

Contents

<i>Foreword 1</i>	<i>xix</i>
<i>Foreword 2</i>	<i>xxi</i>
<i>Preface</i>	<i>xxiii</i>
<i>Acknowledgements</i>	<i>xxvii</i>
<i>Contributors</i>	<i>xxix</i>

PART I CORE CONCEPTS AND ISSUES

Chapter 1 Introduction	3-10
1.1 What is Information?	4
1.2 What Constitutes Information Technology?	5
Chapter 2 Database Management Systems	11-46
2.1 Introduction	11
2.2 Need for Development of DBMS	11
2.3 Viewing Data in a DBMS	12
2.4 Data Models	14
2.4.1 Object Based Logical Models	14
2.4.2 Record Based Logical Models	15
2.5 Database Languages	18
2.6 Transaction Management	19
2.7 Relational Database Design	19
2.8 Functional Dependency	20
2.8.1 Definition	20
2.9 Normal Form	21
2.9.1 First Normal Form (1NF)	21
2.9.2 Second Normal Form (2NF)	22
2.9.3 Third Normal Form (3NF)	22
2.9.4 Elementary Key Normal Form (EKNF)	23
2.9.5 Boyce Codd Normal Form (BCNF)	23
2.10 File Organization	24
2.11 Query Languages: Relational Algebra and SQL	27
2.11.1 Relational Algebra	27
2.11.2 Structured Query Languages (SQL)	32

2.12	Data Mining: An Overview	35
2.12.1	Requirements and Challenges of Data Mining	36
2.12.2	An Overview of Data Mining Techniques	38
2.12.3	Mining Different Kinds of Knowledge from Databases	38
2.12.4	Mining Association Rules	39
2.12.5	Algorithm Apriori	40
2.12.6	Multi-level Data Generalization	41
2.12.7	Data Cube Approach	42
2.12.8	Data Classification	42
2.12.9	Clustering Analysis	43
2.12.10	Clustering Large Applications Based upon Randomized Search	44
2.12.11	Mining Path Traversal Patterns	44
	<i>References</i>	46
Chapter 3	Role of Telecommunication in Information Technology	47-72
3.1	Introduction	47
3.2	Information and the Channel Capacity	48
3.2.1	Information—How do We Represent it?	48
3.2.2	Digital and Analog—What are They?	48
3.3	Other Classifications of Signals	50
3.3.1	Frequency Domain Representation of a Signal	50
3.3.2	One Reason Why Data cannot be Transmitted at an Arbitrary Rate	54
3.4	Concept of Signal to Noise Ratio	55
3.5	Baseband Signals and Modulated Carriers	55
3.5.1	Modulation Schemes	55
3.6	Modulation Schemes	57
3.6.1	Analog Modulation Schemes	57
3.6.2	Digital Modulation Schemes	60
3.7	Communication Network	67
3.7.1	Communication Media	67
3.8	Transmission through Wires (Cables or Fibres)	67
3.8.1	Telephone Wires	67
3.8.2	xDSL Technology	68
3.8.3	Optical Communication	68
3.9	The Telephone System	68
3.10	Wireless Communications	70
3.11	Satellite Communications	70
3.12	Cellular Telephone System	70
3.13	Conclusion	71
	<i>References</i>	72
Chapter 4	Basics of the Internet	73-90
4.1	Introduction	73
4.2	Circuit and Packet Switching	75
4.3	Web Site	75
4.4	Home Page	76
4.5	Domain Name System (DNS)	76

4.6	Name Server	77
4.7	IP Address—What is TCP/IP?	78
4.8	HTTP	79
4.9	IP Address	79
4.10	Balancing the Load on the Internet Servers	80
4.11	URL (Uniform Resource Locator)	81
4.12	Client Server Model	81
4.13	Client and the Browser	81
4.14	The Server	83
4.15	Proxy Server	83
4.16	HTTP and HTML	84
4.17	Java, the Language of the Internet	86
4.18	Security—A Concern	86
4.19	How to Go about Surfing the Net	87
4.19.1	Lynx	87
4.19.2	Search Engines	88
4.20	What You can do on the Net	88
4.20.1	E-mail	88
4.20.2	TELNET—Virtual Terminal Protocol	89
4.20.3	FTP (File Transfer Protocol)	89
4.20.4	Chat	89
4.20.5	Gopher	90
4.21	Conclusion	90
<i>References</i>		90
Chapter 5	Overview of Present Day Networking Technologies	91-118
5.1	Introduction	91
5.2	Down the Layers	92
5.3	The Layer 2	93
5.4	The LAN Technologies	93
5.4.1	Ethernet and Ethernet Switching	93
5.4.2	Token Ring and Token Ring Switching	95
5.4.3	FDDI (Fiber Distributed Data Interface)	95
5.5	The WAN Technologies	96
5.5.1	Interfaces	96
5.5.2	High-level Data Link Control	96
5.5.3	Point-to-point Protocol	96
5.5.4	X.25	96
5.5.5	Frame Relay	97
5.5.6	Integrated Services Digital Network	97
5.5.7	Asynchronous Transfer Mode	97
5.6	Layer 3	99
5.6.1	Internet Protocol (IP)	99
5.6.2	ICMP	101
5.6.3	Transmission Control Protocol	102
5.6.4	User Datagram Protocol	102
5.6.5	Applications	102

5.7	IP Routing Protocols	103
5.7.1	Static Routes	103
5.7.2	Dynamic Routing Protocols	104
5.7.3	Distance Vector Protocols	104
5.7.4	Routing Information Protocol	104
5.7.5	IGRP/EIGRP	105
5.7.6	Link State Protocols	105
5.7.7	Open Shortest Path First	105
5.7.8	Intermediate System	106
5.7.9	Path Vector Routing Protocol and BGP	106
5.8	Multicasting	107
5.9	Quality of Service	109
5.9.1	Differentiated Service	109
5.10	Integrated Service and RSVP	110
5.11	Lower Level QoS Support	110
5.12	QoS Implementation by Queuing and Congestion Avoidance	111
5.13	Security	111
5.13.1	Firewalls	112
5.13.2	Proxies	112
5.13.3	Intrusion Detection Systems	113
5.13.4	Virtual Private Networks and IPSec	113
5.14	Network Management	114
5.14.1	Simple Network Management Protocol (SNMP)	114
5.14.2	Common Management Information Services (CMIS)	115
5.14.3	Remote Monitoring (RMON)	115
5.15	Other Protocols	116
5.15.1	DNS	116
5.15.2	Dynamic Host Configuration Protocol (DHCP)	117
5.15.3	Network Time Protocol (NTP)	117
5.15.4	Network Address Translation (NAT)	117
5.16	Conclusion	117
	<i>References</i>	<i>118</i>
Chapter 6	Principles of Visual Information Analysis	119–150
6.1	Introduction	119
6.2	Visual Scene Enhancement	119
6.2.1	Image Enhancement	121
6.3	Image Filtering	123
6.3.1	Low-pass Filter (LPF) or Spatial Smoothing	123
6.3.2	High-pass Filter or Image Sharpening	124
6.4	Image Restoration	124
6.5	Segmentation and Feature Extraction	126
6.6	Texture	128
6.7	Shape and Colours in Object Recognition	130
6.7.1	Shapes Provide Information	130
6.7.2	Colours Provide Information	130

6.8	Object Classification and Scene Interpretation	131
6.9	Image Indexing and Retrieval	134
6.9.1	Image Database	135
6.10	Steganography	137
6.10.1	A Simple Method of Data Hiding	137
6.10.2	TER Based Embedding	138
6.11	Applications of Image Processing	138
6.12	Face Recognition	138
6.12.1	Selection of Front Face Feature Points	140
6.12.2	Selection of Fiducial Marks from Side Facial Features	140
6.12.3	Template Matching	142
6.12.4	Formation of Feature Vector	144
6.12.5	Experimental Set-up and Face Identification	144
6.13	Biomedical Image Processing	145
6.13.1	X-ray Image Processing	145
6.13.2	Microscopic and Macroscopic Image Analysis Applications	146
6.13.3	Analysis of X-ray Images for Lung Disease Identification	146
6.13.4	Classification of Mammographic Images	147
6.14	Automatic Visual Inspection System	147
6.14.1	Inspection of Incandescent Lamp Filaments	148
6.14.2	Automatic Surface Inspection	148
6.14.3	Automatic PCB Fault Detection	149
6.15	Conclusion	149
	<i>References</i>	149
Chapter 7	Information Technology for Multimedia Communication	151-166
7.1	Introduction	151
7.2	Multimedia Application	152
7.3	The Human Perceptual System	154
7.3.1	Human Visual System	155
7.3.2	Human Auditory System	156
7.4	Analog Representation of Perceptual Information	157
7.5	Digital Representation and Coding of Visual Information	158
7.6	Third Generation Cellular Telephony for Multimedia Communication	160
7.7	Advanced Multimedia Coding Standards	161
7.7.1	Still Picture Coding: JPEG 2000	161
7.7.2	Video Coding: MPEG-4	163
7.7.3	Multimedia Content Description Interface: MPEG-7	164
7.8	Speech Coding Standards	164
7.8.1	Audio Coding Standards	165
7.9	Text Compression Standards	165
7.10	Conclusion	165
	<i>References</i>	166

PART II DEVELOPMENT OF INFORMATION SYSTEMS

Chapter 8 Graph-Theoretic Structure of the World Wide Web	169–203
8.1 Introduction	169
8.2 How can We Model the WWW?	170
8.2.1 WWW is not the Internet	170
8.2.2 Is WWW a Distributed Database?	171
8.2.3 WWW as a Digraph	171
8.3 Models of Random Graph	172
8.3.1 Erdős-Rényi Model	173
8.3.2 Small-World Models	173
8.3.3 The Preferential-attachment Model	177
8.3.4 The Web-site Growth Model	179
8.3.5 An Evolving Web-Graph Model	181
8.3.6 The Alpha-Beta Model	182
8.4 Empirical Studies	182
8.4.1 The Bowtie Empirical Study	183
8.4.2 Sampling the Web through Random Walk	184
8.5 Properties of the Web Graph	185
8.5.1 Power-law Distribution	185
8.5.2 Diameter of the Web Graph	186
8.5.3 Connected Components	186
8.5.4 Size and Growth Characteristics	186
8.5.5 Changing Contents of a Web Page	187
8.6 Search Engines	188
8.6.1 Architecture of a Search Engine	188
8.6.2 Issues in the Design of Effective Search-Engines	189
8.7 Graph-Theoretic Web Algorithms	190
8.7.1 The WWW Communities	190
8.7.2 HITS Algorithm	191
8.7.3 Mining Knowledge-Bases	193
8.7.4 Web Page Evaluation	194
8.7.5 Small-world Algorithmics	197
8.7.6 Novel Search-Engine Techniques	197
8.8 Conclusion	199
<i>References</i>	<i>199</i>
 Chapter 9 Principles of Image Compression	 204–221
9.1 Introduction	204
9.2 Principles of Still Image Compression	205
9.2.1 Predictive Coding	206
9.2.2 Transform Coding	207
9.2.3 Subband Coding	209
9.3 Quantization	211
9.3.1 Scalar Quantization	212
9.3.2 Vector Quantization	214
9.4 Entropy Coding	216

9.5	Principles of Video Compression	216
9.5.1	Motion Estimation	217
9.5.2	A Video Coding Model	218
9.6	Conclusion	220
	<i>References</i>	220
Chapter 10	Text Compression	222–232
10.1	Introduction	222
10.2	Information Theory Concepts for Data Compression	223
10.2.1	Discrete Memory Less Model and Entropy	223
10.2.2	Compression Ratio	224
10.3	Classification of Compression Algorithms	224
10.4	Algorithms for Text Compression	225
10.5	Lempel-Ziv Coding	226
10.5.1	The LZ77 Algorithm	227
10.5.2	The LZ78 Algorithm	228
10.6	Conclusion	231
	<i>References</i>	231
Chapter 11	Content-based Multimedia Analysis and Retrieval	233–259
11.1	Introduction	233
11.2	Content-based Image Analysis	234
11.2.1	Colour Features	235
11.2.2	Texture Features	237
11.2.3	Shape Features	238
11.2.4	Spatial Features	240
11.3	Content-based Image Retrieval	241
11.3.1	Examples of Image Query Systems	241
11.4	Content-Based Video Analysis	242
11.4.1	Video Segmentation	242
11.4.2	Shot Representative Frames	246
11.4.3	Video Motion Features	247
11.5	Structure Beyond Video Shots	249
11.6	Structured Video Analysis	250
11.7	Content-based Video Retrieval	253
11.8	The MPEG-7 Standard	253
11.9	Conclusion	254
	<i>References</i>	254
Chapter 12	Speech and Audio Compression	260–296
12.1	Introduction	260
12.2	Speech Coding Algorithms and Standards	261
12.2.1	Source System Models and Short-Term Linear Prediction	261
12.2.2	Linear Prediction and the ADPCM ITU G.726 and G.727 Waveform Coders	263
12.2.3	Speech Analysis-synthesis Using Linear Prediction	264
12.2.4	Open-Loop Linear Prediction and the LPC-10	265
12.2.5	Mixed-Excitation Linear Prediction	265

12.3	Standards Based on Analysis-by-Synthesis Linear Prediction	266
12.3.1	Long-term Prediction (LTP)	266
12.3.2	Multipulse Excited Linear Prediction for the Skyphone Standard	267
12.3.3	The Regular Pulse Excitation (RPE) Algorithm for the ETSI Full-Rate GSM 6.10 Standard	268
12.3.4	The FS-1016 Code Excited Linear Prediction (CELP) Algorithm	268
12.3.5	Vector Sum Excited Linear Prediction (VSELP) and International in Cellular Standards	270
12.3.6	The 16 kbit/s ITU G.728 Low-delay CELP	271
12.3.7	The CDMA IS-96 QCELP	272
12.3.8	The ITU G.729 and G.729A CS-ACELP	273
12.3.9	The ITU G.723.1 MP-MLQ/ACELP Algorithm	273
12.3.10	The ETSI GSM 6.60 Enhanced Full-rate Standard	273
12.3.11	The Use of the EFR Algorithm in the IS-641 TDMA Cellular/PCS Standard	274
12.3.12	The IS-127 Enhanced Variable Rate Coder (EVRC) Used in the CDMA Standard	274
12.3.13	The Japanese PDC Full-rate and Half-rate Standards	275
12.3.14	Third-generation Cellular Standards and LP	275
12.4	Speech Coding Standards Based on Subband and Transform Coders	275
12.4.1	The ITU G.722 Subband Coder	275
12.4.2	Sinusoidal Transform Coding	276
12.4.3	The Multiband Excitation Coder and the Inmarsat-M Standard	276
12.5	Audio Coding Methods and Standards	277
12.5.1	Psychoacoustics	279
12.5.2	Time-frequency Analysis Using Filter Banks and Transforms	281
12.5.3	The ISO MPEG-1 and MPEG-2	283
12.5.4	Adaptive Transform Acoustic Coding (ATRAC)	288
12.5.5	AT&T Perceptual Audio Coder (PAC), Enhanced PAC (EPAC) and Multichannel PAC (MPAC)	289
12.5.6	The Dolby AC-2 and AC-3	290
12.5.7	The DTS Algorithm	291
12.6	Summary	291
	<i>References</i>	292
Chapter 13	All-Optical Networking and Evolution of Network Infrastructure: From Electrical to Optical	297-309
13.1	Snapshot of Today's Telecom Network Architecture	297
13.1.1	Brief History of Fiber Optics Communication	298
13.1.2	Post EDFA Story—Beginning of a New Generation Optical Network	299
13.1.3	Introduction to WDM and DWDM Systems	300
13.2	Concept of an All-Optical Network	303
13.2.1	Introduction	303
13.2.2	Challenges and Features of All-Optical Networks	304

13.3 All-Optical Network Architecture	305
13.3.1 Topology	305
13.3.2 Protection Scheme	307
13.4 Reliability of Telecom Network	308
13.5 The Future	309
References	309
 Chapter 14 Computer Security Threats and Countermeasures	 310–326
14.1 Information Security Threats	310
14.2 The TCP Protocol	312
14.2.1 TCP Sequence Number Prediction	313
14.2.2 Trust Relationship Exploitation by IP Spoofing [10]	315
14.2.3 SYN Flooding	315
14.2.4 TCP Session Hijacking	317
14.2.5 RST and FIN Attack	317
14.2.6 Ping O' Death	318
14.2.7 Ping Flooding and Smurf	319
14.3 Threats to Standard TCP/IP Services	319
14.3.1 File Transfer Protocol (FTP)	319
14.3.2 Telnet	320
14.3.3 Simple Mail Transfer Protocol (SMTP)	320
14.3.4 Domain Name System (DNS)	321
14.2.5 'Finger' and 'Who is' Services	322
14.3.6 World Wide Web (WWW)	322
14.3.7 Network Time Protocol (NTP)	323
14.3.8 Network File System (NFS)	324
14.4 Countermeasures	324
References	326
 Chapter 15 Image Databases	 327–335
15.1 Introduction	327
15.2 Data Model	328
15.3 Content-based Retrieval	330
15.4 Conclusion	334
References	334
 Chapter 16 Principles and Applications of Soft Computing	 336–358
16.1 Soft Computing	336
16.2 Fuzzy Set Theoretic Approach to Information Processing	337
16.3 Fuzzyfication	338
16.4 Basic Terms and Operations	339
16.5 Linguistic Variables and Values Representing them	340
16.6 Applications of Fuzzy Set Theory	340
16.7 Neural Network	342
16.7.1 Error Backpropagation Learning Law: Generalized Delta Rule	342
16.7.2 Learning Algorithm	344

16.8	Kohonen's Self-Organizing Feature Map	345
16.8.1	Counter Propagation Classifier	346
16.8.2	Fuzzy Neural Network	346
16.9	Granular Computing	347
16.9.1	Pawlak's Method of Granular Computing for Knowledge Reduction	349
16.9.2	A Generalization of the Pawlak's Method	350
16.9.3	Dependency of Attributes	350
16.10	Conclusion	357
	<i>References</i>	358
Chapter 17	An Introduction to Clustering Techniques	359-366
17.1	Introduction	359
17.2	Preliminaries	361
17.3	Partitioning Algorithms	363
17.4	Hierarchical Methods	365
17.5	Conclusion	366
	<i>References</i>	366
 PART III IMPORTANT APPLICATION AREAS OF IT		
Chapter 18	Bioinformatics: Issues and Challenges	369-384
18.1	Introduction	369
18.2	A Little of Molecular Biology	369
18.3	Human Genome Project	371
18.4	Bioinformatics as an Information Science: The Role of a Scientist	372
18.4.1	The Protein Folding Problem	373
18.4.2	Gene Hunting and Genomic Sequence Analysis	375
18.4.3	Homology Search and Multiple Alignment	376
18.5	Alignment of Sequence	376
18.5.1	Basic Definitions	377
18.5.2	Local vs Global Alignment	378
18.6	Searching Biological Databases	378
18.6.1	Scoring Matrices	379
18.6.2	The BLAST Algorithm	379
18.6.3	What is Beyond BLAST?	381
18.7	Future Directions	382
18.8	Conclusion	382
18.9	Acknowledgments	383
	<i>References</i>	383
Chapter 19	Information Technology in Healthcare and Telemedicine	385-408
19.1	Introduction	385
19.2	Era of Computerization in Healthcare System	385
19.2.1	Computerized Patient Record (CPR)	386
19.2.2	Advantages of Computerized Patient Record	386

19.3	Introduction to Telemedicine	387
19.3.1	Block Schematic of a Telemedicine System	387
19.3.2	Applications of Telemedicine	388
19.4	Benefits of Telemedicine	389
19.5	Data in Telemedicine	390
19.5.1	Electrocardiogram (ECG)	390
19.5.2	Magnetic Resonance Imaging (MRI)	393
19.5.3	Computed Axial Tomography	395
19.6	Transducer in Telemedicine	396
19.7	Noise in Medical Signal	398
19.8	Communication Aspects	398
19.8.1	Data Compression	399
19.8.2	VSAT (Very Small Aperture Terminal)	400
19.8.3	Diagnosis and Interpretation	401
19.9	Multimedia Technology in Biomedical Applications	401
19.9.1	Pervasive Computing	403
19.10	Hospital Software	403
19.10.1	Advantages of the Hospital Software Implementation from Doctor and Patient Point of View	404
19.10.2	From Government Point of View	406
19.10.3	From Medical Research and Academic Point of View	406
19.11	Important Issues Regarding Client Server Technology	406
19.11.1	New Scope of Work in Automated Healthcare System	406
19.12	Conclusion	407
	<i>References</i>	407
Chapter 20	An Overview of Remote Sensing and GIS Techniques	409-436
20.1	Introduction	409
20.2	Remote Sensing	409
20.2.1	Sensors for Remote Sensing	411
20.3	Steps in Remote Sensing	413
20.3.1	Expert System for Interpretation	413
20.3.2	Classification Using Advanced Techniques	417
20.4	Geographical Information System and Its Applications	417
20.5	Multicriteria Decision-making in GIS for Site Selection	419
20.6	Satellite Remote Sensing and GIS in Micro-level Planning— A Case Study	420
20.6.1	Objectives	421
20.6.2	The Study Area	421
20.6.3	Data Input and System Used	422
20.6.4	Details of Investigation	422
20.7	Development of Digital Topographic Database (DTDB)	422
20.7.1	Restoration of Geometric Fidelity of SPOT and IRS 1C Images	424
20.7.2	Mapping from IRS 1C Images	424
20.7.3	Digital Analysis and Mapping of Socio-economic Data	426

20.7.4	Water Resources Development Planning for a Selected Watershed	427
20.7.5	Utility of Remote Sensing and GIS	428
20.8	Discussions and Concluding Remarks	434
20.9	Acknowledgements	436
	<i>References</i>	436
Chapter 21	E-commerce: A Source of Competitive Advantage in Global Market	437-454
21.1	Introduction	437
21.2	Is IT Indispensable Today in Business	438
21.3	Business on the Net	438
21.4	Genesis of Change in Business Processing	440
21.5	Payment Methods Used in E-commerce	443
21.6	Technological Issues	444
21.7	Implementation Scenarios	448
21.7.1	Technology Standards for E-commerce	449
21.8	Security Aspects	449
21.8.1	Encryption—Decryption Techniques	450
21.9	Legal Aspects of E-commerce	451
21.10	Future of Electronic Commerce	452
21.11	Conclusion	453
	<i>References</i>	453
Chapter 22	An Investigation into the Emerging 'Cybermediary' Concept	455-471
22.1	Introduction	455
22.2	Conceptual Background	456
22.3	The Cybermediary Concept	457
22.4	The Future Competitive Advantage	463
22.5	The Dominant Logic of Marketing	464
22.6	The Emergence of Cybermediaries and the Marketing-Mix	465
22.7	Cybermediaries and the Marketing-Mix	466
22.8	Conclusion	469
	<i>References</i>	470
Chapter 23	Industrial Information Technology	472-486
23.1	Introduction	472
23.2	What is Industrial IT?	473
23.3	Industrial IT—Global Status and Trends	476
23.4	Industrial IT: The Indian Scenario	478
23.5	Some Case Studies Undertaken at IIT Kharagpur	480
23.5.1	Fault Detection and Fault Tolerant Control of Industrial Processes	480
23.5.2	Control of Variable Air-volume Air-conditioning Systems	481
23.5.3	Development of an Image-based Measurement System for Fluted Ingots	482
23.5.4	Condition Monitoring of Machine Tools for Intelligent Manufacturing	482
23.6	Industrial IT: The Road Ahead	483
	<i>References</i>	485

Chapter 24 Colour Image Processing and Analysis	487-502
24.1 Introduction	487
24.2 Colour Spaces	488
24.2.1 Physiological Limitations of Human Eye and Vision	488
24.3 Colour Perception Mechanism	489
24.4 HSI/HSL/HSV Hue Saturation and Intensity/Lightness/Value	491
24.5 Colour Space Quantization	491
24.6 Nonlinearity of Human Vision	492
24.6.1 Computation of Parameters	493
24.7 Colour Space Quantization and Just-noticeable Difference	496
24.8 Redundancy in Colours and Fuzzy Approach	497
24.9 Enhancement, Edge Detection and Segmentation Algorithms	498
24.10 Conclusion	500
<i>References</i>	501
 Chapter 25 Information Technology in Mining and Electrical Load Forecasting	 503-521
25.1 Introduction	503
25.2 IT in Mining Industries	504
25.3 Internet and Information Superhighway	505
25.4 Remote Sensing and Geographic Information System (GIS)	507
25.5 A GIS System	508
25.5.1 Digital Collection of Mining-related Reduced-scale Drawings	508
25.5.2 Real Estate Maps and Figures	509
25.6 Mapping Using GIS and Remote Sensing	510
25.6.1 Vegetation Mapping	510
25.6.2 Land Cover and Use	510
25.6.3 Construction of Road Network in the Mines	511
25.6.4 Environment Assessment	511
25.7 Intelligent Mines	512
25.8 Global Positioning System (GPS)	512
25.8.1 GPS Based Truck Dispatching System	513
25.8.2 The System and Operation	514
25.8.3 GPS Based Shovel Positioning Systems	515
25.8.4 GPS Based Auxiliary Equipment Positioning System	515
25.9 Forecasting in Power System	516
25.9.1 Forecasting Range	516
25.9.2 Long-Range Forecasting	517
25.9.3 Medium-Range Forecasting	517
25.9.4 Short-Range Forecasting	518
25.10 Conclusion	520
<i>References</i>	521
 Chapter 26 Information Processing from Document Images	 522-547
26.1 Introduction	522
26.2 Document Categories and Application Domains	524
26.2.1 Document Categories	525
26.2.2 Typical Application Domains	527

26.3	Document Image Processing: Challenges	529
26.3.1	Preprocessing	529
26.3.2	Document Segmentation	531
26.3.3	Document Decomposition	532
26.3.4	Multiple Language Documents	534
26.4	Optical and Intelligent Character Recognition	535
26.4.1	General Architecture for an OCR	535
26.4.2	Post-processing and Intelligent Character Recognition	539
26.4.3	Form Design to Improve the Performance	541
26.5	Storage and Management of Document Datasets	541
26.5.1	Indexing and Retrieving Text in Documents	542
26.5.2	Indexing and Retrieving Document Images	543
26.6	Emerging Issues and Technologies	543
26.6.1	Detection and Recognition of Text in Images and Videos	544
26.6.2	Modern Digitizing Devices	544
26.6.3	Recovery of Distorted Document Images	545
<i>References</i>		546
Chapter 27 Information Technology for Rural Development		548-577
27.1	Introduction	548
27.2	Development Methodology of a Rural Information Centre	549
27.2.1	Creation of Table	550
27.3	Solution Methodologies	551
27.3.1	Client/Server	551
27.4	Centralized and Distributed Databases	553
27.5	SQL Server	554
27.5.1	SQL Server Architecture	554
27.5.2	SQL Commands	555
27.5.3	Operators	560
27.5.4	Functions	561
27.6	Internet Technology	566
27.6.1	Introduction	566
27.6.2	TCP/IP	566
27.6.3	Browsers	566
27.6.4	Web Server	567
27.6.5	Scripting	567
27.7	Active Server Pages (ASP)	567
27.8	Objects in the ADO Object Model	572
27.9	Application Development Using ASP & SQL Server	573
27.9.1	Database Design	574
27.9.2	Front-end Design	575
27.10	Conclusion	576
<i>References</i>		577
Appendix Projects for IT Courses		579-585
Index		587-602