EE 706: Communication Networks

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Assignment 1 : **15 points** **Due date**: January 25, 2012

Suppose a source and a destination are connected by a binary symmetric channel with crossover probability p. Suppose the source wishes to communicate an N-bit string to the destination. The source uses a magical single parity check code to detect errors in the received bit string which adds one bit of redundancy and detects all errors[1]. Whenever error is detected by the magical parity check decoder at the destination, assume that this event is communicated back to the source instantaneously without incurring any communication overhead. The source resends the N-bit string when this feedback is received.

1. Derive the throughput for this scenario as a function of N and p. Using Matlab or Scilab, simulate the scenario and confirm your derived expression for different values of N and p. Include a printout of your code with the submission.

2. If the source uses a 3-repetition code in addition to the magical parity check code, derive the throughput as a function of N and p. Using Matlab or Scilab, simulate the scenario and confirm your derived expression for different values of N and p. Include a printout of your code with the submission.

3. If $N = 20$, for which values of p is the magical parity check only scenario better than the magical parity check plus 3-repetition code scenario? You can restrict the value of p to be between 0 and 0.5.

Recall that throughput is defined as the average rate of successful message delivery. We will define throughput here as the ratio of the number of information bits N and the average number of bits transmitted to communicate them to the destination.

[1]This is an approximation of the CRC scheme which detects all errors with high probability using a small amount of redundancy