

Gordon E. Pelton

Uyless Black, Consulting Editor

## Contents

Preface xi Acknowledgments xv

Chapter 1. Introduction	riacegu enorusiaT
Voice Processing Applications Nontelephone Applications Call Processing Voice Messaging	Milit - closed vertical nebbit 3  Milit - closed vertical nebbit 3  A closed to edicat 4  If this ellat design palebox 5  Pablit disk vertical guitabox 6  But shared altered vertical 2  A consumation of the consumation of
Chapter 2. History of Talking Automata	nolteolorimmuoeleT .e teta 13
Speaking Idols of the Ancients	evilogero'l isoliofal 13
Talking Heads in the Middle Ages	exipansal enoticalnum acceler 14
Some Contrivances of the Seventeenth and Eig	ghteenth Centuries 15
Professor Kratzenstein's Prize	detical states 2
The Speaking Machines of Wolfgang von Kemp	pelen 16
Two Talking Heads of the Abbe' Mical	salfiQ mebris 7 21
Further Efforts in the Nineteenth Century	omieki gawalneti kandali 142 22
The Automaton Speaking Figure of Professor	Joseph Faber 22
The Contributions of Alexander Graham Bell	A STATE OF THE PROPERTY OF THE PARTY OF THE
Developments in the Early Twentieth Century	26
Pedro, the VODER	alfrair masaimaca 27
Milestones in the World of Telephone Commun	nications 32
The Digital Computer and Voice Processing	pnivelnitical 32

Chapter 3. Speech Technology		33	
Production of Speech Waveforms		34	
Digitization of Analog Waveforms		37	
Sampling Analog Waveforms		38	
Quantizing Analog Waveforms		40	
Analysis/Synthesis in the Frequency Domain		47	
Spectrum Analysis of Speech Waveforms		48	
Subband Coding—SBC		54	
Analysis/Synthesis in the Time Domain		55	
Differential Coding		56	
Evaluation of Coding Schemes		66	
Text-to-Speech		67	
Linguistic Issues		68	
The Conversion Process		72	
The artist County by McGrawshill or gas the artist work			
Chanter A. Speech Becognition		83	
Chapter 4. Speech Recognition	or contact	03	
Variations in Speech		84	
Classification of Systems		85	
Speaker Dependence		86	
Vocabulary Size		87	
Telephone Speech		88	
Speech Recognition Technology		88	
Hidden Markov Models—HMM		90	
Choice of Speech Units		93	
Modeling Speech Units with Hidden Markov Mod	els	96	
Modeling Grammar with Hidden Markov Models		97	
Acoustic/Phonetic Example Using Hidden Marko	v Model	99	
Measures of Performance	nobletupos nelharraga	02	
Production of Francisco State Company of the Compan			
Chapter 5. Telecommunications	$^{1}$ gotor 2. History of Talking	03	
Historical Perspective	neionA ent to slob! pro exect	03	
Telecommunications Networks		06	
Switched Network		08	
Central Office (CO)		09	
Remote Switch	ing a migiz toxista year in of	10	
Toll Office	N to espina Machine of 1	11	
Tandem Office	GA sail to absolt publish out 1	11	
Toll Network Switching Hierarchy	eterdit edi ni anotta recicus 1	13	
Public Versus Private Telephone Networks	1 the American Special of 1	15	
Analog Versus Digital Networks	ras a 6 to anoing type 2 and 1	17	
Integrated Services Digital Network (ISDN)	Y ulse 9 - 48 mi sthammer 1	18	
Transmission	1	19	
Transmission Media		20	
Modulation	1	24	
Multiplexing		32	
Carrier Systems		36	
Cellular Systems		40	
Switching		41	
Manual Switching	1	41	

Electromechanical Switching		143
Digital Switching		151
Private Branch Exchange (PBX)		159
Signaling		162
A Typical Call		164
Subscriber Loop Signaling		165
Interoffice Signaling		170
mioromoo oignamig		
Chapter 6. Requirements and Features		173
and a second sec		
Requirements		174
Basic Capabilities		174
Miscellaneous Capabilities External Interfaces		184
Optional Installed Hardware		184
· ·		186
Design Features	•	186
Screen and Keyboard Versus Telephone	to the time and the second of	188
Systemwide Features		189
Planning for Data Input Miscellaneous Ideas		191
MICH.		191
Script Design		193
Scenarios		193
Prompt and Menu Design		193
Chapter 7. Hardware	and west for Vecescalary Production	197
229		107
Microcircuits Telecommunications		197 198
Signal Processing		198
Digital Signal Processors (DSP)		198
Portable, Special-Purpose Speech DSP		200
		201
Personal Computer Add-in Boards Telephone/Voice Boards		202
Telephony Interfaces		209
Speech Recognition		212
Facsimile (FAX)		215
Text-to-Speech		216
Peripheral Text-to-Speech Products		
		220
System-Level Products		220
Chapter 8. Development Software		221
		000
Device Drivers		222
Multiline Requirements		
Special Features		225
User Interface	MILIDAGE	229
Function Libraries for Higher-Level Lan	guages of the XAR A kinnogn	229
Multitasking Systems		229
Requirements		230
Voice Processing Systems		231

Multitasking Executives	pninatiw8 tapidartasmottael3 233	3
Development Toolkits	gmetatiwa letipio 238	3
Features	(XSIR) sprantoxil domail efection 239	•
Components	onliano 240	)
Application Generators	246	6
Overview	gailangle good redicadud 246	6
Features	contamination of the 252	2
Software Architecture	253	3
Vessbulery Production	275	5
Application Documentation	isa one atname upor la 1970 276	6
Creating an APGEN from a Toolkit	sinems une, 276	6
Speech Editors	gold/Indene O years 277	7
Hardware Requirements	echilidade a reconstructiva 278	8
Speech File Management	seon and length 278	8
Recording	ensylvated patratural land to 0 280	0
Visual Editing	28	1
		_
Chapter 9. Vocabulary Production	Grant size of policials 289	9
Permanent Vocabulary Production	esubl suconstitutelia 29	0
and the second of the second o	nglag0 http229	
The Recording Facility	aphanace 29	
Some Principles of Audio The Professional Studio	nglesG trashi bas iqmar 29	_
Recording Studio at Home or Office	29	
	20	
Hardware for Vocabulary Production	enowbiald V value 29	
Microphone Characteristics	25	
Microphone Types Recording Equipment	enolizatnumana seleT 30	0
Digitization and Editing Devices	palaceca A tental 2 30	9
	(980) a reseason's teagle letters 31	2
The Announcer Candidates	rinangê seogal-Purpess Speakin	
Auditions	sprace ni-bbA refugino 3 lancare 31	
Candidate Evaluation	stració epic Venoricale T 31	4
The Recording Session	essetterni yarango's T 31	4
Preparation	noffingacial design 31	
Script Design	18 Feceimie (FAX)	-
Microphone Techniques	rfamoge-of-txs1 31	15
Direction of a Recording Session	ajouber9 rioseg8-of-txsT larangh -31	16
Prototype Versus Permanent Vocabulary	atoubor History James V 31	
	31	
Vocabulary Editing	31	
The Process Marginal Utterances	ennior 8. Davelopment Software	
Indexed Files	31	
Final Review	31	-
		19
Conclusion	anaboli indica	
	runding hibraries for Highard aver i	
Appendix A. MAX, The Check-in Syst	em 32	21
Pass		
Telephone User's Guide		21
All employees		21 23
Supervisors	Properties of the Party of the	23

Appendix B. Amy Scheduling System	325
Appendix C. Sample Scenario for an Auction-Results	
Telephone System	331
A Possible Scenario	331
Caller has not submitted an absentee bid	332
Caller has submitted an absentee bid	332
Appendix D. Top-Level Dialogue for Guard Check-in System	337
Appendix E. C-Language Program Using a Voice Processing	
Development Toolkit	341
Appendix F. Script Program in Assembler-Like Language	353
Appendix G. Sample Script Language Program	365
Bibliography	375
Index	381