Autumn 2022
ITT305: Programming Assignment 1

13 October 2022

Objective: Implement Line coding encoder and scrambler with digital data generator

- Digital data generator: generates completely random data sequence and a random sequence with some fixed sub-sequences like eight or four consecutive zeros. It should also return the longest palindromic sequence in the generated data.

- Line coding schemes to be implemented: NRZ-L, NRZ-I, Manchester, Differential Manchester, AMI.

- Scrambling schemes: B8ZS, HDB3.

Language used: Any programming language can be used except MATLAB and similar options like Scilab or GNU octave.

Input: Ask user for digital data stream generation i.e., whether user wants completely random sequence or a random sequence with fixed sub-sequences (usually used for scrambling) and the type of encoding. For encoding you need to provide user with various options (NRZ-L, NRZ-I, Manchester, Differential Manchester, AMI). If user asks for AMI, you need to pop a query whether scrambling is needed or not, if answer is yes next query would ask about the type of scrambling.

Output: Digital data stream given, longest palindrome in that data stream, digital signal produced and in case of scrambling, scrambled signal produced.

Competitive Coding: You can improve the time complexity of the code for example for *finding the longest palindrome in data stream and scrambling (to look for the longest common sequence of string of 0s)*. For this component, the marks will be awarded as per the best time complexity code.

Some pointers: For graphical output you can consider the following options: OpenGL or graphics library (C++), JOGL (Java), numpy and matplotlib (Python). *Note that since plotting in Python in much simpler than other*

languages, any attempts made in other languages (other than Python) or additional improvements done in the encoder interface will earn you some extra credit marks.

Due date and expected deliverables: 13 November 2022. You are expected to submit your code and a one-page specification report mentioning the language and libraries used, assumptions considered, how to run the code, references, etc. Note that both should be separately uploaded over the Gradescope.

Note: You can do your project individually or at maximum in groups of two students. Any help taken from any source or discussions regarding the project should be acknowledged. *Any case of plagiarism found will be severely penalized.*

Extra credit: Implement Line coding decoder This is outside the scope of the assignment marks and is for extra +5 marks.

In this, along with the encoding code you need to provide corresponding decoding of the scheme chosen i.e., after encoding results are displayed you need to ask the user whether you want to decode the signal. If user says yes, then decode according to the chosen scheme and produce back the digital stream. But, *it is important to decode the signal by analysing the encoded signal parameters and not the direct data values.*