

Combining Wave Field Synthesis Audio and Multi-Viewer Stereo Displays

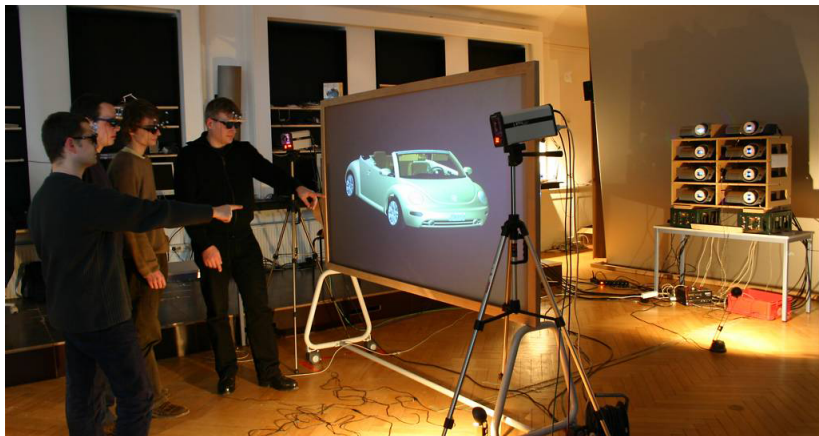
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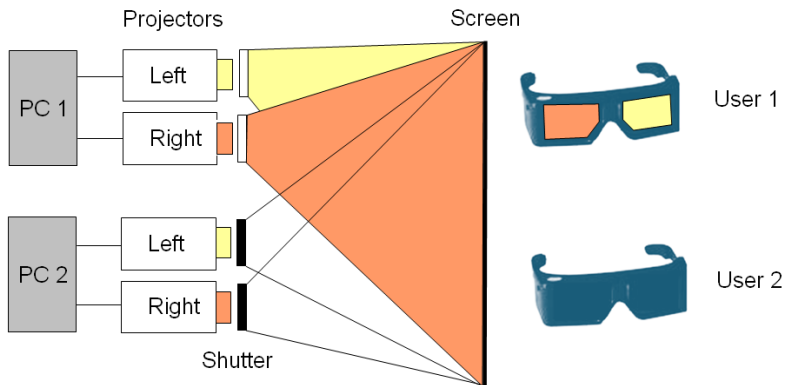
²Fraunhofer IDMT Ilmenau



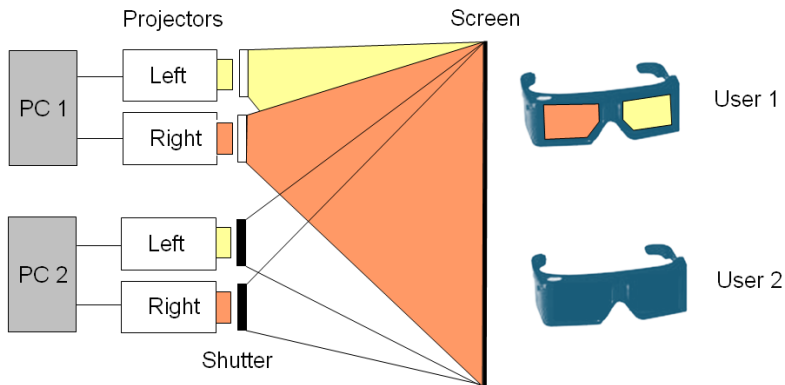
Multi-Viewer Stereo Display



Multi-Viewer Stereo Display — Work Principle



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► perspective-correct stereo for each viewer

Spatial Audio for Multiple Users?

Choices

- ▶ stereo head-phones
- ▶ wave field synthesis

Spatial Audio for Multiple Users?

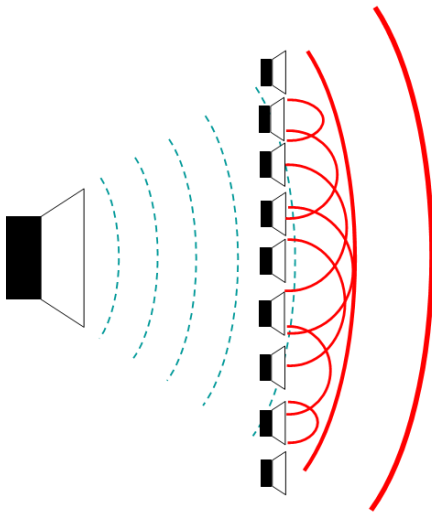
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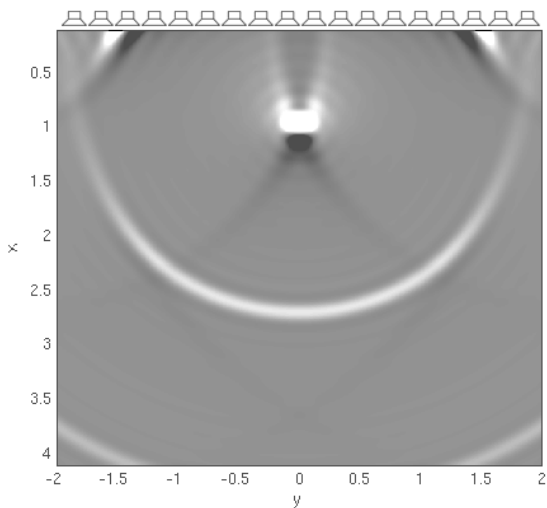
Idea

- ▶ multi-viewer stereo display + wave field synthesis audio
- ▶ consistent spatial audio-visual environment for multiple users

WFS Audio — Huygens' Principle

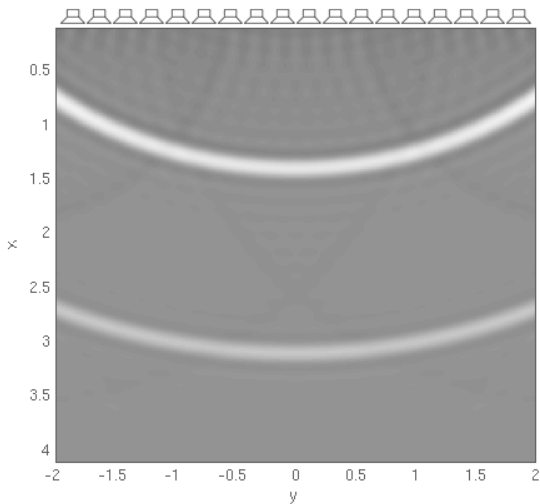


WFS Audio — Virtual Sound Source ...



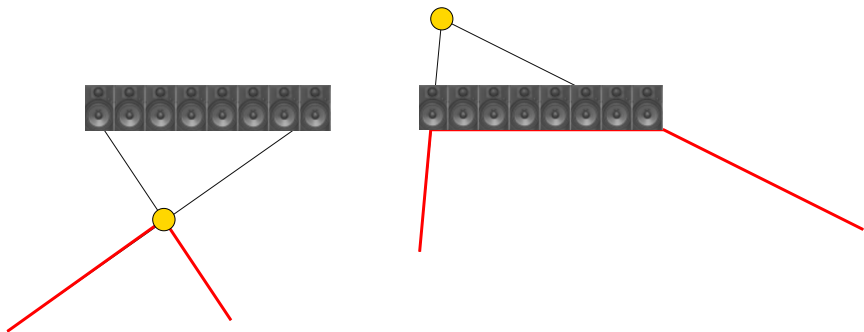
... in front of the loudspeaker array

WFS Audio — Virtual Sound Source ...



... behind the loudspeaker array

WFS Audio — Sound Source Positions



IOSONO Loudspeaker Array



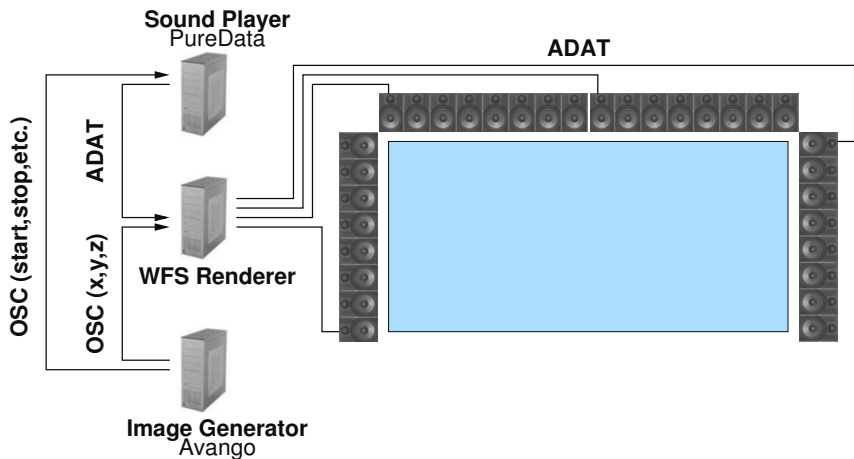
► How to control that many loudspeakers?

IOSONO Loudspeaker Array

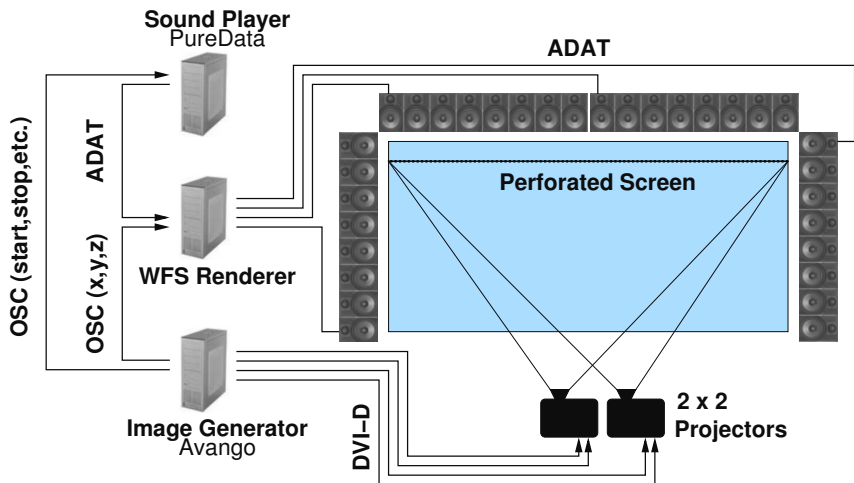


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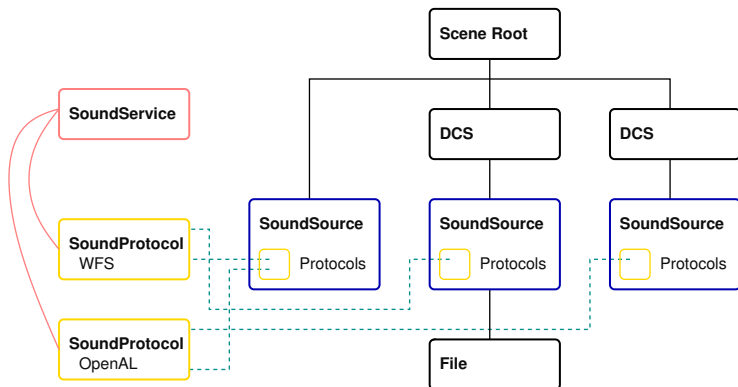
System Setup



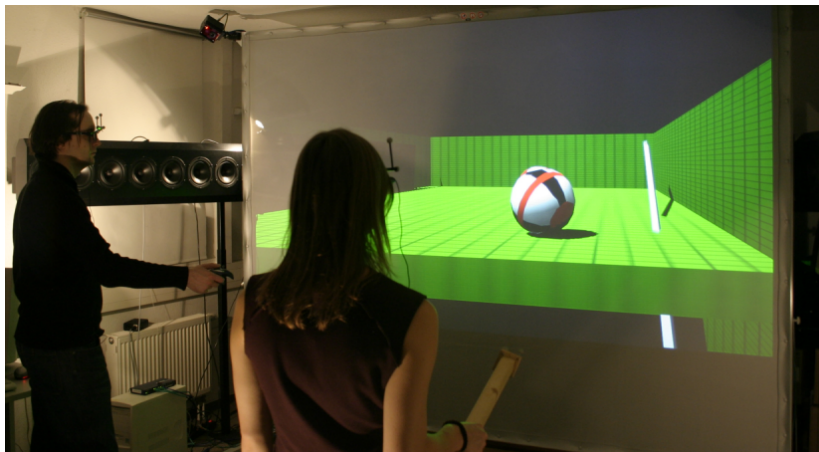
System Setup



Software Abstraction



Prototypes — Billard



Prototypes — Interactive Installation



Conclusion

Summary

- ▶ prototype for consistent spatial audio-visual environment for multiple users
- ▶ good real-time response (short sounds)
- ▶ good sound localization in 2D plane
- ▶ users took the spatial sounds for “granted”

Limitations

- ▶ no sounds behind the user
- ▶ constraint to 2D plane due to 1D speaker array

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Future Work

- ▶ extended user study for sound localization in the 2D plane
- ▶ investigation in 2D loudspeaker array to create 3D wavefront

Thank you for your attention.



Questions?