

Preface

The topic of spherical microphone array signal processing has been gaining importance since the publications of Meyer and Elko around 2002, and fuelled by many others since.

Sound is unavoidably influenced by the space in which it is rendered, as we all know from personal experience, and the capability of microphone arrays to capture the spatial information is both fascinating and intriguing. The English physicist Charles Wheatstone is credited with the first use of the term ‘microphone’. However, it was not until the carbon microphone, invented by David Hughes and demonstrated in 1877, that the concept of capturing sound as an electrical signal became established. The invention by Gerhard Sessler and Jim West of the electret microphone in 1962, and further developments of condenser microphone technology in particular, led to a significant improvement in quality and reliability.

These early microphones were principally targeting the capture of acoustic signals in a close-talking mode, less than around 10 cm from the talker’s or singer’s lips. Would their inventors have considered that the spatial information associated with the sound could be useful, exploited to localize sources of sound, discriminate desired sounds from interferences, or even infer the geometry of an acoustic space and navigate within it? We could only guess but certainly the potential to achieve these goals has been always present. The catalyst for more recent developments has been the happy marriage of high quality, synchronized multichannel analogue-to-digital conversion with powerful digital signal processing hardware and software, facilitating arrays with elements numbering from a handful to hundreds, or even thousands. Given the availability of numerous sensors, many alternative geometries can be considered, the spherical geometry being one such with considerable merits. It is the algorithms to process the signals from these numerous microphones that are the key focus of this book.

We offer the reader a view of the theoretical aspects of microphone array signal processing for spherical geometries and some examples of applications of the ensuing algorithms. Our intention is to present the methods in a general form allowing the ideas to be further developed. It is a well known feeling that digging

deeper into a subject only serves to reveal greater depths and further potential. We hope, nevertheless, that this book will at the same time provide satisfaction to the mind of the curious reader but also serve to equip the researchers of the future to develop and exploit the great potential of spherical microphone arrays and their associated signal processing.

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Erlangen
London
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Daniel P. Jarrett
Emanuël A.P. Habets
Patrick A. Naylor

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Jarrett, D.P.; Habets, E.A.P.; Naylor, P.A.

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