ITT 036 - Digital Signal Generator Assignment

Name	:	Enroll no.	*Github repo* :- signal_generator
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Language & Libraries Used

- Language: **C++** (Object-oriented, procedural)
- Libraries: *iostream*, *cstring*, *cmath* — Standard I/O and math functions
- **OpenG**L (GL/glut.h) — For graphical signal visualization
- **GLUT** (OpenGL Utility Toolkit) — Simplifies window creation and 2D drawing
- STL — For string, arrays, and basic operations

Project Overview

- A Digital Signal Generator that takes digital or analog input.
- Supports multiple line coding techniques: **NRZ-L, NRZ-I, Manchester, Differential Manchester, AMI.**
- Includes scrambling techniques: **B8ZS** and **HDB3**.
- Performs modulation techniques: **PCM** and **Delta** Modulation.
- Finds analytical properties like Longest Palindromic Substring and Longest Zero Sequence.
- Displays waveform using OpenGL Graphics.

Assumptions

- Input data is a valid binary string (for digital mode).
- Analog samples are numeric float values.
- **OpenGL/GLUT** properly installed in the environment.
- Each bit is uniformly spaced in visualization.
- Voltage levels: +1, 0, -1 represent high, zero, and low logic levels.

How to Run the Code

- Install **OpenGL** and **freeglut** (e.g., *sudo apt-get install freeglut3-dev*).
- Compile: **g++ -o** *signal_generator.exe* **signal_generator.cpp -lfreeglut -lopengl32 -lglu32**
- Run: *./signal_generator*
- Follow prompts to select input type and encoding scheme; waveform appears in OpenGL window.

Output

- Encoded signal printed numerically in terminal.
- Real-time waveform plot in OpenGL window.
- X-axis: Bit positions / time slots, Y-axis: Voltage levels.
- Title: Encoding scheme used (e.g., Manchester Encoding).

References

- Guidance and mentorship by **Dr Iqra Altaf Gilani**, Faculty, National Institute of Technology, Srinagar
- Class Notes: Line Coding and Scrambling tutorials.
- OpenGL + GLUT documentation (freeglut.sourceforge.net).