Preface

The basic goal of a language identification (LID) system is to accurately identify the language from the given speech sample. In literature, LID studies were carried out extensively on western and eastern languages by exploring various language-specific features and models. But, in India, language discrimination tasks have been carried out using very few (less than six) Indian languages (ILs), and no systematic study was observed. Discrimination of ILs is a tough task due to high similarity of languages. This is mainly due to common origin (i.e., Sanskrit) for all ILs. In this work, we have analyzed the LID performance on 27 Indian languages with spectral and prosodic features. In our study, spectral features extracted from block processing (BP), pitch synchronous analysis (PSA), and glottal closure regions (GCR) are explored for identification of languages. It was observed that the performance of LID system is better by using the spectral features derived from PSA and GCR compared to BP. Prosodic features represented by intonation, rhythm, and stress (IRS) are proposed at syllable and word levels for discriminating the languages. For representing language-specific information at the global level, dynamics of fundamental frequency (F_0), duration, and energy patterns are proposed in this study. Complementary information present in different features is exploited by combining the systems developed by using individual features. It is observed that the performance of LID system has been improved by combining various components of prosodic features and spectral features. The proposed features are also verified using OGI database, and observed the similar trend. The major contributions of this book are given below:

- IITKGP-MLILSC (Indian Institute of Technology Kharagpur Multilingual Indian Language Speech Corpus) is developed for promoting LID research on ILs.
- Spectral features from pitch synchronous analysis and glottal closure regions are proposed for discriminating the ILs.
- Intonation, rhythm, and stress features at individual syllable level and in the sequence of syllables within a word are proposed for identifying the ILs.

- Prosodic patterns at global level are proposed in terms of variation of F_0, intensity, and duration patterns for recognizing the ILs.
- Language-specific information from the spectral and prosodic features is combined for improving the accuracy of LID system.

This book is mainly intended for researchers working on language identification area. The book is also useful for young researchers, who want to pursue research in speech processing with an emphasis on spectral and prosodic features. Hence, this may be recommended as the text or reference book for the postgraduate level advanced speech processing course.

The book has been organized as follows: Chap. 1 contains a brief introduction about language identification and its applications. General issues in language identification, language-specific cues in speech signal and specific issues in identification of Indian languages are discussed. Chapter 2 briefly reviews explicit and implicit LID systems present in the literature. Chapter 3 introduces multi-lingual Indian language speech corpus and discusses spectral features extracted from conventional block processing, pitch synchronous analysis, and glottal closure regions for discriminating the languages. Chapter 4 discusses language identification using intonation, rhythm, and stress features derived from syllable and word levels. Chapter 5 provides a brief summary and conclusion of the book with a glimpse towards the scope for possible future work.

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