Information theory and error control coding/Teoria da informação e códigos corretores de erros

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Tutorial Questions/Lista de Exercícios - 7

1. A convolutional code is described by

g1=[101], g2 = [111], g3 = [111]

1. Draw the encoder corresponding to this code.
2. Draw the state-transition diagram for this code.
3. Draw the trellis diagram for this code.
4. Find the transfer function and the free distance of this code.
5. Verify whether or not this code is catastrophic.
6. Assuming that this code was used for transmission over an AWGN channel with hard-decision decoding, the output of the demodulator detector is (101001011110111…) Using the Viterbi algorithm, find the transmitted sequence.

2. Develop a Matlab code to simulate convolutional codes with arbitrary parameters of rate R and constraint length K using BPSK modulation and additive white Gaussian noise. Suggestion: use Matlab´s communication toolbox.

a) Plot the bit error ratio (BER) against the signal-to-noise ratio (SNR) for a range of values. Suggestion: pick 5 or 6 SNR points, use rates R = 1/2, 1/3 and 1/4 for each coding scheme and constraint length K = 3, 5 and 7.

b) Compare the BER x SNR performance of different codes with that of uncoded systems.