

Sound in Interaction

Project Draft

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1. A-RDO (*working title*)
2. tbd
3. Games are a very fitting area for sound to be incorporated and the possibilities for sound in interaction to be explored. We thought of labyrinths to be explored by using sound, but figured, that this specific task would be too complex. We then remembered an old game we used to play and thought about a version, where the user is fully emerged in a virtual world of moving sound. This idea was appealing to us, as the interaction is fairly easy to understand and the concept itself seemed original.
4. We will attempt to provide a virtual environment with well defined rules and a well defined setting. Ultimately, this will result in a playable two-player experience, where one player is to uncover the choices of his opponent by sending audio beams into the virtual world and observe how they behave. Concretely, we will implement a small 3d game in C++ using OpenGL (SFML) for graphics and FMOD for sounds. We will not attempt to build a full featured graphics pipeline with awesome explosions and effects, but focus on the sound and interaction aspect.
5. The game idea is based on ORDO (or Black Box in english). You can read about it and its rules here: [http://en.wikipedia.org/wiki/Black_Box_\(game\)](http://en.wikipedia.org/wiki/Black_Box_(game)). In short, it is a two-player board game with 8 by 8 fields. One player (P) has to covertly place five balls on this field, which the opponent (O) has to uncover. He can do this by shooting beams from the border of the field. The beam gets deflected or reflected by the hidden balls. P tells O solely the point where a beam hits the border again. It is thus a puzzling game. We now want to take this concept to a new level and let the opponent shoot "audio beams" into the world. This is done by positioning oneself at a certain spot around the game board and shouting into the microphone. A sphere attached with this sound is then traveling through the world, revealing an auditory path. By doing this repeatedly from different positions, O is to guess where P placed his five balls. The game can also be played in single player mode, where the balls are just being placed randomly. The idea is also quite extendable. One could further establish static sound beams, that would hover above the field and could be explored by walking around. For graphics we will implement a simple board grid in OpenGL, which the opponent can navigate using the left and right arrow keys. The sound will be processed using FMOD and recorded using a standard consumer microphone, as present in most laptops. The sound can easily be rendered to an arbitrary speaker setup, e.g. headphones, 5.1 surround or the Fantum (*fingers cross*).
6. The project is a success if the software works and it is playable as intended.
7. We first will evaluate the concept of moving sound in space and its perception through stereo headphones. We then will implement the graphics and incorporate our findings into the virtual world. Finally, game play mechanics will be added.

8. As the project scope is quite manageable and the development process is linear, we will work in our team of two.
9. Five days per in 7) described step. Then refinement and project report.
10. The main risk is, that the sound spatialisation is not distinctive enough for proper reasoning on the balls positions. If that is the case, we would have to explore different sonification schemes as e.g. encoding the traveled distance in pitch. On the other hand, it might even be too easy to deduce the balls positions given the full beam path. However, in any case there are solutions and measurements we can take.
11. We haven't found any related scientific work, yet. However, the topic can be related to research in spatial audio and 3d sound perception / localisation.