

## ELL710 - Programming Assignment on Reed-Solomon Codes

This is a programming assignment which requires you to encode and recover binary message bits when using Reed-Solomon codes.

### Objective:

- To familiarize yourself with handling erasures when using Reed-Solomon codes

### Input:

- A text file of size 1 KB of your choice.

### Ingredients:

- 1) An  $(n = 7, k = 3)$  Reed-Solomon code over  $F_8 = \mathbb{Z}_2[x]/p(x)$  with  $p(x) = x^3 + x + 1$ .

### Computing Environment:

- Matlab

### Experiment with random errors

- 1) Read the input text-file and convert it to a binary string.
- 2) Convert the binary string into a sequence of symbols over  $F_8$ .
- 3) Divide the string of symbols into several chunks such that each chunk is of size  $k = 3$  symbols.
- 4) Encode each chunk into a sequence of  $n = 7$  symbols by using the above Reed-Solomon code.
- 5) Assuming that each codeword is represented as a row vector, stack the codewords one below the other to form a matrix. With this arrangement, the  $i$ -th column of the matrix, for  $1 \leq i \leq 7$ , can be seen as the  $i$ -th server that stores the  $i$ -th component of all the codewords.
- 6) Generate a random binary erasure pattern  $\mathbf{e}$  of length 7 with hamming weight 4, which is used to represent the erasure pattern of the servers. For instance, if  $\mathbf{e} = [1 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0]$ , then this implies that the first 4 servers have failed, and as a result, the first 4 components of every codeword have been erased.
- 7) Recover the text-file from the existing set of servers (columns).