

# ASR - Augmented Sound Reality

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## 1 Introduction

This sketch describes the Mixed Reality application ASR (Augmented Sound Reality) which uses the overlay of virtual images on the real world to support the placement of three dimensional sound sources. Our system allows to place sound sources in a virtual or real room with the advantage of feeling, seeing and hearing them. This implies a more intuitive and better feeling of space and 3D sound.

Our main goal was to demonstrate how Augmented Reality can be used for placing 3D sound sources to enhance the impression and feeling of 3D sound. The ASR application shows how this could work in the future. Another objective of our work was to develop an AR interface (pen with marker), which allows the user to interact with the virtual objects in a very simple way. The users control the sound sources with the pen. The different sound sources are represented as 3D objects on the HMD and they can be freely positioned by the user. Moreover, the user can select a sound-type and place the sound source into the 3D space. This way several sound sources can be placed in the room and the user gets a very good impression of the behavior of sound sources in the room.

## 2 The Application

The user is able to move the sounds by moving the pen with a mounted marker in the real world. We generally decided to use a low cost setup for the application to give users the possibility to use it without special hardware. For the low cost version users only need a webcam. After starting the application, they move the markers into the web cam's field of view and place the sound sources with a simple mouse click. The high end setup includes a HMD (i-glasses), a web cam and a pen with the marker and three buttons. In this case, the webcam is mounted on the HMD and the users move the pen into their view. All the interaction is done with the pen - creating, changing, dragging & dropping and moving the sound sources into space.

The advantage of the ASR application is the direct integration and testing possibilities of 3D sound in an Augmented Reality environment. The users can directly manipulate the 3D sound source and observe the results immediately. Moreover, like in a keyframe animation it's possible to define different place points for a special sound source and in the play mode, the sound interpolates from one point to the others and finally, it's also possible to record and replay a whole session.

## 3 Implementation

The ASR project uses the ARToolKit computer vision tracking libraries [Kato et al. 1999]. The implementation of the 3D-sound is based on the Creative EAX Library [Creative 2001], which allows - besides the possibilities of OpenAL - to define various parameters for the sound sources. Moreover, the Creative EAX library supports Dolby Surround and Dolby Digital to create three-dimensional sound.



Figure 1: The ASR application.



Figure 2: Moving sound sources with ASR.

As most ARToolkit applications allow relative tracking, we implemented absolute positioning of the 3D sound objects. Using a fixed large marker in the background we easily could calculate the absolute position of the sound source. Its position is a fixed reference in the room.

## 4 Conclusion

ASR was a very interesting project combining two technologies, Augmented Reality using ARToolkit and 3D Sound Technology using the Creative EAX Library. In the future it will be more and more important to improve the realism of virtual environments integrating realistic 3D sound.

## References

- CREATIVE. 2001. EAX 2.0. Tech. rep. <http://developer.creative.com>.
- KATO, H., BILLINGHURST, M., BLANDING, B., AND MAY, R. 1999. ARToolkit. Technical report, Hiroshima City University, December.