
2015 Spring - Information Theory

Homework 1

Part 1

Develop a Morse encoder and decoder

- 1) Given a text of a 5000/10.000 words, develop a Morse encoder then answer the following questions :
How many bits are required to save the text in ASCII code and how many bits are needed to save the text in Morse code?
Call the above ratio the compression ration. Take a text in German, Italian and Spanish: how is the compression rate different in different languages?
- 2) Plot the compression ration for the different texts you consider.

Part 2

- 1) Next assume that the bits in the Morse coded message are flipped from zero to one with a certain probability p :
Using the above decoder, calculate the number of error in the reconstructed text for flipping probability in the interval $p \in [0, 1/4]$.
- 2) Next assumed that bits in the Morse coded message are erased with a probability p :
Using the above decoder, calculate the number of error in the reconstructed text for flipping probability in the interval $p \in [0, 1/4]$.
- 3) Repeat the above calculation for the case in which the message is coded using ASCII code.
- 4) Plot all the error probabilities.

Part 3

Read the paper : "The mathematical theory of communication "(on the course website) , and answer the following questions:

- 1) What kind of problems are defined as communication problem?
- 2) What kind of engineering applications did Shannon have in mind?
- 3) What kind of mathematics did he developed to study the problem at hand?