Speech Communication (CT 540)

Course Title: Speech Communication

Credit Structure: (L-T-P-Cr): 3-0-0-3

Course Code: CT 540

Prerequisites (if any): Basic Knowledge of Signals and Systems is desirable but will also be revised in the initial stage of the course.

Course objective: To study fundamentals of speech production (physiological, acoustical and aeroacoustic perspective), speech analysis methods- STFT, spectrograms, LP analysis, and cepstrum analysis. A case study on Automatic Speech Recognition using Hidden Markov Models (HMMs)

Course content: Given below


(This textbook is followed extensively or mostly for the entire course)

Course Abstract:- Speech communication is an interdisciplinary subject with different research areas ranging from electrical and communication engineering, linguistics, phonetics, psychology, computer science, etc. Speech communication is the transfer of information from one person to another or from person to machine via speech. This course equips students with different fundamental problems in speech science such as speech production process, speech perception, time-domain and frequency-domain processing, homomorphic speech processing and most popular linear prediction (LP) of speech and finally different diverse speech communication applications such as speech analysis, speech coding, speech synthesis, speech recognition and speaker recognition are discussed. The course is designed in such a way that relationships between different parts of speech communication can be understood easily. In addition to this, cohesive discussion on speech production and speech perception will help audience to understand speech communication process better.

Course Outline: - Fig. 1 shows the activity tree for the course. The course will first review very briefly the basic concepts of DSP and random processes followed by detailed discussion on speech production process from the view point of physiological aspects to acoustic theory of speech production. The unique feature of the course will be a detailed discussion on aeroacoustic theory of speech production and development of Teager Energy Operator (TEO) and recently proposed variable length TEO (VTEO).
This time, in the applications domain, the course will concentrate on one application, viz., speech recognition using Hidden Markov Models (HMMs) which is one of most fascinating and challenging problem in speech research and having wide industrial applications.

In addition, we will also discuss another interesting and challenging application, i.e., Speaker Recognition (Voice Biometrics).

**Course Evaluation or Grading Methodology (Tentative)**

- Attendance=10%
- Mid Term = 20%
- Course Project =30%
- Endsem =40%

**Course Instructor**
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