Project Specification Report

Line Encoding Visualizer

Objective

To visualize major **Digital-to-Digital** and **Analog-to-Digital** encoding schemes used in data communication, showing waveforms interactively using Python.

Tools Used

- **Language:** Python 3.x
- **Libraries:** NumPy (numerical operations), Matplotlib (waveform plotting)

Assumptions

- Bit duration = 1 time unit; positive logic used.
- Logic '1' = +1, '0' = –1 (scheme-dependent).
- PCM sampling range: –3 to +4.
- Manchester transitions occur mid-bit.
- Ideal, noise-free transmission assumed.

How to Run

1. Install Python 3.x and run:

   ```
   pip install -r requirements.txt
   python encodings.py
   ```

2. Enter input type, data, and encoding scheme as prompted.

Output

Displays a step plot with:

- **X-axis:** Time **Y-axis:** Amplitude
- **Title:** Selected encoding scheme

References

1. Python Documentation – `https://docs.python.org/3/`
2. Matplotlib Documentation – `https://matplotlib.org/stable/`

Conclusion

This project visualizes key encoding schemes, providing an intuitive understanding of signal representation in data communication.