1 Introduction

Virtual worlds including whole earth environments have been made since the beginning of VR. In 1998, Vice President Al Gore described a vision called the “Digital Earth” which led to a burst of activity. This subsided after the year 2000 when the political landscape and organizational structures changed. We postulate another reason for this downturn was due to a focus by some developers on proprietary, costly infrastructure for large Earth databases, for which applications were then sought. This approach can quickly either overwhelm the capacity of an organization’s resources, or at least become hard to justify when there is no additional funding stream. Therefore, we propose as an alternative a low cost, open source, collaborative and highly scalable system.

Some existing development has come from organizations with their own map databases, intent on publishing their own content. Our system will empower other organizations or individuals to publish their own content into the developing Virtual Earth. We have started implementing these methods in our 3D Metanet Atlas Platform (3map) project.

2 Evolution of Virtual Earth initiatives

A brief history of Virtual Earth initiatives includes early VRML earths such as Mark Pesce’s WebEarth, Rez1 (now part of 3map), System Research International (SRI)’s TerraVision system [Leclerc 2002], the Interagency Digital Earth Working group’s Digital Earth Reference Model (DERM), Web Mapping Testbed (WMT), and Digital Earth Alpha Version; the Geospatial Applications and Interoperability (GAI) working group’s GIRM - Guide for interoperable geospatial applications; the work of the Open GIS Consortium(OGC); and work in the Web3D Consortium's X3D, RM3D and GeoVRML working groups.

3 The 3map project – an open systems approach

The 3map reference implementation is being built using OGC standards to promote interoperability & open publishing, and Java and X3D/GeoVRML in order to facilitate broad availability of the runtime. Other delivery technologies will also be considered, such as Shockwave3D, Blendo on the Playstation, as well as MPEG-4 set-top boxes. The time-sensitive nature of the data, as well as the very large size of global datasets requires online delivery, preferably over broadband networks. We anticipate that end-users and third-party developers will find innovative and unexpected ways of using and extending the system, as has happened with the Word Wide Web.

3Map’s architecture will be based on low cost internetworked systems that can be easily scaled as content and other resource demands grow.

3.1 Interaction design

As well as providing an open platform for Virtual Earth publishing, 3MAP will broaden the base for contribution through innovations in user interface. Users will be able to navigate effectively in the 3D space, filter information using structured metadata, and publish their own content from within the context of the virtual world.

Lessons from game design show us that navigating 3D space can be simple and effective if users are given appropriate affordances and constraints. Generalised VR navigation systems typically allow unconstrained movement in three dimensions, leading to user disorientation [Clarke-Willson, 1998].

3map will provide a series of constrained navigation modes, appropriate to user task flow, which is closely linked to the user’s proximity to the planet. The following modes are being developed:

- **Orbital view** – rotate globe to select an area of interest
- **Satellite/map view** - nadir-facing (looking straight down), users can move across the surface of the planet
- **Helicopter view** – initially facing diagonally down, but with control of view angle, users can fly at a constant height above terrain and objects on the ground

The fourth navigation mode is similar to VRML Walk navigation. Additionally, a target lock facility can constrain forward motion [Clarke-Willson, 1998]. This is particularly useful when users are placing geometry in the environment. In games, the environment is often a static setting or backdrop. In 3map, the setting becomes an interactive artifact [Champion 2003].

At any point, users can find information or filter their view using dynamic queries on structured metadata. This is an effective user interface technique for manipulating complex datasets, especially suited to geographic applications, which leads to significant improvements in user satisfaction and engagement over traditional text searches [Schneiderman, 1994]. In fig 2, a user is seeking a 3-bedroom house in a specified price range.

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Conclusion

The next generation of Virtual Earths will enhance everyday activity with virtual experience. 3MAP is aimed at achieving this vision through sustainable progressive augmentation, open source development and open publishing.

References


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