Student projects using ARToolKit

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Abstract

In this paper we would like to describe three student projects developed at the University of Applied Science at Hagenberg (Media Technology and Design) using ARToolKit. All projects were implemented by students during their semester projects or during their master thesis. MusicAR is the first application presented in this paper. It describes the master thesis of B. Hauser and shows a nice music learn program for children. The second application is ASR (Augmented Sound Reality), realized by D. Dobler and P. Stampfl during their semester project. ASR allows the user to place 3D sound sources and gives the user an acoustic 3D impression of the sound sources. Finally, M. Stangl and D. Zirnig implemented ARoom, a furnishing program using AR.

1. MusicAR

The goal of *MusicAR* (see Figure 1) was the development of an AR based game for children. Based on Richard Marks' application presented at SIGGRAPH 2001 [1], the goal was to enhance the attraction of a kid application by using a webcam. Marks' game application was based on a Playstation 2 game console using a video camera. Our application should become a learn program for kids and it resulted in a program for learning music and rhythmic. By using ARToolKit markers, children can activate or deactivate the different musicians (trumpeter, guitarist, etc.) or play/stop them playing their instruments. The application uses simple 3D characters (Quake II models), which are animated. Therefore, the Quake II loader of [3] has been integrated in the ARToolKit environment. Even Halflife models can be integrated. For its implementation we integrated the Halflife loader based on [4]. The sound output is implemented by using OpenAL. At the moment, only simple interactions are possible. Children can activate the animation of characters by holding the markers into the webcam. However, the existing characters are too passive. If the user doesn't do anything, nothing happens. For a future scenario (game), the user should be motivated even more. As in Marks' application, the avatars have to be active even if the user doesn't interact with the application - an integration of a simple AI for the avatars could solve this problem.

A similar approach was developed by the National University of Singapore. Their Magic Music Desk allows an interaction with markers, with speech recognition and with gesture recognition and it allows to play music with a virtual (augmented) band.

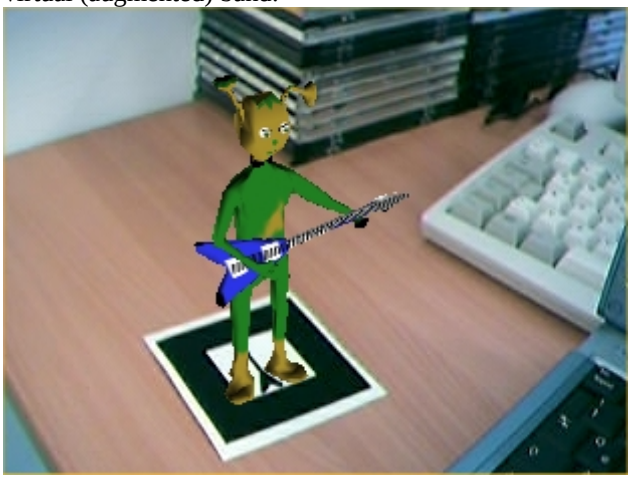

Figure 1: MusicAR is used to enhance the music world of children.

2. ASR

The second application, ASR (Augmented Sound Reality), combines Augmented Reality with a 3D sound environment (cf. Figure 2). Current AR based applications suffer from missing audio integration. And even if they have audio support, they do play real **3D sound**. In this installation the users can **place** different sound sources not only virtually in the real 3D space, but they can also **hear** the results in 3D.

ASR uses a low end hardware system. It doesn't use any magnetical tracking system – nevertheless, the user's position and orientation has to be tracked. Instead of the expensive magnetical tracking system, our application is based on ARToolKit by using reference markers mounted on the walls in the background. For the interaction, the users use a PIK (Personal Interface

Keypad), which is mounted on their arm and a small input pen with a mounted marker.

Figure 2: A user can place with ASR different sound sources in the real world and he can play them in 3D.

ASR was presented in the Emerging Technologies of SIGGRAPH 2002. Further information about this project can be found in [5][6].

The future potential of ASR is widespread. So, for example, the results of ASR could be integrated in an authoring tool for MR/AR applications. Artists could use ASR for the installation and creative recording sessions, and finally, DJs could enhance their performances with the exploration of the third dimension.

3. ARoom

In the future the user shouldn't be disappointed by the wrong size of the furniture bought in the furnishing house. With the catalogue from Ikea at hand it is possible to place furniture in a real world environment and see whether it fits into the room. In contrast to [7] and [8], users don't work with a mini-world and they don't interact like in a doll's house. Instead, we tried to use in ARoom the real environment (see Figure 3). Using markers, the user can place the furniture in that world and make tests if the new (virtual) shelf fits near the real bed.

A combination of ASR with ARoom makes sense. Who doesn't want to now how the sound changes, if the speakers of the brand new stereo systems are moved from the left to the right angle in the living room. Another very interesting extension of ARoom could be the virtual assembly description of furniture, which in reality sometimes becomes a little bit too difficult.

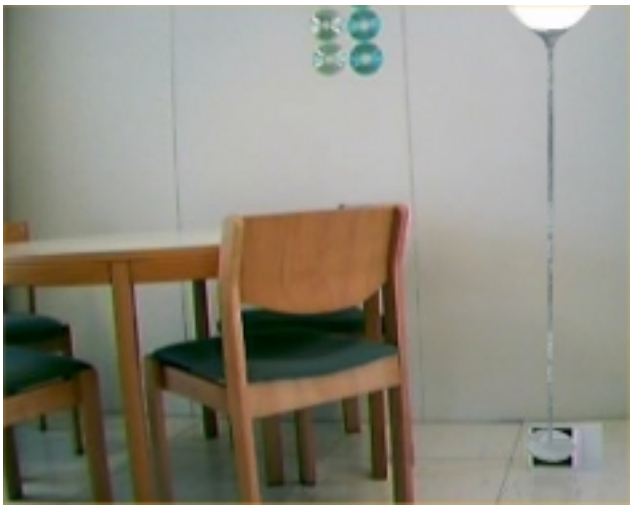

Figure 3: With ARoom the users can test, if their new lamp fits into the room.

4. Acknowledgements

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5. References

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