

# Contents

Relationship between Machine Readable (MRPA) and International Phonetic Alphabet (IPA) for Australian English	x
Relationship between Machine Readable (MRPA) and International Phonetic Alphabet (IPA) for German	xii
Downloadable Speech Databases Used in this Book	xiv
Preface	xvi
Notes on Downloading Software	xix
Chapter 1 Using Speech Corpora in Phonetics Research	1
1.1 The Place of Corpora in the Phonetic Analysis of Speech	1
1.2 Existing Speech Corpora for Phonetic Analysis	4
1.3 Designing Your Own Corpus	6
1.4 Summary and Structure of the Book	18
Chapter 2 <i>Some Tools for Building and Querying Annotated Speech Databases</i>	20
2.1 Overview	20
2.2 Getting Started with Existing Speech Databases	21
2.3 Interface between Praat and Emu	24
2.4 Interface to R	26
2.5 Creating a New Speech Database: From Praat to Emu to R	32
2.6 A First Look at the Template File	34
2.7 Summary	38
2.8 Questions	39
Chapter 3 Applying Routines for Speech Signal Processing	46
3.1 Introduction	46
3.2 Calculating, Displaying, and Correcting Formants	48
3.3 Reading the Formants into R	53

3.4	Summary	58
3.5	Questions	59
3.6	Answers	69
Chapter 4 Querying Annotation Structures		72
4.1	The Emu <b>Query Tool</b> , Segment Tiers, and Event Tiers	72
4.2	Extending the Range of Queries: Annotations from the Same Tier	74
4.3	Inter-tier Links and Queries	77
4.4	Entering Structured Annotations with Emu	82
4.5	Conversion of a Structured Annotation to a Praat TextGrid	86
4.6	Graphical User Interface to the Emu Query Language	88
4.7	Re-querying Segment Lists	90
4.8	Building Annotation Structures Semi-automatically with Emu-Tcl	91
4.9	Branching Paths	97
4.10	Summary	101
4.11	Questions	103
4.12	Answers	108
Chapter 5 An Introduction to Speech Data Analysis in R: A Study of an EMA Database		115
5.1	EMA Recordings and the <b>ema5</b> Database	116
5.2	Handling Segment Lists and Vectors in Emu-R	121
5.3	An Analysis of Voice-Onset Time	125
5.4	Intergestural Coordination and Ensemble Plots	132
5.5	Intragestural Analysis	139
5.6	Summary	159
5.7	Questions	161
5.8	Answers	164
Chapter 6 Analysis of Formants and Formant Transitions		171
6.1	Vowel Ellipses in the $F2 \times F1$ Plane	172
6.2	Outliers	177
6.3	Vowel Targets	179
6.4	Vowel Normalization	183
6.5	Euclidean Distances	190
6.6	Vowel Undershoot and Formant Smoothing	198
6.7	$F2$ Locus, Place of Articulation, and Variability	206
6.8	Questions	213
6.9	Answers	216
Chapter 7 Electropalatography		220
7.1	Palatography and Electropalatography	220
7.2	An Overview of Electropalatography in Emu-R	222
7.3	EPG Data-Reduced Objects	234
7.4	Analysis of EPG Data	248

7.5 Summary	258
7.6 Questions	259
7.7 Answers	260
Chapter 8 Spectral Analysis	264
8.1 Background to Spectral Analysis	264
8.2 Spectral Average, Sum, Ratio, Difference, Slope	288
8.3 Spectral Moments	297
8.4 The Discrete Cosine Transformation	304
8.5 Questions	316
8.6 Answers	320
Chapter 9 Classification	327
9.1 Probability and Bayes' Theorem	327
9.2 Classification: Continuous Data	330
9.3 Calculating Conditional Probabilities	336
9.4 Calculating Posterior Probabilities	338
9.5 Two Parameters: The Bivariate Normal Distribution and Ellipses	342
9.6 Classification in Two Dimensions	347
9.7 Classifications in Higher Dimensional Spaces	352
9.8 Classifications in Time	359
9.9 Support Vector Machines	366
9.10 Summary	373
9.11 Questions	374
9.12 Answers	377
References	381
Index	394