

IT8006 PRINCIPLES OF SPEECH PROCESSING

DETAILED SYLLABUS

OBJECTIVES:

The student should be made:

- To understand the speech production mechanism and the various speech analysis techniques and speech models
- To understand the speech compression techniques
- To understand the speech recognition techniques
- To know the speaker recognition and text to speech synthesis techniques

UNIT I SPEECH SIGNAL CHARACTERISTICS & ANALYSIS

Speech production process - speech sounds and features- - Phonetic Representation of Speech --representing= speech in time and frequency domains - Short-Time Analysis of Speech - Short-Time Energy and Zero-Crossing Rate - Short-Time Autocorrelation Function - Short-Time Fourier Transform (STFT) - Speech Spectrum - Cepstrum - Mel-Frequency Cepstrum Coefficients - Hearing and Auditory Perception - Perception of Loudness - Critical Bands - Pitch Perception

UNIT II SPEECH COMPRESSION

Sampling and Quantization of Speech (PCM) - Adaptive differential PCM - Delta Modulation - Vector Quantization- Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT III SPEECH RECOGNITION

LPC for speech recognition- Hidden Markov Model (HMM)- training procedure for HMM- subword unit model based on HMM- language models for large vocabulary speech recognition - Overall recognition system based on subword units - Context dependent subword units- Semantic post processor for speech recognition

UNIT IV SPEAKER RECOGNITION

Acoustic parameters for speaker verification- Feature space for speaker recognition-similarity measures- Text dependent speaker verification-Text independent speaker verification techniques

UNIT V SPEAKER RECOGNITION AND TEXT TO SPEECH SYNTHESIS

Text to speech synthesis (TTS)-Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody

TEXT BOOKS:

1. L. R. Rabiner and R. W. Schafer, Introduction to Digital Signal Processing, Foundations and Trends in Signal Processing Vol. 1, Nos. 1–2 (2007) 1–194

2. Ben Gold and Nelson Morgan —Speech and Audio signal processing- processing and perception of speech and music, John Wiley and sons 2006

REFERENCES

1. Lawrence Rabiner, Biiing and– Hwang Juang and B. Yegnanarayana —Fundamentals of Speech Recognition, Pearson Education, 2009
2. Claudio Becchetti and Lucio Prina Ricotti, —Speech Recognition, John Wiley and Sons, 1999
3. Donglos O shanhnessy —Speech Communication: Human and Machine —, 2nd Ed. University press 2001.