# NCC-2002 Tutorials

### 1) Microstrip Antenna (MSA): (1/2 day)

by Prof. Girish Kumar, IIT-B

- 1. Characteristics of MSA
- 2. Rectangular, circular and triangular MSA
- 3. Broadband MSA
- 4. Compact MSA
- 5. Circularly polarized MSA

#### 2) Speech Recognition: (1/2 day)

by Prof. Hema A. Murthy, IIT-M

#### Abstract

Speech recognition applications are now appearing on desktop platforms, and the trend is likely to grow. This tutorial gives an overview of the area, with specific focus on the key concepts driving today's recognizers. The tutorial will begin with an introduction to the acoustics of speech, which includes the physics of speech production and perception. Next the characteristics of the speech waveform (time-domain) and their spectra (frequency domain) are considered. The commonly used source-filter model for speech production is introduced. Fundamental to speech recognizers is the notion of feature vectors - the so-called front-end processing. Both model-based and non-model-based feature extraction techniques will be addressed. An overview of how the extracted parameters are used in the recognition process will be given next. Here the hierarchical structure that is present in many practical recognition tasks will be discussed, leading to the notion of recognition grammars. The older technique of Dynamic Time Warping (DTW) will be presented using an isolated word recognition system as an example. The theory of Hidden Markov Models (HMMs), which have become the de facto approach for building recognizers, is the last key topic that will be covered. The tutorial will end with a tour through a prototypical Isolated Speech Recognition System based on discrete HMMs.

## **3) MPLS**: (1/2 day)

by Prof. Abhay Karandikar, IIT-B

1. Brief History- ATM Network, IP over ATM Issues, IP Forwarding and Traffic Engineering, Evolution of MPLS Network

2. Earlier `Avatars' of MPLS- Tag Switching, IP switching, ARIS

3. Fundamental Concepts of MPLS- Label Switching \_forwarding Component, Control Component

4. Architecture of MPLS- Label distribution, allocation and Retention modes

5. Traffic Engineering in MPLS- Constraint based routing, CR-LDP and RSVP- TE

6. Quality of Service and MPLS- QoS Issues in MPLS, DiffServ over MPLS, VPN and MPLS

## 4) Wireless Data Networking: GPRS AND WCDMA: (1/2 day)

by Prof. A. Chockalingam, IISc, Bangalore

#### Abstract:

This tutorial will address the technical issues involved in wireless data networking. Wireless channel behavior and its effect on the design of wireless protocol stacks will be discussed. Examples of the design lower layer protocols (e.g., ARQ) for wireless will be illustrated. Specific focus will be made on packet data services in next generation cellular systems, including General Packet Radio Service (GPRS) and Wideband Code Division Multiple Access (WCDMA). GPRS supports packet mode communications using the existing GSM infrastructure, augmented with specialized packet routing nodes (GSNs). The GPRS system architecture, protocol stack, mobility management and QoS provisioning will be discussed in detail. WCDMA can provide multiple services (voide, data, video, etc) to mobile users at data rates up to 2 Mbps. WCDMA uses similar network infrastructure architecture as GPRS. The WCDMA protocol stack, the functionalities of various layers, and system operation will be presented.

## 5) Quality Enhancement in Packetized Voice Communication

by Dr. Aloknath De, Hughes Software Systems, Gurgaon

Legacy telecommunication network is being enhanced worldwide to cater for rising needs of data communication via ISDN, modem technologies, integrated services over ATM/frame relay backbones and so on. Also, has emerged a packet-based IP networking world that caters for data transport over local and wide areas using links, routers, bridges and switches. QoS provides performance guarantees about a network offered to its users. In this tutorial, we will address voice quality issues in packet communication at great details. For voice compression, generally G.711 – PCM, G.726 - ADPCM, G.728 - LD-CELP, G.729/G.729A - CS- ACELP and G.723.1 - Multi Rate CELP codecs are used for rates varying from 64 to 5.3 kbps. Speech quality, under tandemmed conditions, is generally inferior and a tandem-free operation (TFO) scheme drastically helps in

maintaining voice quality. Every stage in the data-flow pipeline, from coding to transport to reception to decoding, adds delay to the overall transmission, by a fixed or variable amount. Such latency causes two problems----talker overlap and echo. As echo is perceived as a significant quality problem, Voice over Packet (VoP) systems implement echo control and/or echo cancellation techniques. The delay problem is compounded by the need to remove jitter by collecting packets and holding them long enough to allow the slowest packets to be played in the correct sequence. Under peak load and congestion, voice packets are often lost; and thus a sophisticated packet replication algorithm is implemented which reduces voice quality degradation. With illustrations of typical VoP systems, in this tutorial, we will describe the various signal processing modules, highlight the design challenges involved and elucidate how the DSP components play an active role in alleviating voice quality degradation in packet communication.

#### 6) Digital Signatures: (1/2 day)

by Prof. T.S. Lamba, IIT-Kh, Kharagpur

In today's world a large number of important messages are being sent in electronic format instead of on paper. To ensure the authenticity of these messages, they should be signed, and the signature is also to be sent in electronic format. Since anything sent by electronic means can be copied and repeated, the problem of Digital Signatures becomes important and the signature has to message dependant.

In this tutorial we will see how to sign messages using the concept of public keys. We will look at the problem of choosing the appropriate keys and then discus standard which will enable the lay user to employ digital signatures.

Since Digital Signatures are computationally expensive it is necessary to sign a summary of the message. This summary is called a message digest and we will look at some message digests.

To verify the signature the receiver should know the key used. Since this key has to be obtained - also electronically - it is required to have a verifiable key which can be got using certificates and we will also examine the format of certificates.