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# From VrmI to Augmented Reality Via Panorama-Integration and Eai-Java

## Abstract

The author shows the enhancement of abstract and "sterile" VRML-scenes by integration of panoramas, made from stitched photographs or special panorama cameras. The problem of having only one point of view in a photograph taken from a fixed point can be solved by using a defined, invisible "box" in vrmI, which allows a movement of just a few meters, but also turning around and getting a kind of Augmented Reality.

The next development of interaction not only in movement is the interactive integration of vr-objects by using EAI-Java-Tools.

## Resumo

*O autor mostra o desenvolvimento de cenas-VRML abstratas e "estéreis" pela integração de panoramas, feitos através de fotografias tradicionais "coladas" ou câmeras especiais. O problema de existir apenas um ponto de vista nas fotografias tiradas de um ponto fixo pode ser resolvido usando-se uma "caixa" definida e invisível em vrmI, permitindo um movimento de alguns metros, além de rotacionar e propiciar uma espécie de Realidade Aumentada.*

*O próximo desenvolvimento de interações, não apenas no movimento, é a integração interativa de objetos-rv utilizando-se EAI-Java-Tools.*

## VRML

VRML was a fascinating invention by standardizing 3d-geometry worldwide, by enabling virtual buildings und communities, by enabling global engineering and communication in the field of architecture and planning.

One of the great advantages for architects is the ability of nearly every cad-program to export 3d-constructions to vrmI - by this means it is possible for architects, students, client, multi-disciplinary-workgroups on different places in the world to talk about those constructions or threedimensional concepts or even works together on those projects.

Nevertheless VRML normally shows artificial, abstract and sterile pieces of architecture, far away from all those little details of the real world. Especially compared to a photograph you see the difference and the poorness of this kind of digital abstraction (figure 1).

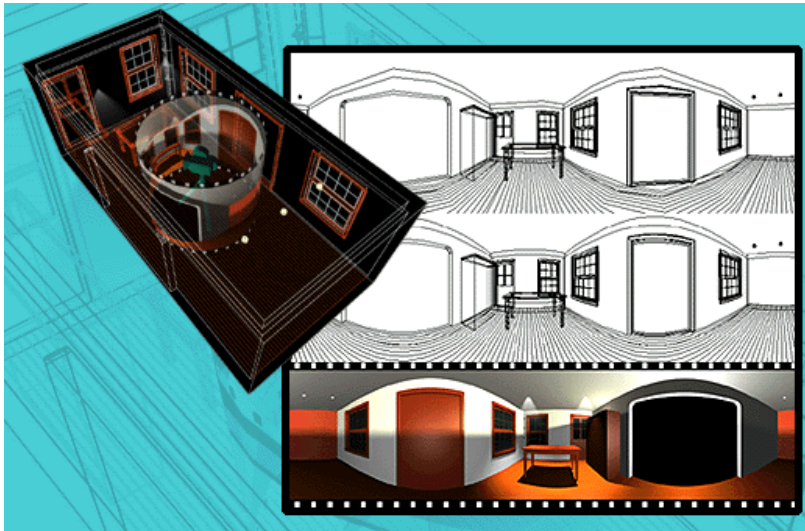


figure 1 - Sterile virtual worlds

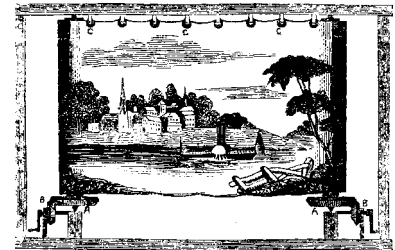


figure 2 - Moving Threatre



figure 3 - Stitched photographs

## QTVR and other panorama-techniques

On the other hand Quicktime-VR was invented, followed by other similar techniques of showing 360-degree-panorama-scenes, such as IPIX, RealVR, Smoothmove etc. It seemed to be a very new kind of mirroring our real surrounding, but it was not more than a sophisticated transfer of a very old idea into the world of digital media: the “moving panorama”, which was already used in british theatres a hundred years ago! (figure 2)

One of the fascinating ideas in Quicktime-VR and similar techniques is the stitching-process, which abandons expensive equipment (figure 3). In Bochum we also started with this kind of low-tech-panoramas, but we found out, that those panoramas are just good enough for illustrating web-pages, but not for creating full-screen immersive impressions. So we used the most professional analog-panorama-camera, the Roundshot 220 (figure 4) and we bought one of the first digital panorama-cameras, the Pano-Cam (figure 5) This enables us to create a full-screen pano-photo in a few seconds (vertical capacity 5000 px)!



figure 4 - Roundshot (analogue panorama)



figure 5 - Pano-Cam (digital panorama)

While Quicktime-VR only delivers cylindric panos, IPIX, Smoothmove and the early versions of Real-VR also deliver spheric-views, made by using fisheye-lenses (either stitched or rotated).

The fisheye-photographed surrounding of the point, the photograph was taken, can be shown as a flat projektion (always with the ratio of 1:2, which results from the 180 degrees vertical and 360 degrees horizontal). Alternately some programs (as Smoothmove) can transform and export the surround-picture into a cube with 6 sides. (figure 6)

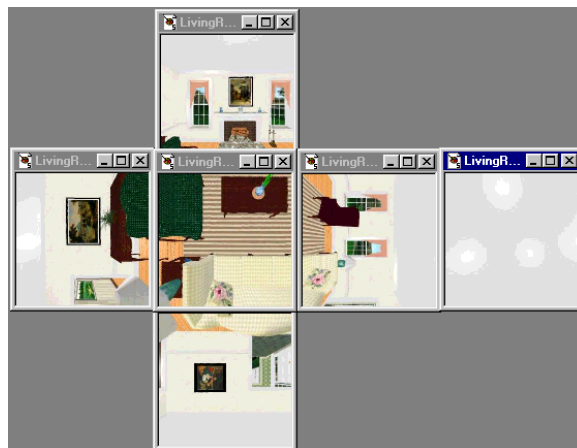


figure 6 - six sides form a cube

## Combining VRML and panorama-techniques



figure 7 - 360-degrees background

In Bochum we tried to combine both: digital panoramas (first we used panoramas, “stitched” by Quicktime VR, then we used RealVR, later labeled as Livepicture’s IVR), which is compatible to VRML 2.0. VRML also enables creators to use a background, formed by six sides of a cube. Normally those sides are made from colored backgrounds. When using photographs (made from a panorama-camera), those 6 sides are totally melted together and creating a totally realistic interactive background (figure 7).

This enabled us to realize different sceneries:

- creating a virtual building on an unbuild site, looking at the virtual building and also seeing the naturally “textured” surrounding.
- going inside a virtual building, simulating the view to the site (when turning around, you can have a “natural” view into the garden

We had to develop the integration of panoramas in vrml and the cad-model in vrml - a step towards “augmented reality”. But there is one point, which restrict the movement inside a vr-model: the point of view, either in a static photograph or in a panorama-photograph, limitates the movement of the user in a vr-world. While it is possible in vr-worlds without a photographic-background, to move around and look at the vr-scenery from different points, the usage of a photographed background sets limits: it is only possible to move around for a few meters. We defined an invisible VR-Box, which allows the movement and the turn around to see the panorama from different sides.

## Interaction inside VRML

Another field of engagement is interaction inside of VRML-sceneries - made with VRML and EAI. We already have some prototypes of VRML-EAI and are developing the next generation of navigation inside augmented reality.

We have developed an interactive toolbox, creating geometric elements directly inside of vrml-worlds.

At the moment we work on combining digital-panorama-surroundings with interactive eai-generated virtual objects for interior design as well as for architectural planning in the cities together with “normal” people (citizens, neighbours, non-architects) - simulating alternatives, developed by specialists like architects, town-planners etc. There is a real success and more confidence in the planning by this kind of vr-simulation instead of only working with maquettes.

## Interaction for Non-Architects

The fields of using these techniques reach from professional design to design with non-architects, with users of any kind of architectural object - e.g. a museum. We are just designing an exhibition in a museum, using all thoes techniques: photographing the surrounding with Pano-Cam, converting the photo-file, combining with cad-exported vrml and creating a new world: finding alternative Design by interactive simulation !!



figure 8 - EAI-interactivity



figure 9 - vr-scenery: alternative indoor-design for a museum