**EENG 410 Final Project**

Write a MATLAB program to pass a random stream of information symbols through a polar NRZ AWGN channel. Encode and decode using the extended Golay(24,12) code. Collect actual bit error rate performance for Eb/No ratios ranging from 5.0 dB to 9.0 dB in 0.5 dB steps. Compare this actual performance to the theoretical uncoded performance and the theoretical coded performance of the extended Golay(24,12) code.

**Deliverables:**

* MATLAB program source code
* Calculations for theoretical uncoded and coded bit error rates
* Table of bit error rates for each value of Eb/No
* Graph showing actual vs. theoretical performance (uncoded and coded)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Uncoded | Theoretical | Theoretical | Coded | Actual | Actual |
| Eb/No | Uncoded | Decoded | Message | Decoded | Decoded |
| (dB) | BER | BER | Symbols | Errors | BER |
|  |  |  |  |  |  |
| 5.0 | 5.954E-03 | 2.034E-03 | 48E+06 | 106856 | 2.226E-03 |
| 5.5 | 3.862E-03 | 8.954E-04 | 48E+06 | 46228 | 9.631E-04 |
| 6.0 | 2.388E-03 | 3.517E-04 | 48E+06 | 17872 | 3.723E-04 |
| 6.5 | 1.400E-03 | 1.219E-04 | 48E+06 | 6270 | 1.306E-04 |
| 7.0 | 7.727E-04 | 3.682E-05 | 48E+06 | 1992 | 4.150E-05 |
| 7.5 | 3.988E-04 | 9.561E-06 | 48E+06 | 480 | 1.000E-05 |
| 8.0 | 1.909E-04 | 2.104E-06 | 48E+06 | 104 | 2.167E-06 |
| 8.5 | 8.400E-05 | 3.859E-07 | 96E+06 | 36 | 3.750E-07 |
| 9.0 | 3.363E-05 | 5.794E-08 | 240E+06 | 8 | 3.333E-08 |
| 9.5 | 1.211E-05 | 6.973E-09 |  |  |  |
| 10.0 | 3.872E-06 | 6.569E-10 |  |  |  |