

ECE 154C Homework #2  
Due: Wednesday, April 15, 2009

For all of the following problems consider an i.i.d. source with source letters {A,B,C,D,E} with probabilities {0.1, 0.2, 0.3, 0.3, 0.1}

1. Compute the entropy of the source base 2, 3, and 4.
2. For  $n = 2$ , find binary Huffman codes for taking  $n$  source symbols at a time. Compute the average number of binary code symbols per source symbol and compare it to the entropy (with the appropriate base.).
3. Repeat problem 2, for ternary codes. Here the code alphabet is {0, 1, 2}.
4. Repeat problem 2, for quaternary codes. Here the code alphabet is {0, 1, 2, 3}.
5. Find a Tunstall code for the source that encodes the source phrases into binary code words of length 4. Compute the average number of binary code symbols per source symbol and compare it to the entropy (with the appropriate base).
6. Suppose the Tunstall code found in Problem 5 is followed by a binary Huffman code. Compute the average number of binary code symbols per source symbol and compare it to the entropy (with the appropriate base).
7. Find a Tunstall code for the source that encodes the source phrases into ternary code words of length 2. Compute the average number of ternary code symbols per source symbol and compare it to the entropy (with the appropriate base).
8. Suppose the Tunstall code found in Problem 7 is followed by a ternary Huffman code. Compute the average number of ternary code symbols per source symbol and compare it to the entropy (with the appropriate base).