

Project 2

EECS243: Error Correcting Codes

Due June 6, 2018

Consider a rate-compatible punctured convolutional code with a rate $1/4$ mother code with generator sequences $g^{(1)} = (1\ 0\ 0\ 1\ 1)$, $g^{(2)} = (1\ 1\ 1\ 0\ 1)$, $g^{(3)} = (1\ 0\ 1\ 1\ 1)$, and $g^{(4)} = (1\ 1\ 0\ 1\ 1)$. For a uniform binary random source with $p(1) = p(0) = 0.5$, you should simulate

- An encoder for the mother code,
- The transmission of the encoded bits over a binary symmetric channel (BSC), and
- A Viterbi decoder for the received bits at the output of the channel.

As the second part of the project, consider eight bits from each output ($P = 8$) and puncture the outputs of the encoder, respectively, using the following puncturing matrix

```
1111 1111
1111 1111
1100 1100
0000 0000
```

where a zero is used to indicate deleted bits. Transmit the output of the punctured code over a BSC and decode the received bits using the Viterbi algorithm.

The final report for the project (maximum two pages) should include the end-to-end probability of error results for different values of the probability of bit error rate (BER) in the BSC, for example, $p = 0.01, 0.1, \dots$ and the comparison between the mother code and its punctured code with a justification of their differences. You may use C, C++, or matlab in your simulation. However, you should not use matlab's toolboxes. You should also provide the source code such that I can run your programs and reproduce your results.