

Practical Assignment (Milestone 2)

Due Date: May 13th 2025

Consider a channel encoder/decoder system. Assume the information bits (i.e., bits input to the channel coding process) are extracted from a video stream. The channel coded bits are transmitted over a communication channel with probability of error p . You are asked to write a MATLAB code to simulate the transmission of the encoded bits over the communication channel using an incremental redundancy system as follow: You will apply the following puncturing patterns on your convolutional code of rate $\frac{1}{2}$.

Table A: Puncturing Patterns

Code Rate	Puncturing Rule
8/9	X:1111 0111 Y:1000 1000
4/5	X:1111 1111 Y:1000 1000
2/3	X:1111 1111 Y:1010 1010

Example: (for code rate 8/9)

1. The Video stream is represented as a binary sequence.
2. The binary sequence representation of the video stream is divided into messages of size 1024 each.
3. Each message is encoded with the rate $\frac{1}{2}$ convolutional code (for a rate- $\frac{1}{2}$ packet size of 2048 bits).
4. The 2048 bits (rate- $\frac{1}{2}$ packet) is punctured to become a rate- $\frac{8}{9}$ packet using the puncturing pattern in Table A. The rate- $\frac{8}{9}$ packet size is 1152 bits.
5. The punctured packet is then transmitted over a BSC channel with error probability p .
6. The received packet is corrected by a Viterbi decoder in accordance to the $\frac{8}{9}$ code rate.
7. The corrected message (1024 bits) is compared with the original transmitted message (1024 bits).

NOTES:

1. You are allowed to use MATLAB built in functions for the encoder and decoder.
2. You are required to apply puncturing for the convolutional code of rate $\frac{1}{2}$ and compare the puncturing patterns results.

Project summary

Each group should submit a MATLAB code that:

- reads an .avi file.
- converts the file to bits.
- subdivides the video stream to packets of length 1024.
- encodes packets using the convolutional code is step 3.
- decodes using the same sequence using Viterbi decoder.
- reconstructs the video stream.
- Apply the puncturing patterns
- saves the corresponding video files.

Each group should submit the following in a compressed folder:

- A SINGLE document with the code and the following content:
 - Curves that reflect the following:
 - Plot of the coded bit error probability vs. different values of p from (0.0001 to 0.2) after applying the puncturing patterns.
 - Plot of the throughput (data rate) vs. different values of p from (0.0001 to 0.2) after applying the puncturing patterns.
- Commented Matlab code (You must explain what you are doing).
- Six video files for the decoded video:
 1. $P=0.001$ using no channel coding
 2. $P=0.001$ using rate $\frac{1}{2}$ convolutional code
 3. $P=0.001$ using puncturing patterns
 4. $P=0.1$ using no channel coding
 5. $P=0.1$ using rate $\frac{1}{2}$ convolutional code
 6. $P=0.1$ using puncturing patterns

- **Project submission deadline is on 13/5/2025.**
- **You will submit your project by sending the compressed folder (Matlab code with the report) to the following e-mail address:**

submissions.guc@gmail.com

- **Project Evaluations**

Individual project Evaluation tasks will take place in the week after submissions. You will be notified with the exact locations and timings.

Any similar projects will be assigned zeros