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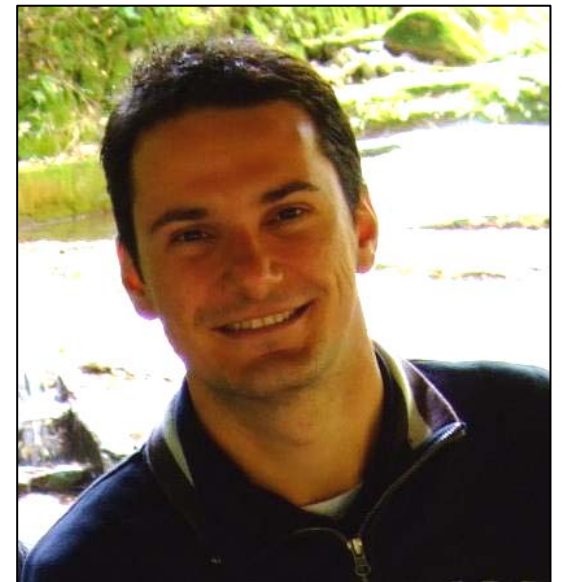
Research Fellowship

Electroacoustical Inverse Problems

Co-funded by EPSRC

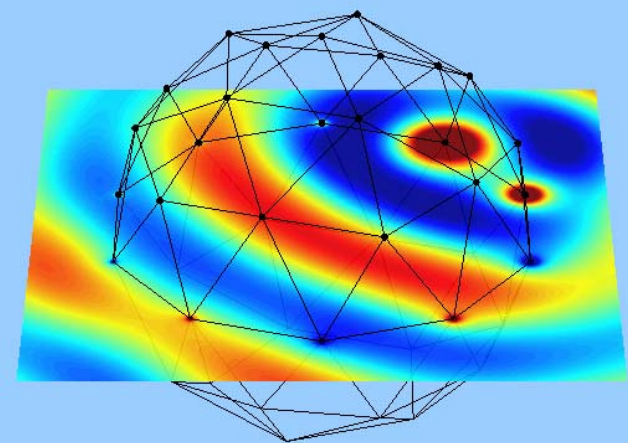
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Multi-channel audio: Technological background

Multi-channel audio has recently become a subject of increasing interest to industry for several reasons. Firstly, the latest developments in electronics have created the technological possibility of performing advanced, real time, digital processing of multiple audio signals. Secondly, increasingly large bit-rate for data transmission made available by the latest telecommunication technologies allows for streaming of multi-channel audio. The commercial tendency for 5.1 surround sound systems to substitute for conventional stereo systems is a clear indicator that the public is becoming more and more demanding in respect to the spatial attributes of the audio material provided by audio products. This means that multi-channel audio systems are next to become a “must” in the technological kit of the modern house. This in turn implies that the development of new technologies for the recording, processing and rendering of audio material dedicated to such systems is a subject of interest for the audio and broadcasting industry. This is witnessed by the research activity which is carried out on this field not only by a multiplicity of academic institutions, but also by various industrial companies.



Numerical simulation of a sound field reproduced by an array of loudspeakers

Research objectives

The proposed research is aimed at the application of the mathematical theory of inverse problems to the study of new possibilities arising in electroacoustical systems for audio purposes. Both theoretical and experimental work is undertaken in parallel, with constant input and feedback from industry, which is expected to provide fundamental guidelines for the research activity. The project proposed is also aimed at defining new technologies and to transfer this knowledge to national and international industrial companies operating in the fields of telecommunications, professional audio and virtual reality. The main objectives are:

1. To study new technological solutions for multi-channel audio applications, with special focus on the development of novel methods for the reproduction of a desired sound field and on the techniques for rendering multi-channel audio material.
2. To develop the theory of microphone arrays for sound recording and to develop technological applications for video conferencing.
3. To develop innovative solutions for audio systems for applications in Virtual Reality systems and to carry out technological research for the realisation of high-end multi-channel auralisation systems for the simulation of the reverberant acoustic field of concert halls and other real or virtual environments.
4. To apply the theory of inverse problems to DSP based control of large loudspeaker arrays for sound reinforcement.

Beneficiaries and dissemination



Experimental setup for ETRI-ISVR joint project on sound field reproduction.
The support by ETRI of Korea for the experiments depicted above is gratefully acknowledged.

- The results will be published in specialized international journals with a high impact on the academic community, such as the Journal of Sound and Vibration, the Journal of the Acoustical Society of America and IEEE Transactions. The target is also to publish results in journals which are more accessible to the community of audio engineers, such as the Journal of the Audio Engineering Society.
- The exploitation of the results will take place through the constant transfer of knowledge to industry for technological research. This will be granted by the direct co-operation with companies during the research activity. The latter is strongly targeted at the development of technological solutions which can be protected by national or international patents. The University of Southampton has excellent mechanisms for the management of intellectual property and well-defined routes for its exploitation through licensing or the formation of spin-out companies.