Speech and Audio Processing

100904 - Speech and Audio Processing

Introduction- Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness.

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of non- stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types.

Scalar Quantization of LPC- Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF.

Linear Prediction Coding- LPC model of speech production; Structures of LPCencoders and decoders; Voicing detection; Limitations of the LPC model.

Code Excited Linear Prediction- CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero- input zero-

state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.

Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729standards

Text/Reference Books:
1. "Digital Speech" by A.M.Kondoz, Second Edition (Wiley Students" Edition), 2004.
2. "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", W.C. Chu, Wiley Inter science, 2003.

Advance Java Programming

Advance Java Programming

Module 1: Java Beans and Web Servers: Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Working with Http request and response, Security Issues. Java Script: Data types, variables, operators, conditional statements, array object, date object, string object, Dynamic Positioning and front end validation, Event Handling

Module 2: JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.

Module 3: Database Connectivity: Database Programming using JDBC, Studying Javax.sql.*package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

Module 4: Java Servlet: Brief origin and advantages over CGI, J2EE Servlet 2.x Specification, Writing small Servlet Programs, Deployment Descriptor, Inter Servlet Collaboration, Session: Definition, State on web, Different ways to track sessions,

Module 5: J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading, J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison

amongst 2-tier, 3-tier and N- tier architectures, Thin and Thick Clients

Text Books:
1. Elliotte Rusty Harold, " Java Network Programming", O'Reilly publishers,
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc.
3. Hortsmann& Cornell, "Core Java 2 Advanced Features, Vol II", Pearson Education,

References:
1. Web reference: http://java.sun.com.
2. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill.

Cryptography and Network Security

Cryptography & Network Security

Module 1 Security Services, Mechanisms and Attacks, TheOSI Security Architecture, A Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotol Machines, Steganography.

Module 2 Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Module 3 Finite Fields and Confidentiality: Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF (p), Polynomial arithmetic, Finite Fields of the Form GF(2"), Placement of Encryption Function, Traffic Confidentially, Key Distribution, Random Number Generation.

Module 4 Encryption Standard and Ciphers: Evaluation criteria for AES, AES cipher, Multiple encryption and Triple DES, Block cipher Modes of operation, Stream ciphers and RCG.

Module 5 Number Theory and Public-Key Cryptography: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public- Key Cryptosystems, The RSA Algorithm,

Module 6 Message Authentication, Function, Algorithms and Digital System: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols.

Text Book:

1. W.Stallings : Cryptography and Network Security : Principles and Practice, 4/e Pearson Education, New Delhi, 2006.

Reference Books:

1. B.A. Forouzan – Cryptography and Network Security, TMH, New Delhi, 2007
2. B. Schneier – Applied Cryptography, John Wiley, Indian Edition, 2006.