

The Loop Room

3D A/V Project

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Media Design

(Medienkunst/Mediengestaltung)

Semester 3, SS2010

Bauhaus Universität Weimar, Fakultät Medien

29.11.2010

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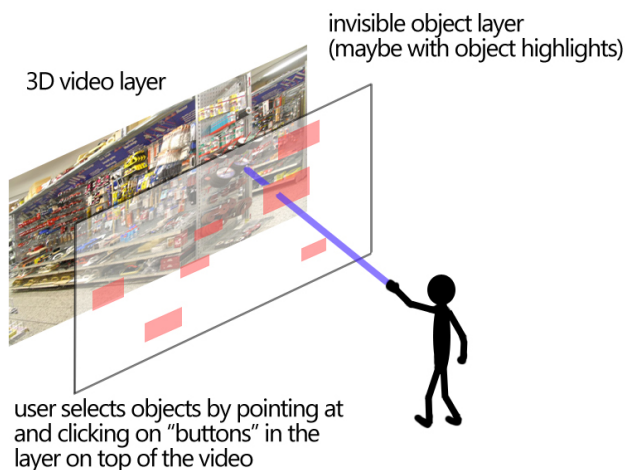
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The Concept

What's it all about

In the summer semester of 2010, the Bauhaus University of Weimar offered students the opportunity to take part in a 3D Audio/Visual project. The project was a cooperation between students of Media Systems and Media Design, under the guidance of Prof. Ben Sassen. The aim of this project was to create contents for the VR-Lab, which contains a multi user 3D screen for up to four people and a wave field synthesis sound system, allowing users to locate sounds independent from their own position. Each user is being tracked separately via infrared sensors and there are numerous input devices making it possible to manipulate the 3D environment.



The two basic concepts

In the beginning Florian and I had two separate ideas utilizing the system. Florian's concept consisted of a live video manipulation in connection with sound from different choosable, reality-based soundscapes. The user should be able to collect all the sounds he could hear in the video and then play around with them. My own concept was to create a 3D sample playing sequencer. This sequencer should allow the user to control the positions of looped sounds by arranging 3D objects which are connected to these sounds. The loops themselves are created using a pattern system, based on the design of drum computers.

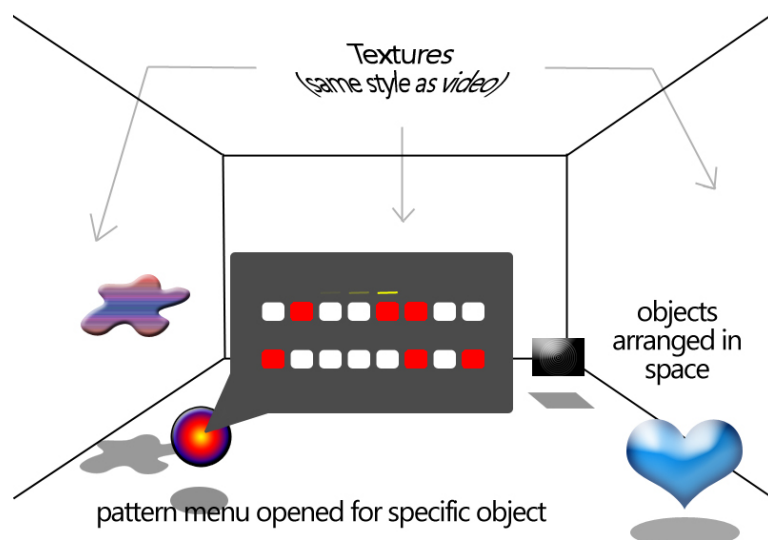


Combining these concepts

We decided to combine these concepts by splitting our application in two parts.

It starts with a 3D video introducing various items making sounds, allowing the user to „collect“ them. The video repeatedly pauses with an overview of some of the items, where the user can pick his favourites.

After completing the video part (and having chosen his objects/sounds), the user proceeds to the sequencer environment. We wanted either a complete modelled and textured environment or a video panorama, to make sure it resembles the previous video. The sequencer environment is basically the „stage“, where the user can place his previously saved sounds. Every item he collected is modelled and textured and can be freely positioned in space, affecting the position of the sound connected to it. As interface to interact with the objects we chose a tracked wand. It seemed most intuitive to point at things you want to pick up or move. To realize this application we decided to use the Avango NG framework.



Production progress

Solving problems

While producing our first materials we stumbled over several problems, some of them forcing us to drastically change our basic concept.

The first obstacle was the difficulty handling the 3D cam. It took us a few shots to realize the importance of steadycam equipment – even little shakes felt totally disturbing in 3D. We also had to avoid objects very close to the camera. When the distance fell below a certain value, the camera (consisting of actually two synchronized cams) had trouble keeping the autofocus synchronized, which caused some headaches watching the material afterwards. However, the biggest problem with the cameras was, that they totally lost their synchronization after a few minutes. This resulted in shooting only very short clips and rebooting the 3D cam after every shot.

Besides our problems shooting 3D material, there were way bigger problems. Throughout the semester we had to realize, that the pattern system for triggering the sounds was too complex to realize inside the framework of our choice (Avango NG). Our solution was to create two pre-recorded loops for every sound with the possibility to choose between them, to keep the sound variable.

Another consequence of this is that the user has no opportunity to change the BPM, which should have been controllable in the first concepts. Nevertheless, this seems to be even better than the pattern system after all, because it's easier and faster use.

The idea of creating a video Using a video panorama for the second part would have caused many difficulties and cost much effort. Chances were high that our objects wouldn't have fit in or that it would have caused the loss of a proper 3D effect. Our solution was to stick to 3D modelling and to create a matching environment to provide a consistent experience.

Not a real problem, but a restriction was the fact, that the wave field synthesis only provides 8 channels; thus we had to keep our room smaller and use less objects.

The biggest problem of all was that the semester was too short to implement the video aspect in avango; we had to keep it as an option for the end of the project – Sadly our project lost a lot of its original character based on this technical issue.





Creating a dummy

In order to work with the framework and to start writing the program, we had to create conceptual media. This was also important for further planning, because this dummy showed us which types of media we had to produce, the exact amount, file formats, etc. Our tasks for this dummy were to create temporary 3D models and a modelled and textured 3D environment. We had to record sounds, process them to a standard level and create various loops with them. In this progress we also shot our first experimental 3D videos, looking out for suitable and interesting locations. Altogether, we kept this dummy very simple. We made 3D models consistent of basic forms and a room with some pillars, added plane textures to them and recorded some sounds of random objects (e.g. a hammer hitting on metal, ripping off duct tape).

Intensely assisted by Media Systems students we were able to create a script connecting our data and showing first results.

The final version

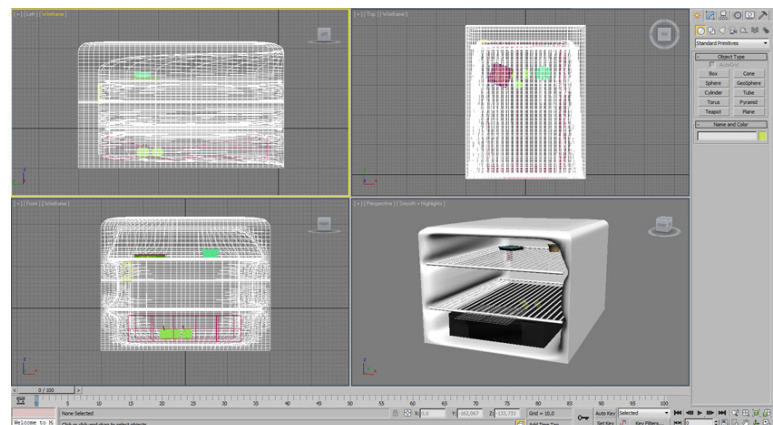
For our final version of the application, we chose a supermarket as theme. The user should pick up groceries in the market and then create rhythms/beats with them in a modelled fridge. We liked the idea of taking something everyone knows from the daily life, and putting it into a completely different context. The user experiences making music with something he's familiar with, but maybe never thought of in this way.

Also, the supermarket provided us with many different items, making various sounds possible.

For the video part, we shot four clips, each with four products in them, which makes 16 choosable items in total. The clips are shot as an ego-perspective ride through the supermarket, which should enhance the immersion of the user. He should feel like he's moving through the market himself, buying groceries. In a paused overview at the end of the clip, the user has to choose two of the four items shown. To maintain immersion, the clips are connected and each clip begins where the predecesing one ended, nearly without a gap.

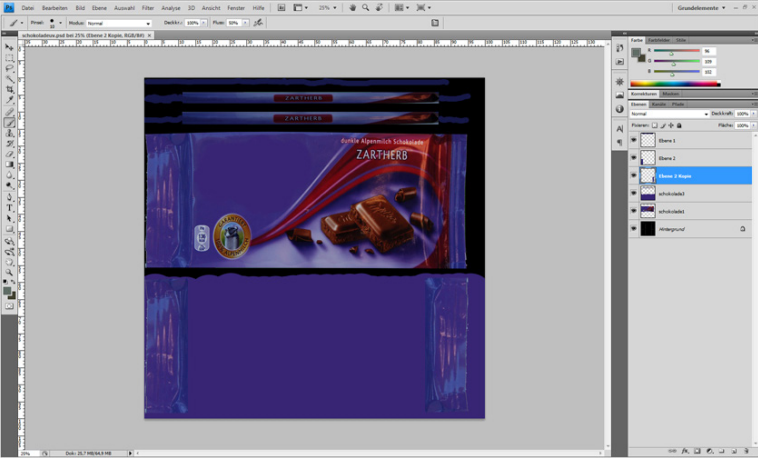
Even though we shot and edited these videos, we still weren't able to connect them to the application in Avango, which is why the video aspect is not part of our final version.

For our final application we actually bought all the products shown in the videos and created a resembling 3D model for every one of them. We also designed a fridge for the 3D environment.



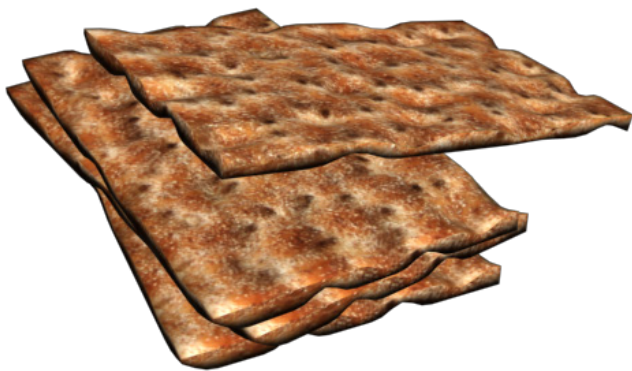
To generate the textures for these models we captured the products in daylight during a photo session in the garden, using a neutral, white background. These Photos were edited – we had to adjust colors and brightness, erase the trademarks and then cut them into form in Photoshop.





Finally we applied the textures, along with transparency and other materials to our models. These final objects were converted into the .3ds format.

Because of the missing video part, we decided to create a menu where you can choose your objects. For this menu we rendered a thumbnail picture of each object and also created some simple buttons.



In order to produce rhythmic sounds we recorded possible noises for our loops by doing all kinds of stuff with the products we bought (e.g turning, pulling, knocking, opening, breaking, biting). Our idea was to find sounds imitating the components of a beat: kickdrum, snare, hi-hat, ambiente sounds, lead sounds, etc. After cutting the best samples out of our recordings, we added dynamics, filters and effects (compressor, equalizer and a little reverb) to get an acceptable sound and tried to reach a uniform loudness. Finally, these edited samples were loaded into a software sample player and we created our own loops and rythms by triggering them via MIDI-Interface. The last step was the conversion into mono .ogg files.

To integrate all this stuff into Avango NG we only had to replace the old dummy files with the new ones and enhance the script a little bit (integration of the menu). Some final adjustments, containing the proportions, the loudness, calibration of the wand and the 3D glasses were done, until we finally could test our work (and of course fix various bugs).



Technology

Software used

- Avango NG open framework
- 3DS Max, Cinema 4D (modelling)
- Cubase 5 with Battery 3 VST Plugin (sounds & loops)
- Premiere Pro (video cut)
- After Effects (video effects)
- Photoshop (textures)

VR Lab – Bauhaus University

- Projection system with four shuttered and polarized projectors and a huge screen
- Wave field synthesis system
- Miscellaneous computers, running Linux
- Shuttered and polarized glasses, infrared tracking system
- Tracked wand

Hardware used

- Food products from our local supermarket
- 2 connected and adjusted Camcorders = 3D Cam
- Canon D50 DSLR
- Sennheiser ME-66 directional microphone (supercardioid)
- Tascam US-144 USB Sound Interface (for MIDI and XLR)
- Laptop and PC

Conclusion/Further Developments



Even though we were not able to insert the video feature into our application, we think the final result is really interesting. We managed to find a good solution to get along without the missing video aspect and accomplished to give the user the opportunity to manipulate music in a 3D environment. While presenting it at the Mediengang, we got lots of positive feedback and we were fascinated, that even children and senior people had fun playing with our application. It was enough to basically explain the functions and to watch the users explore all the objects and sounds.

Another possible addition to our project for the future could be, that users can create own patterns and beats in a simple way. We also were totally amazed by the imagination of having a horizontal wave field synthesis system, allowing to have sounds positioned behind the user. Another idea, was to track many users simultaneously to affect the sound in different ways and produce a more complex experience. And finally, we thought of an arcade-like game mode, where users can challenge each other in some kind of a competition.



Thanks!

... to Maximilian Michel, Ben Sassen, Andre Schollmeyer, Alexander Kulik and all the other guys working at the VR lab!

- Florian Erdmenger
- Tristan Weis