# Quantification of the performance of 3D sound field reconstruction algorithms using high-density loudspeaker arrays and 3rd order sound field microphone measurements.

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In

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**Master Thesis**

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# 1 Abstract

The development and improvement of 3-D immersive audio is gaining momentum through the growing interest in virtual reality. Possible applications reach from recreating real world environments to immersive concerts and performances to exploiting big data acoustically.

To improve the immersive experience several measures can be taken. The recording of the sound field, the spatialization and the development of the loudspeaker arrays are some of the greatest challenges.

In this thesis, these challenges for improving immersive audio will be explored. First, there will be a short introduction about 3D audio and a review about the state of the art technology and research. Next, the thesis will provide an introduction to 3D loudspeaker arrays and describe the systems used during this research. Furthermore, the development of a new 16-element 3rd order sound field microphone will be described. Afterwards, different spatial audio algorithms such as higher order ambisonics, wave field synthesis and vector based amplitude panning will be described, analyzed and compared. For each spatialization algorithm, the quality of soundfield reproduction will be quantified using listener perception tests for clarity and sound source localization.

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