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Fractional Fourier Transform Techniques for Speech Enhancement

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Preface

This book expounds the use of fractional Fourier transform techniques for speech enhancement applications. It could serve as a resource guide for the engineers, scientists, and academic researchers who are working in this area.

Speech enhancement involves the processing of degraded speech. It has been a challenging problem over the decades and yet is an active area of research due to the complexities involved in the highly non-stationary signal processing. In general, the processing is in temporal or spectral domains. Many expedient techniques have been proposed to non-stationary signal processing such as short-time Fourier transform (STFT), wavelet transform (WT), and fractional Fourier transform (FrFT). Among all the transformation techniques, FrFT had been proved to be a perfect time-frequency analysis tool in many signal processing applications. With this context, this book framed to explain the speech enhancement in FrFT domain and also explores the use of different FrFT algorithms in both single-channel and multi-channel enhancement systems.

The primary goal of the book is to provide a rigorous introduction to the major concepts of the fractional Fourier transform: What is FrFT? Why FrFT is advantageous for time-frequency analysis? What are the properties of FrFT? What are the numerous applications of FrFT?

The secondary goal of this book is to present new FrFT algorithms which were proposed for speech enhancement. All the new approaches are presented with the apposite results and analysis.

This book is organized into six chapters. The earlier chapters give a comprehensive development of fractional Fourier transform, and the later chapters present the generalization and the application of FrFT in speech enhancement. Special focus is given on the detailed explanation of fractional cosine transform and fractional sine transform.

This book is arranged in a progressive order, starting with basic definitions, moving to a thorough discussion on the enactment of the algorithms. This could help the readers to understand and also to develop new algorithms easily.

Some of the unique features of the book include:

- A comprehensive analysis of fractional Fourier transform techniques in speech enhancement applications
- New approaches for speech enhancement using FrFT
- Attempts are made to elucidate the theory of different FrFT methods in detail.
- The future scope of research in this emerging area

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