ECE 695C, Homework #8, due date: 4/17/2012

https://engineering.purdue.edu/∼chihw/12ECE695C/12ECE695C.html

Question 1: Plot the EXIT chart for the turbo code described in HW5 with a binary-input additive white Gaussian channel: $Y = (-1)^X + N$ where N is Gaussian with mean 0 and variance $(\sigma_0)^2$. Please use $K = 100000$, which is the number of information/systematic bits, when plotting the EXIT curves.

For each $(\sigma_0)^2$ value, you should be able to plot one EXIT chart (with two EXIT curves). Plot three EXIT charts for the following σ_0 values, respectively: $\sigma_0 = 1.4$, $\sigma_0 = 1.27$, and $\sigma_0 = 1.14$. Have you observed an open tunnel in these EXIT charts?

Question 2: [Optional]

1. Use EXIT chart analysis and binary search to determine the threshold σ^* of this turbo code when $K = 100000$. (You may need good precision in your Monte-Carlo simulation to pinpoint when the open tunnel will close.)

   Note that you only need to simulate one RSC when creating one EXIT curve. The other EXIT curve can be obtained by symmetry. Moreover, since EXIT charts only consider the marginal, with $K = 100000$ you only need to repeat the Monte-Carlo simulation for a small number of times to have the desired precision.

2. Directly simulate the performance of the turbo code by performing turbo decoding with 18 iterations as you did in HW5. Does the threshold predicted by the EXIT chart match that of your direct simulation?

   You should observe that EXIT chart prediction is computationally more efficient than direct Monte-Carlo simulation.