this grid system aims at making the overall world more coherent and legible, the lack of intentional structure in the other constituent elements of the environment as well as appropriately positioned landmarks results in an often undifferentiated, confusing and disorientating setting.

It can also be suggested that most current online communities (e.g. Active Worlds, Holodesk, Cybertown, etc.) mainly consist of an entry space (Gateway) and several other large (e.g. Teleports in AW) or smaller scale (e.g. Worlds in AW) "chatroom" spaces, which can be accessed by means of menu selection in a 2D interface. Very rarely do visitors experience a continuous overall environment. There is no clear structure and hierarchy in the way that these spaces are conceptualised and organised.

The use of the **3rd dimension** is often ignored in landscape design - most spaces feature simple flat textured floors. It is rare to find a multi level plan structure of a space, even more rare to be able to relate a particular function to these levels. Although these environments are clearly three-dimensional and mainly consist of 3D objects, most browser programs tend to restrict the user to a walk mode with gravity thus limiting the scope for utilising the third dimension to its full potential and affording an overview of the whole world.

The **form** of spatial elements is usually **realistic** since these spaces are largely intended to imitate the real world. Based on anecdotal evidence [5], it is suggested that people are able to comprehend, adapt to and act in non-realistic situations (flying navigation mode, non-gravity, etc.) and within less realistic settings in VEs. It is more likely that the design of realistic spaces could be attributed to lack of imagination and limited willingness to explore the potential of these environments for affording

spatial experiences. Computer games like Descent are clear examples of unrealistic spaces experienced and enjoyed by many.

The **complexity** of environments created within 3D online communities varies, but is always restricted due to bandwidth and download times. As a result the initial view of a space is often merely the floor geometry and possible the shared backgrounds. Objects and elements of the environment appear as soon as they load at a rate relative to the available bandwidth.

An added complication is the adoption of the **Level of Detail (LOD)** concept. In order to improve navigation speed, a threshold is imposed to the viewer over which objects are not rendered. However, it seems that there is not an easy and clear way to override this threshold in order to ensure that key elements of the space (landmarks, paths etc.) will be visible from a longer distance, when needed.

Dynamic evolution of spatial elements is rarely seen in 3D online communities. Environments are static with the exception of visitors who navigate within them. Usually advanced programming skills are needed and only time-based animations of spatial elements are employed. User interaction is limited to point and click and in certain cases proximity sensors trigger events.

Suggestions for designing space to accommodate 3D on-line communities

Humans need to impose a certain structure onto their environment so that they perceive it as an organised system of meaningful places consequently giving form and structure to their real world experiences [6]. Lynch [7] introduced the concepts of the *environmental image* [1] (*"the generalised mental picture of the exterior physical world that is held by an individual"*, which is used to interpret information and to guide action) and *legibility* [8] (a kind of visual environmental quality which determines the easiness with which any given observer may recognise the parts of the environment and may organise them into a coherent pattern).

Based on Kaplan (as quoted in Evans [9]) it can be argued that humans would prefer to navigate or perform several activities in a legible environment, which facilitates the formation of environmental images. Kaplan also relates preference for an environment to this environment's **coherence** and **moderate uncertainty**:

- **Coherence** [10] is the degree to which a scene is characterised by a certain organisation. Structural features that provide coherence include continuous texture gradients, thematic colour or graphic patterns and variable but identifiable physical forms.
- **Moderate uncertainty** is provided by variety, moderate complexity, moderate spaciousness and occasional structural irregularities.

It can therefore be suggested that it would be preferable for inhabitants to exist and navigate in legible, 3D on-line environments, which would enhance the generation of environmental images. A clear structure should be designed into these environments and a balance between environmental coherence and moderate uncertainty should be attained.

When we navigate in real environments, we find our way by utilising environmental information, directly or indirectly conveyed to us [13]. Similarly in VEs, a participant may obtain:

- **Primary environmental information**, implied by the arrangement of spatial elements (*places, paths, intersections, domains*) determined by appropriately positioning space-establishing objects (*landmarks, boundaries*, etc.) in the environment [14]. The sense of space conveyed by

this setting may indirectly aid participants to anticipate forthcoming events, or direct them towards significant spaces.

- **Secondary environmental information** from objects such as *signs* or *symbols* or via support systems which provide specific direct environmental cues ([15] and [16]).

The production of domains expresses man's general need for imagining his world as an *"ordered cosmos within an unordered chaos...By structuring the environment into domains by means of paths and places"* [17]. A VE may comprise several domains. Each domain may be a composition of spatial elements comprising paths, intersections, and places, which are defined by boundaries; it may also include several landmarks, signs or other objects integrated in its structure. Spatial elements can be organised according to several types of configurations (centralised, linear, radial, clustered or grid).

In terms of evolution, Alpha World star-like shape is explained through the teleportation co-ordinate simplicity of the two main axis (where X or Y value is zero) and the two diagonals (where X=Y, or less on X= - Y...) As is the case with real environments, Alpha World and the majority of 3D on-line community environments largely spread in two dimensions. Although avatars are able to fly in three dimensions, the majority of environmental elements are "ground" related. A radically different approach could be suggested according to which a multilayered structure may spread vertically and thus each level could be easily accessed by a "floor" number or some elevator-overview mechanism.

The analysis and consequent suggestions presented in this paper are by no means exhaustive but are intended to act as the starting point of a discussion on the issue of designing space to accommodate 3D on-line communities.

Notes

1 The concept of an 'environmental image' is in many ways relative to the concepts of the cognitive map [11] and the spatial schema [12].

References

1 AlphaWorld by Activeworlds: http://www.activeworlds.com/tour/alpha.html
2 Holodesk by Tpresence Inc. http://www.holodesk.com/hd/home/index.html
3 CyberTown by Blaxxun interactive http://www.cybertown.com/
4 McLellan, H. **Beam Me Up to My Avatar**, *VR World*, Mecklermedia, March/April 1994.
5 Charitos, D. **The architectural aspect of designing space in virtual environments**. PhD Thesis submitted to the Dept. of Architecure and Building Science, University of Strathclyde. Glasgow. 1998.
6 Relph, E. **Place and Placelessness.** Pion, London, p.1. 1976.
7 Lynch, K. **The image of the city**. MIT Press. Cambridge. Massachusets, p.4. 1960.
8 Lynch, K. ibid. p.2.
9 Evans, G.W. **Environmental Cognition**. *Psychological Bulletin*. 88, pp.259-287,1980.
10 Bell, B., Greene, T., Fisher, J. and Baum, A. **Environmental Psychology**. Harcourt Brace College Publishers, Orlando, p.54, 1996.
11 Downs, R.M. and Stea, D. **Cognitive Maps and Spatial Behaviour: Process and Products**. In Downs, R.M. and Stea, D. (eds), Image and Environment. 1973.
12 Norberg-Schulz, C. **Existence, Space and Architecture**. Praeger Ltd, New York, 1971.
13 Passini, R. **Wayfinding in Architecture**. Van Nostrand Reinhold. New York, p.90, 1992.
14 Charitos, D. ibid.
15 Darken, R.P., & Sibert, J.L. **A toolset for navigation in virtual environments**. Proceedings of the ACM User Interface Software and Technology, pp.157-165, 1993.
16 Charitos, D. and Rutherford, P**. Guidelines for the Design and Exploration of Virtual Environments.** Proceedings of the 3rd UK Virtual Reality Special Interest Group Conference. De Montfort University, Leicester, pp. 93-111, July 1996.
17 Norberg-Schulz, C. ibid, p.23.

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