ECE 154C Homework #8
Due June 3, 2009

1(a) Consider the (8,4) code with parity check matrix given as:

1 1 1 0 1 0 0 0
1 1 0 1 0 1 0 0
1 0 1 1 0 0 1 0

Draw the Tanner graph corresponding to this code.

(b) Assume that the 8 soft inputs to the decoder (that is, the 8 probabilities that each of the 8 digits is equal to 1) are:

0.1, 0.6, 0.8, 0.1, 0.1, 0.9, 0.9, 0.9

Assume that in the first step of decoding, these 8 values are broadcast from the bit nodes to the parity nodes. Find the value that the first parity node (corresponding to the top row of the parity matrix) sends back to the first bit node in the next decoding step.

(c) Assume that at some step in the decoding, the first bit node receives the following estimates that it is a 1.

From the channel	0.1
From the first parity node	0.7
From the second parity node	0.6
From the third parity node	0.8

What value does this bit node send to the first parity node to which it is connected?

2 Consider the (7,4) code with parity check matrix given as:

1 1 1 0 1 0 0
1 1 0 1 0 1 0
1 0 1 1 0 0 1

Assume that the code is to be used in conjunction with a binary **erasure** channel.

(a) Of the 35 erasure patterns with 3 erasures, how many can the code correct?

(b) Draw the Tanner graph for this code. If one uses an iterative procedure to correct erasures on this graph, how many of the 35 erasure patterns with 3 erasures will be correctable by this procedure?

(c) Assume that an extra parity node is appended to the graph that is the mod 2 sum of the other 3 parity equations. If one uses an iterative procedure to correct erasures on this new graph, how many of the 35 erasure patterns with 3 erasures will be correctable by this procedure?

3. Draw the convolutional encoders for the following codes: (a) Rate ½, code with octal tap connections 51 & 73, (b) rate 1/3 code with octal tap connections 127 & 133 & 125, and (c) Rate ¼ code with octal tap connections 472 & 572 & 626 & 736. How many states does the trellis for each encoder have?

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