COSC 6222 :: Course Project

Note. This is the default project. If you wish, you may complete a different project; in this case, please consult with the instructor as soon as possible.

In this project, you will implement an encoder and a decoder for a particular kind of capacity-achieving error-correcting code, called a Repeat-Accumulate (RA) code.

You may use any literature references you wish, but the seminal paper on the topic is the following:

D. Divsalar, H. Jin, and R. McEliece, "Coding theorems for 'turbo-like' codes," in *Proc. 36th Allerton Conference on Communications, Control, and Computing*, Monticello, Illinois, USA, 1998. Available online at:
http://www.ee.caltech.edu/EE/Faculty/rjm/papers/Allerton98.pdf

The decoder for this code uses an iterative method known as "belief propagation". This decoding method is not thoroughly described in the above paper, but you may instead consult one of the following references:

F. R. Kschischang, B. J. Frey, and H.-A. Loeliger, "Factor graphs and the sum-product algorithm," *IEEE Trans. Inform. Theory*, Feb. 2001. Available online via IEEEXplore.

D. J. C. Mackay, *Information Theory, Inference, and Learning Algorithms*, Cambridge University Press, 2003. Available online at:
http://www.inference.phy.cam.ac.uk/mackay/itila/book.html

Your deliverables for this project are:

- Source code for the encoder and decoder;
- A brief (1-page) discussion of your method and conclusions (this should also **list all references you consulted**, other than those given above);
- Simulation curves reproducing the 10, 20, and 30 iteration lines for N=1024 and k=3 from Figure 5 in Divsalar et al.; and
- Simulation curves for 10, 20, and 30 iterations for N=2048 and k=3.

You may complete the project in C, C++, Java, or MATLAB. Please consult the instructor if you would like to use another language.

Your project grade will be assigned on the technical quality and correctness of your results (70%), the quality of your report and plots (10%), and the quality of your source code (readability, comments, etc.) (20%).