① K=3, g11=5, g12=7, g13=7, g14=7 → rate 1/4 $1+D^2$, $1+D+D^2$, $1+D+D^2$, $1+D+D^2$

② K=3, g11=5, g12=7, g13=7 → rate 1/3

③ K=3, g11=5, g12=7 → rate 1/2 → used Inpuncturing

④ K=2, g11=6, g12=2, g13=6, g21=2, g22=4, g23=4 → rate = 2/3

for first input bit — for second input bit

$g_{11} = 5 = 101 \rightarrow i + b_1$ (↳ $[i-2]$)

$g_{12} = 7 = 111 \rightarrow i + b_0 + b_1$ ($[i-1]$, $[i-2]$)

$g_{11} = 6 = 110 \rightarrow i + b_0$ (↳ $[i-1]$)

---

for ③ $K=3$ $g_{11}=5$ $g_{12}=7$ → 1) Convolutional Coding

2) Do puncturing for 8/9, 4/5, 2/3

1) Encode video

2) Pass it on channel with an error prob

3) Decode and Create a vid

1) Video

2) Seperate video into frames (stored in an Array of frames)

3) each frame has size of [height, width, color_channels]

what Matlab does extracts each color channel as a 2D Matrix of intensity value

R = frame.cdata(:,:,1); 144 x 176 Matrix of red from 0 → 255

* We create 3 Matrices of R, G, B

each Matrix is the same size as the frame where

(Row, Col) represents a pixel

So we split the Color to RGB with Diffrent intensities

Red $\begin{bmatrix} 255, 10 \\ 30, 100 \end{bmatrix}$ Green $\begin{bmatrix} 0, 200 \\ 80, 50 \end{bmatrix}$ Blue $\begin{bmatrix} 0, 50 \\ 90, 255 \end{bmatrix}$ = $\begin{bmatrix} \text{pureRed}, \text{greenish yellow} \\ \vdots, \ddots \end{bmatrix}$

Convolutional Code

for $K=3$ (Constrain length $= 3$) Memory elements $= 2$

$g_{11} = 5$ $g_{12} = 7$ $g_{13} = 7$ → Octal (Not decimal)

$g_{11} = 101$ (3 bits)

$g_{12} = 111$ (3 bits)

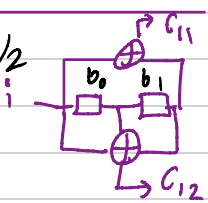
$g_{13} = 111$ (3 bits)

→ 3 g_s 3 outputs rate $= 1/3$

---

* We will apply puncturing to the Code with rate $= 1/2$

$K = 3$, $g_{11} = 5$, $g_{12} = 7$



1) each packet (1024 bits) will be encoded by rate $1/2$ $g_{11} = 5$ $g_{12} = 7$

for each bit the output will be $C_{11}\,C_{12}$

Where $C_{11} = i \oplus b_1$

$C_{12} = i \oplus b_0 \oplus b_1$

2) The resultant 2048 bits (rate 1/2) → punctured → to become rate ex: 8/9

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

[X, Y]

for 8/9

for every 16 bits we will puncture (remove) 7 bits and Keep 9 bits

So, rate $\frac{2048 * 9}{16} = 1152$

for 4/5 Remove 6 and Keep 10

So, rate $\frac{2048 * 10}{16} = 1280$

for 2/3 Remove 4 and Keep 12

So, rate $= \frac{2048 * 12}{16} = 1536$

More puncturing
Less rate

---

(1) So we want to do Convert 1/2 → 8/9

1/2 : 8 i/p → 16 o/p

8/9 : 8 i/p → 9 o/p

So 16 i/p → (puncturing) 9 (Delete 7) using puncturing pattern [X, Y]

This is Done by logical anding $* \begin{bmatrix} , , , , , , , , \\ [X, Y]_{1\times 16} \end{bmatrix}_{1\times 8}$

Same is Done for All puncturing Rates (grouping of 16 bits)