

Preface

Speech processing and localization/tracking of acoustic sources have a significant role in the automation of several applications, including video conferencing with audio-based camera steering systems as well as surveillance systems. In such applications, it is essential to localize the speaker as well as any acoustic experience. Furthermore, localizing noise sources around/in a moving car environment is an active research area. These applications require preprocessing stage for speech enhancement based on automatic Direction of Arrival estimation (DOAE) of speech sources. Multi-DOAE is indispensable in real acoustic environments, such as mobile active speech sources.

Several outstanding DOAE techniques, such as Maximum Likelihood (ML) method, estimation of signal parameters via invariance techniques (ESPRIT), multiple signal classification (MUSIC), and Local Polynomial Approximation (LPA), can be employed in the speech sources DOAE and localization. Currently, the DOAE and localization contexts have an outstanding theoretical basis for several practical applications; however, it is still an embryonic research domain.

This book supports the researchers, designers, and engineers in various interdisciplinary domains, such as engineering, speech processing, mobile communication, direction of arrival estimation, and localization to explore the broad vision of the DOAE/localization of speech sources. The book introduces the concept and model of the acoustic sources. Then, it highlights the most contemporary studies on this pervasive problem. The book provides a brief overview of the most classical direction of arrival estimation and localization techniques. In addition, employing the optimization algorithms to improve the DOAE techniques is also highlighted. The book addressed the concept and principles of the multi-DOAE approaches. Using a microphone array, this book introduced the localization and tracking problem of multiple speech/acoustic sources. It includes applications of speech sources localization based on the DOAE approaches. The book reports the challenges facing the DOAE techniques in speech sources localization.

The unique features of this book include:

- Provides a solid background on the concept and model of the acoustical signal and sources.
- Offers a brief overview of the most classical direction of arrival estimation and localization techniques.
- Explores the role of optimization algorithms to improve the DOAE techniques.
- Highlights the concept and principles of the multi-DOAE approaches.
- Introduces the localization and tracking problem of multiple speech/acoustic sources with highlighting the most contemporary studies on this pervasive problem.
- Discusses several applications and real-life speech sources localization based on the DOAE approaches.
- Reports the challenges facing the DOAE techniques in speech sources localization.

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Direction of Arrival Estimation and Localization of
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