

Preface

Based on individual personality, we are all creators and performers.

Since 1985, when the first volume of this series, *Concert Hall Acoustics*, was published, remarkable progress has been made in temporal- and spatial-primary percepts of sound. The subjective preference theory, well based on neural evidence of the sound field, has been developed. Thus, a model of the auditory pathway with brain activities has been reconfirmed (Ando 1985, 1998, 2009). The specialization of the left and right human cerebral hemispheres that support the model of the auditory-brain system has been well described. Neural activities related to subjective preference of the sound field and the visual field have been discovered.

Subjective preference is made up of the most primitive responses of subjective attributes, because preferences are an evaluative judgment, and judgment is performed in the direction of maintaining life and is deeply related to aesthetic issues. Overall, subjective responses including the annoyance of environmental noise, speech recognition (Ando 2015), and reverberance as well as subjective preference of the sound field may be well described by both temporal and spatial factors. Such significant temporal and spatial factors are extracted from the running autocorrelation function and the interaural cross-correlation function, respectively.

A new possible type of opera house can be designed by the maximization of the scale value of subjective preference of the sound field applying the genetic algorithm (GA).

Also, a wide range of applications of this model is available including those for quality of the sound field in an opera house with the stage for vocal sources and the pit for musical instruments, and the visual field on the stage can be well designed.

This volume focuses on *Opera House Acoustics Based on Subjective Preference Theory*. The author aims to present information to researchers and students in acoustics and vision who are interested in physics, psychology, brain physiology, and understanding of any subjective attributes in relation to objective parameters.

The well-known Helmholtz theory, which was based on a peripheral model of auditory system, unfortunately has failed to describe pitch, timbre, and duration as

well as spatial sensations, thus it also fails to describe overall responses such as subjective preference of sound fields and annoyance of environmental noise and even speech recognition without a supercomputer.

Acknowledgments

The subjective preference theory was established by a series of investigations since 1975 at the Third Physics Institute of the University of Göttingen, where Director Professor Manfred Schröder sent a recommendation to the Alexander von Humboldt Foundation in Bonn to invite the present author to his institute.

Colleagues of the Yoichi Ando Laboratory, the Graduate School at Kobe University; the Professor Alessandro Cocchi Laboratory, University of Bologna; and the Professor Roberto Pompoli Laboratory, University of Ferrara; provided useful information as well as illustrations for this volume. Particularly, Alessandro Cocchi provided the photograph of a drawing by his father, Massimo Cocchi, which is printed at the very beginning of this volume. Shin-ichi Sato, Hiroyuki Sakai, Nicola Prodi, Yoshiharu Soeta, Kenji Fujii, Ryota Shimokura, Yosuke Okamoto, and Kosuke Kato have published a number of excellent works, which are fully cited in this volume. The author would like to express his appreciation to the laboratories, the authors of papers, and the publishers who have granted permission for the use of their works for publication in this volume. Keiko Ando suggested the term “crystal opera house” as discussed in Sect. [12.2](#).

Drs. Akira Fujimori and Shioko Okada, Konan Hospital, Kobe, oversaw continuous medical treatments to maintain the health of the author.

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Theory

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