MTAT.05.128: Introduction to Digital Communications **University of Tartu**

Homework assignment 6

Due date: June 6, 2016

In this homework assignment, you will investigate the symbol error rate (SER) of the 8-PAM modulation.

Reminder: M-PAM modulation, where $M = 2^k$, maps k bits onto the points $(2m - 1 - M) \cdot \sqrt{E_g}$, where E_g is the energy of the basis signal, and $m = 1, 2, \cdots, M$.

1. What is the symbol error rate of 8-PAM modulation (as a function of signal-to-noise ratio (SNR))? You can use formulas which were derived in the class.
2. Obtain the theoretical expression for the symbol error rate of the 8-PAM modulation using `erfc` function.
3. Write a MATLAB/OCTAVE simulation, which generates random 8-PAM modulated signals sent over the AWGN channel. The resulting signal is demodulated, and the decision is made by using the minimum Euclidean distance criteria. Show dependence of the SER on the SNR (SNR is given in db). On the same plot show the theoretical values of the SER.

   Hints:

   - You can base your solution on the simulation examples, which were shown in the class.
   - You can assume that $E_g = 1$.