7th February 2017

Maximum Marks = 40

ELL786: Multimedia Systems

Minor 1 Examination, Duration: 1hr

Note: All questions are compulsory.

Q1.

a. With the help of a block diagram clearly describe the working of the encoder in a predictive coding scheme. Clearly label all the blocks and explain their function.

b. A source outputs a sequence of symbols whose autocorrelation sequence can be represented as

$$R_x(0) = 26,\ R_x(1) = 7,\ R_x(2) = 7/2$$

Obtain the coefficients of a 2nd order predictive coder to encode any sequence that this source generates.

c. Derive the expression of prediction error. What is the prediction error in the example given above? **(3+4+3)**

Q2. Consider the following 4, 2D points:

[2,1] [3,2] [4,3] [1,1]

a. Obtain the eigen vectors and eigen values and apply KL transform.

b. Plot the points before and after the transform and comment on the result. **(8+2)**

Q3. Given a memory-less source with alphabet {a, b, c, d}, the probabilities of occurrence of the 4 symbols are 0.5, 0.3, 0.15, 0.05 respectively.

a. What is the entropy of this source?

b. Apply ***Huffman coding*** and obtain the bits/symbol value for the code.

c. Given the sequence 'cddb', obtain the code corresponding to this sequence if ***arithmetic coding*** is applied.

d. Construct Golomb code to represent symbols of this source. What is the value of the parameter *m* chosen? Justify the choice. Obtain the bit/symbol value for the code. **(1+3+4+4)**

Q4. Assume another memory-less source with alphabet {a, b, c} and probabilities of occurrence 0.4, 0.3, 0.3 respectively.

a. Construct a minimum variance Huffman code for the case where two symbols are concatenated to construct the extended alphabet. Compare the bits/symbol value with the Entropy of the source.

b. Show mathematically that extending the symbols can help construct a code whose bits/symbol value approaches the Entropy of the source. **(5+3)**