

ECE 154C Homework #3

Due: Wednesday, April 22, 2009

1. Using the Lempel Ziv window algorithm with a window size 32, encode the following text message.

MARY HAD A LITTLE LAMB LITTLE LAMB LITTLE LAMB MARY HAD A
LITTLE LAMB WITH FLEECE AS WHITE AS SNOW. OH WHERE OH WHERE
HAS MY LITTLE DOG GONE OH WHERE OH WHERE CAN HE BE

Calculate the average number of encoded binary digits per source letter.

2. Using the algorithm derived in class, find the optimal quantization regions and representation points for a Gaussian random variable (of mean 0 and variance 1) for the case of 2, 3, 4, and 5 bit quantization. In each case, calculate the average mean squared error between the unquantized and quantized values.
3. By simulation, verify the results for the mean squared error found in problem 2 for 3 bit quantization.
4. Repeat problem 2 for the case of a random variable that has a probability density function $f_X(x) = 1 - |x|$, for $-1 < x < 1$.
5. By simulation, verify the results for the mean squared error found in problem 4 for 3 bit quantization.