

Autumn 2024

ITT305: Programming Assignment 1

18 October 2024

Objective: Implement digital signal generator

- Line coding schemes to be implemented: NRZ-L, NRZ-I, Manchester, Differential Manchester, AMI and scrambling schemes: B8ZS, HDB3.
- Pulse code modulation (PCM) or Delta modulation (DM)

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

Input: Ask user for digital signal generation i.e., whether user wants to give analog or digital input. Then, accordingly proceed with line encoding or PCM/DM. 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. For PCM/DM, take analog input and process it based on the chosen technique, then the digital data generated can be fed to one of line encoding techniques.

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 is 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 2024. 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 three 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.*