M. Tech
Speech Processing
(040160206)
2nd Semester
EFFECTIVE FROM January-2013
A. Prerequisite: Basic knowledge of Fourier and spectral analysis necessary to evaluate the problems of Speech Processing

B. Aim and Objective: To acquaint with the concepts of Speech Processing and application method

C. Subject Code: 040160206 Subject: Speech Processing

D. Total: 60 Hrs. [Lecture: 4 Tutorial: 0 Practical: 0]

E. Detailed Syllabus:

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<th>Sr. No.</th>
<th>Topic Name</th>
<th>Weightage (%)</th>
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<td>1.</td>
<td>Introduction</td>
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<td>1.1</td>
<td>Speech Production Mechanism</td>
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<td>1.3</td>
<td>Classification of Speech, Sounds, Nature of Speech Signal</td>
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<td>1.4</td>
<td>Speech Signal Processing: Purpose of Speech Processing Short Time Analysis</td>
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<td>2.</td>
<td>TIME DOMAIN METHODS FOR SPEECH PROCESSING</td>
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<td>2.1</td>
<td>Time Domain Parameters of Speech</td>
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<td>2.2</td>
<td>Methods For Extracting the Parameters Energy, Average Magnitude, Zero Crossing Rate</td>
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<td>2.3</td>
<td>Silence Discrimination Using ZCR and Energy</td>
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<td>2.4</td>
<td>Short Time Auto Correlation Function</td>
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<td>Pitch Period Estimation Using Auto Correlation Function</td>
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<td>3.</td>
<td>FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING</td>
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<td>Short Time Fourier Analysis</td>
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<td>Analysis by Synthesis</td>
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<td>Pre-Emphasis &amp; De-Emphasis</td>
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<td>Filter Bank Analysis</td>
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<td>4.</td>
<td>LINEAR PREDICTIVE CODING OF SPEECH</td>
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4.1 Basic Principles of Linear Predictive Analysis
4.2 Auto Correlation Method
4.3 Covariance Method
4.4 Solution of LPC Equations
4.5 Cholesky Method
4.6 Durbin’s Recursive Algorithm
4.7 Pitch Detection Using LPC Parameters
4.8 VELP
4.9 CELP

5. QUATISATION OF SPEECH SIGNAL

5.1 Scalar Quantization
5.2 Basics of PCM, APCM and ADPCM
5.3 Vector Quantization
5.4 Concept of Codebook
5.5 K-Means Clustering Algorithm

6. APPLICATION OF SPEECH SIGNAL PROCESSING

6.1 Hidden Markov Modelling
6.2 Speech Recognition
6.3 Speech Synthesis And Speaker Verification
6.4 VOIP

F. Modes of Transaction (i.e. Delivery)
   1. Teaching activities can be carried out using conventional (chalk & board) method and/or with advance multimedia equipment’s
   2. Theory and practical may be explained with some basic simulation tools
   3. Separate session should be conducted to explain the concept of subject practically

G. Teachers Activities/Practicum
The following activities should be carried out by the teachers:
   1. Carry out Mid-semester examination & remedial examination (if necessary)
   2. Continuous evaluation may be carried out to evaluate the performance of student by mean of arranging Quiz/viva/sessional examination
   3. Laboratory sessions are used to show the practical applications of the subject
   4. Minimum three assignments should be given to students which cover all important topic of the subject

H. Student Activities/Practicum
The following activities may be carried out by the students:
1. Remain present in all theory and practical sessions conducted by faculties
2. Complete assignments and other term work time to time given by faculty
3. Prepare a book to keep a record of practical sessions conducted by faculties and complete the laboratory manual in time
4. Take active part in all activities related to subject conducted by faculties

I. Text Books
   2. WaiC. Chu, Speech coding algorithms, John Wiley & Sons, Inc., publication

J. Reference Books
   2. W. Rappaport, Wireless Communication