

## NSF/ESRC Agenda Setting Workshop on Agent-Based Modeling of Complex Spatial Systems: April 14-16, 2007

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### Agents in Virtual Worlds

My work is focussed on generating a variety of graphic media for various projects in CASA ranging from our 3D GIS model of Greater London to panoramic imaging of urban environments through to real time monitoring of local urban climates. Much of this work is deigned for dissemination to both professionals and less expert community groups through primarily web based services. A variety of my work is shown on my blog <http://www.digitalurban.blogspot.com/> but here I will focus on the work I have been doing with virtual worlds and the representation of presence and agent behaviour in digital environments.

Agent based modelling is traditionally a 2D discipline in academia which has an emphasis on pedestrian and transport simulation within the field of spatial analysis. Yet advanced agent based modelling is possible, and indeed common, within 3D multi-user environments. We examine the use of these agents, based on our own experience, detailing the use of agents in virtual worlds and gaming environments.

We first examine the use of bots in ActiveWorlds, a multi-user environment whereby the user is represented as an avatar (Figure 1); this is a common theme throughout such systems.



Figure 1 – Avatars and Agents in ActiveWorlds

Agents can be inserted, with varying degrees of complexity and autonomy, into the ActiveWorlds environment. We have examined the use of such agents, detailing the ability to relate to shortest path analysis, object construction, artificial conversation according to proximity, and spawning behaviour.

The use of such agents in multi-user environments is often controversial and the use of Non-Player Avatars or NPC's, as agents are more commonly known, has been banned in many systems. Of note is the ability of agents to build and interact with their environment combined with the ability to clone not only objects but also themselves through self spawning. This has led to a number of examples of virtual world vandalism carried out by autonomous agents, as indeed we note in our 30 Days in ActiveWorlds paper.

There are calls for a ban on NPC's in the environment known as Second Life. Of note is the 'CopyBot' an agent which can clone any other object, this is significant in terms of Second Life as its economic system is based on the purchasing of objects to use in the environment – such as a new house or car. CopyBot can be released into the world and simply clone any object, including avatars, with additional scripting it is then possible to respawn that object allowing users identity to be stolen and then to be surrounded by multiple copies of themselves. In essence this is the base of crowd simulation yet a crowd which contains a mix of agents and genuine avatars.

Agents in virtual worlds are therefore controversial, yet one only has to look towards the more powerful gaming environments to see where the true development of agents is taking place. The most commonly known game with agents is 'The Sims' where you have the ability to toggle 'Free will' on and off. Using this function it is easy to understand the complexity of agent systems within game engines.

A number of these games ship with their own 'Sandbox' mode allowing the game engine to be edited and user content added, normally through 3D modelling software such as 3DMax. However, it is not only the 3D section of the games that can be edited, you can also change and add agents opening up the possibilities to agent based modelling in custom made 3D environments. We have examined the possibilities of such agent based modelling within the 'Oblivion' game engine and the results are to date encouraging.

## References

Schroeder, R., Huxor, A., **Smith, A.** (2001) Activeworlds: Geography and Social Interaction in Virtual Reality, *Futures*, 33, 569-587.

**Smith A.** (2002) 30 Days in ActiveWorlds: Community, Design and Terrorism in a Virtual World, in *The Social Life of Avatars, Presence and Interaction in Shared Virtual Environments* (Ed) Ralph Shroeder, Springer, 77-89.