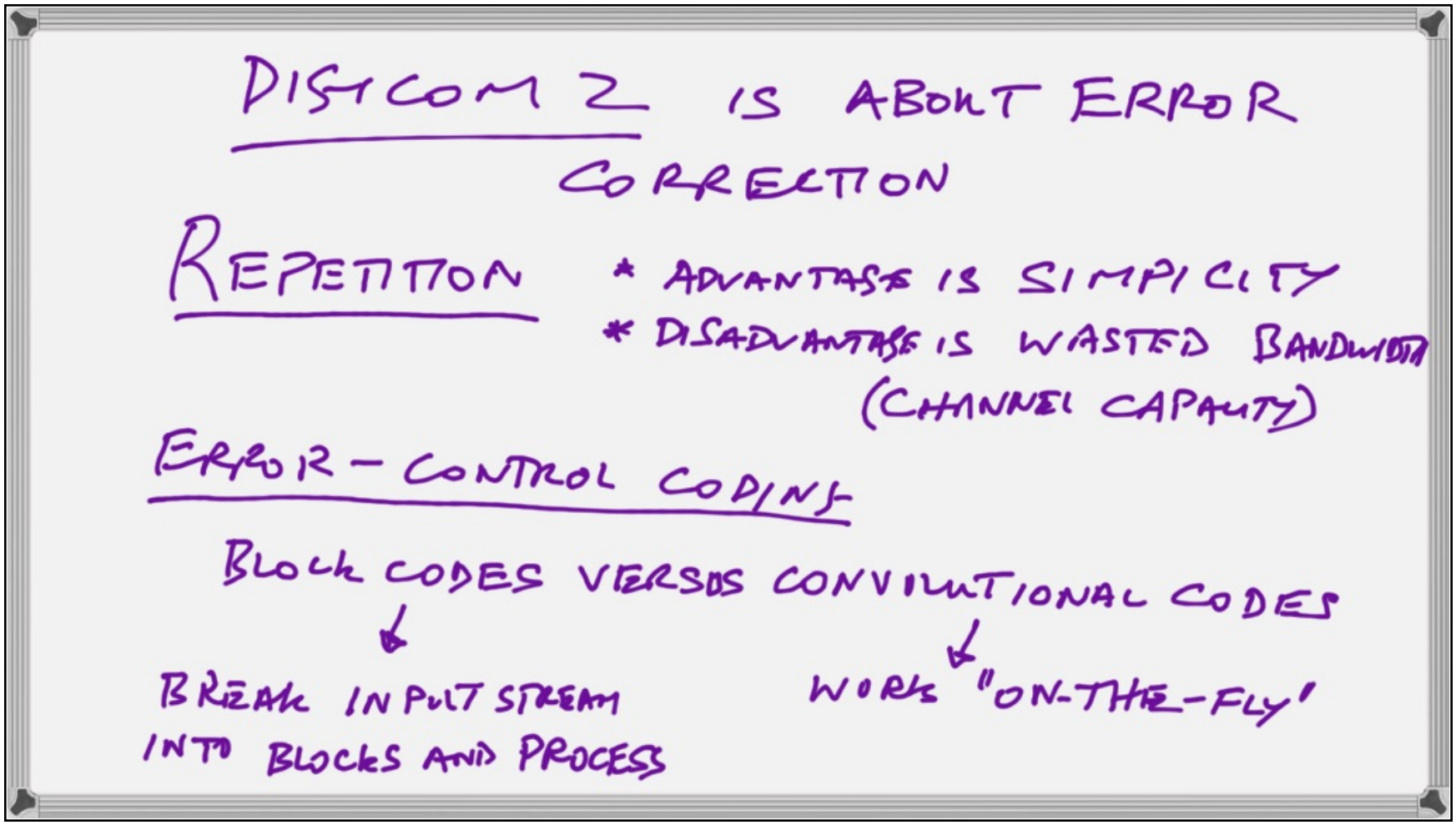
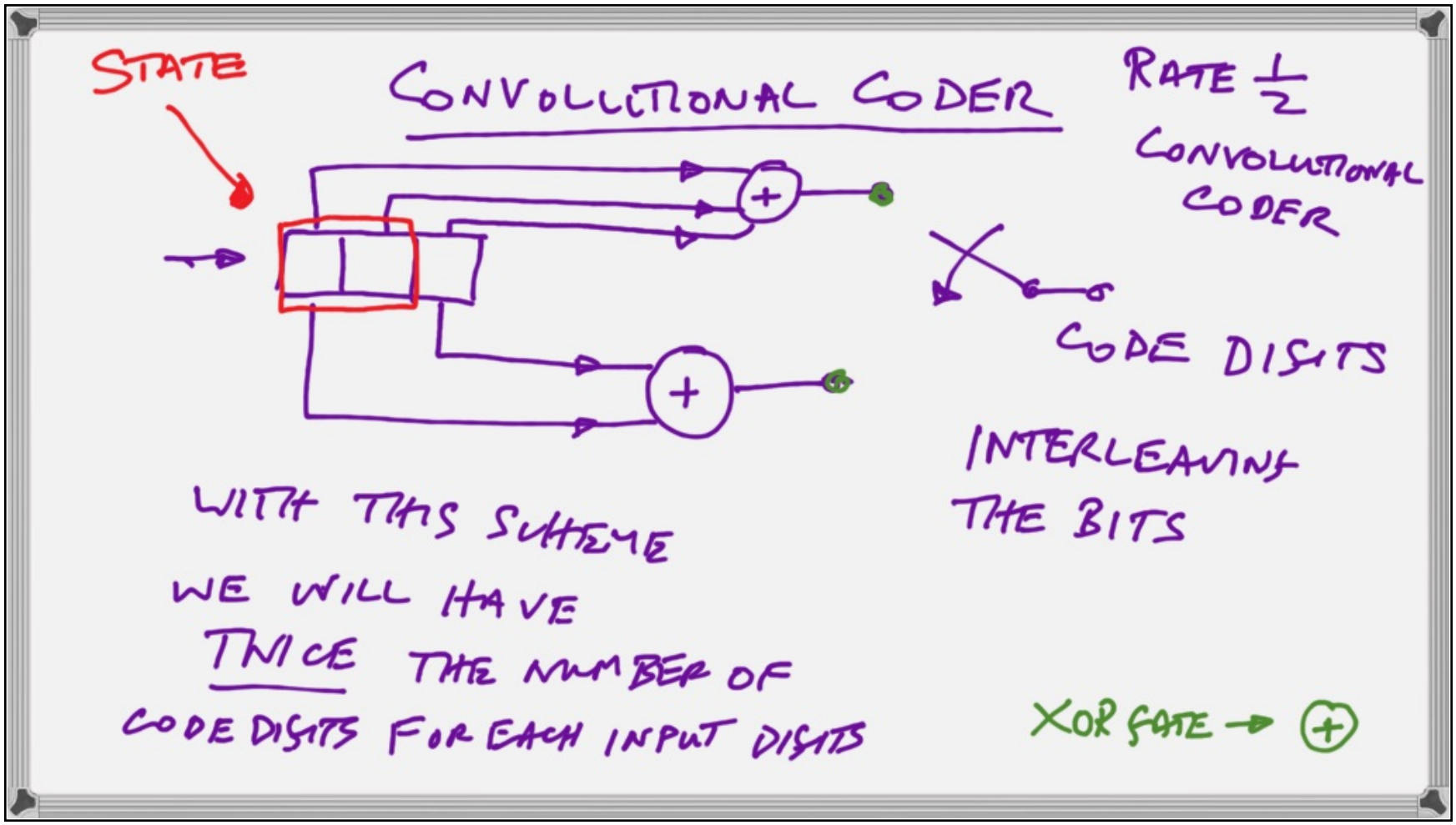
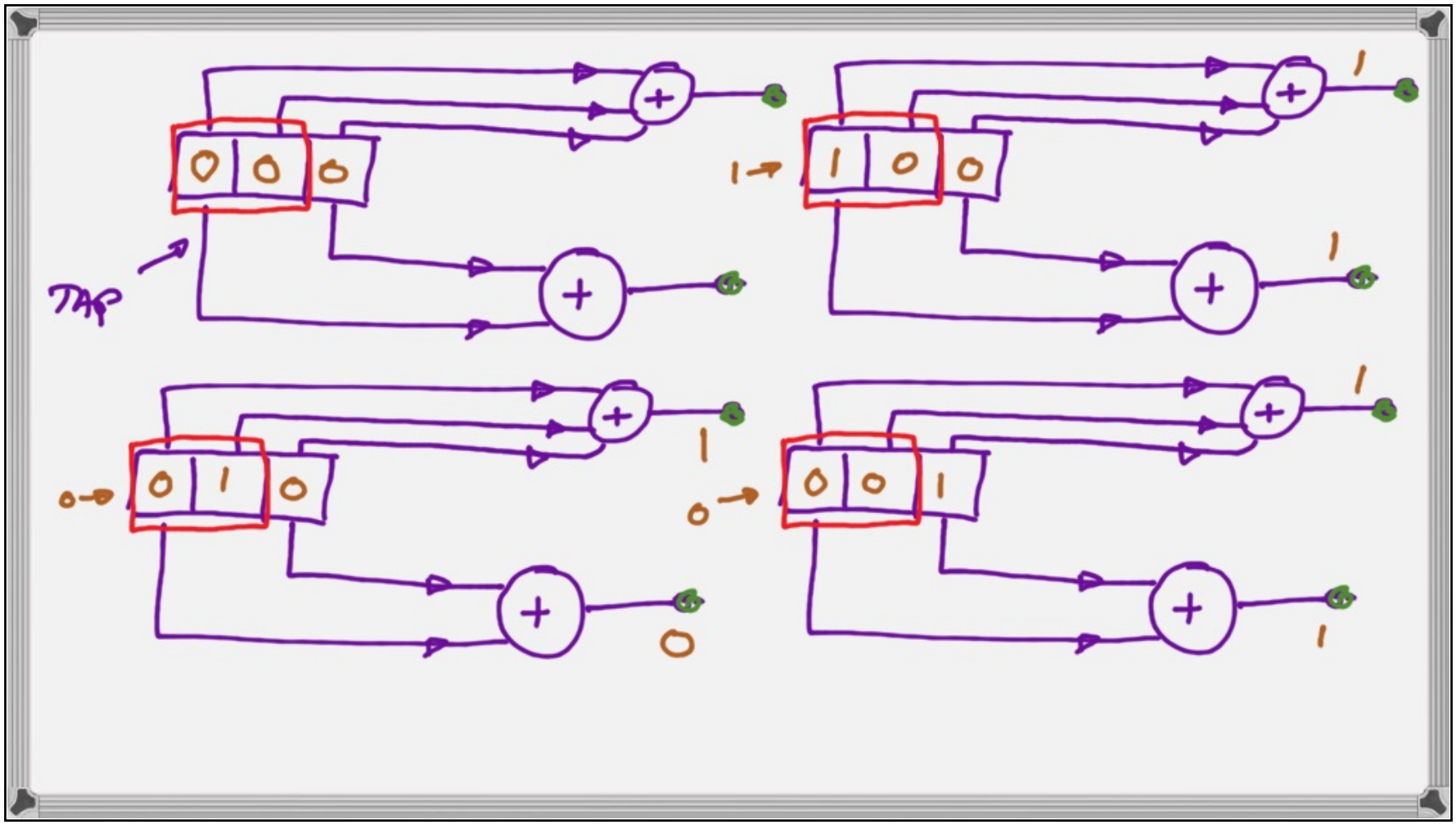
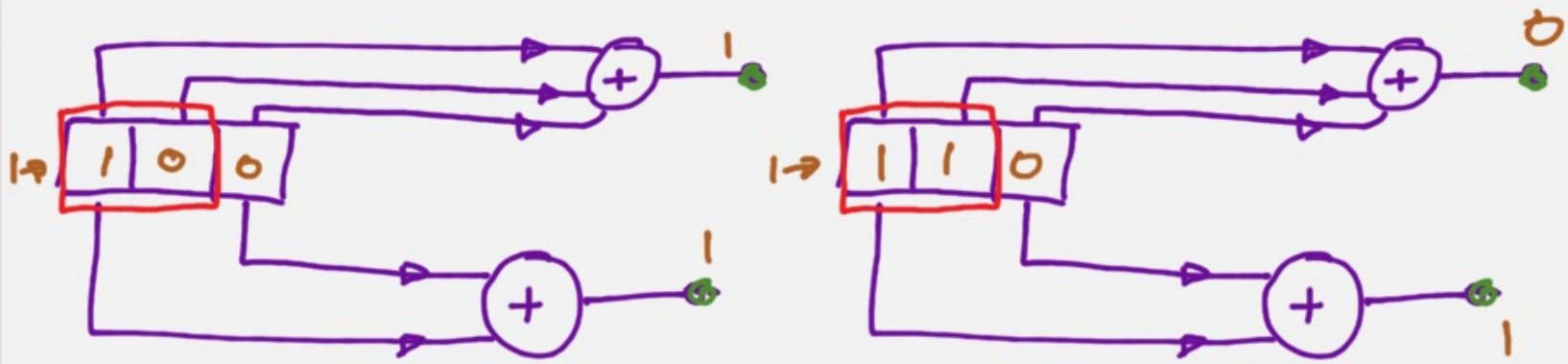
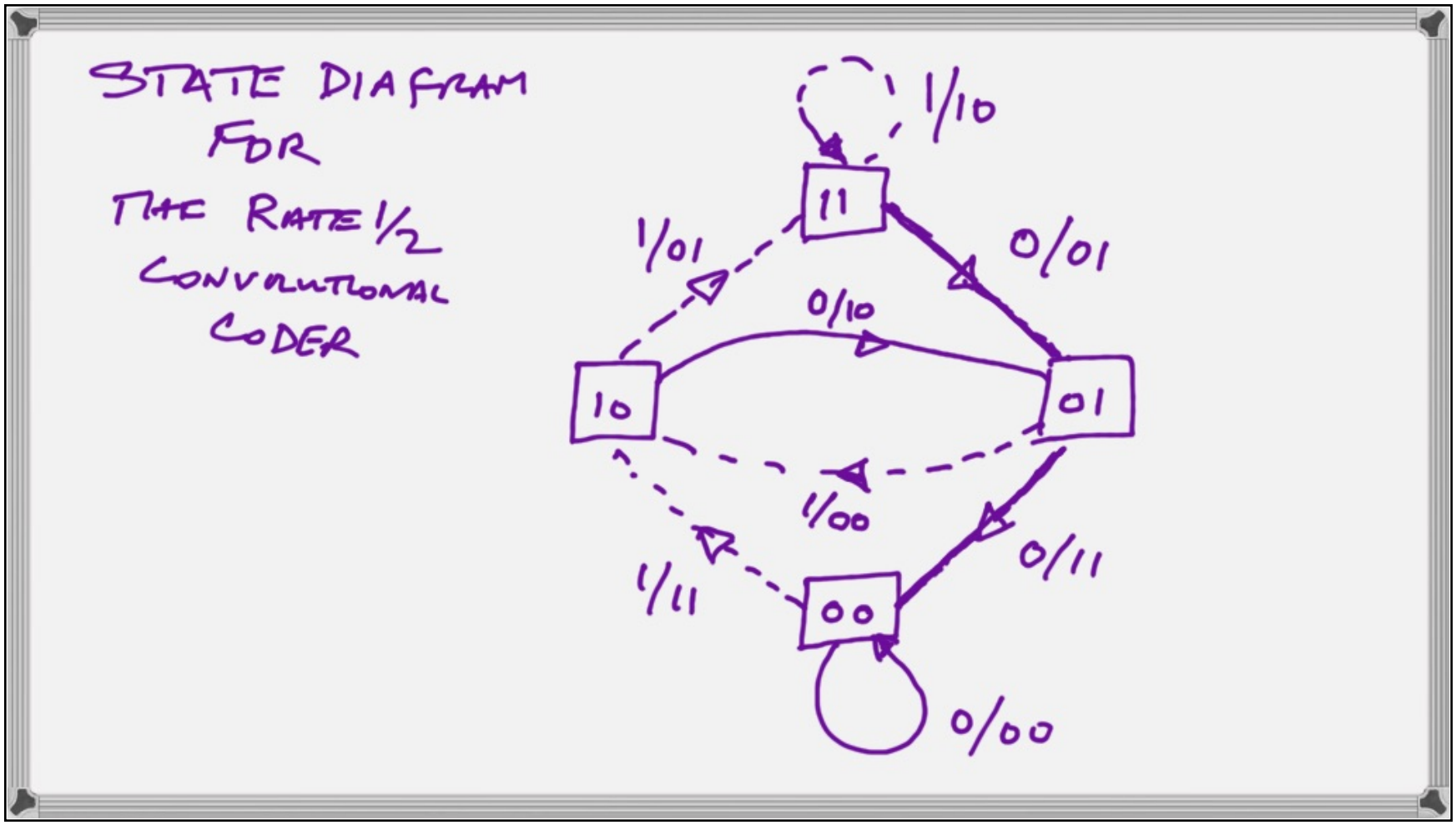

DIGCOM 2 IS ABOUT ERROR CORRECTION
REPETITION
* ADVANTAGE IS SIMPLICITY
* DISADVANTAGE IS WASTED BANDWIDTH (CHANNEL CAPACITY)
ERROR-CONTROL CODING
BLOCK CODES VERSUS CONVOLUTIONAL CODES
BREAK INPUT STREAM INTO BLOCKS AND PROCESS
WORKS "ON-THE-FLY"

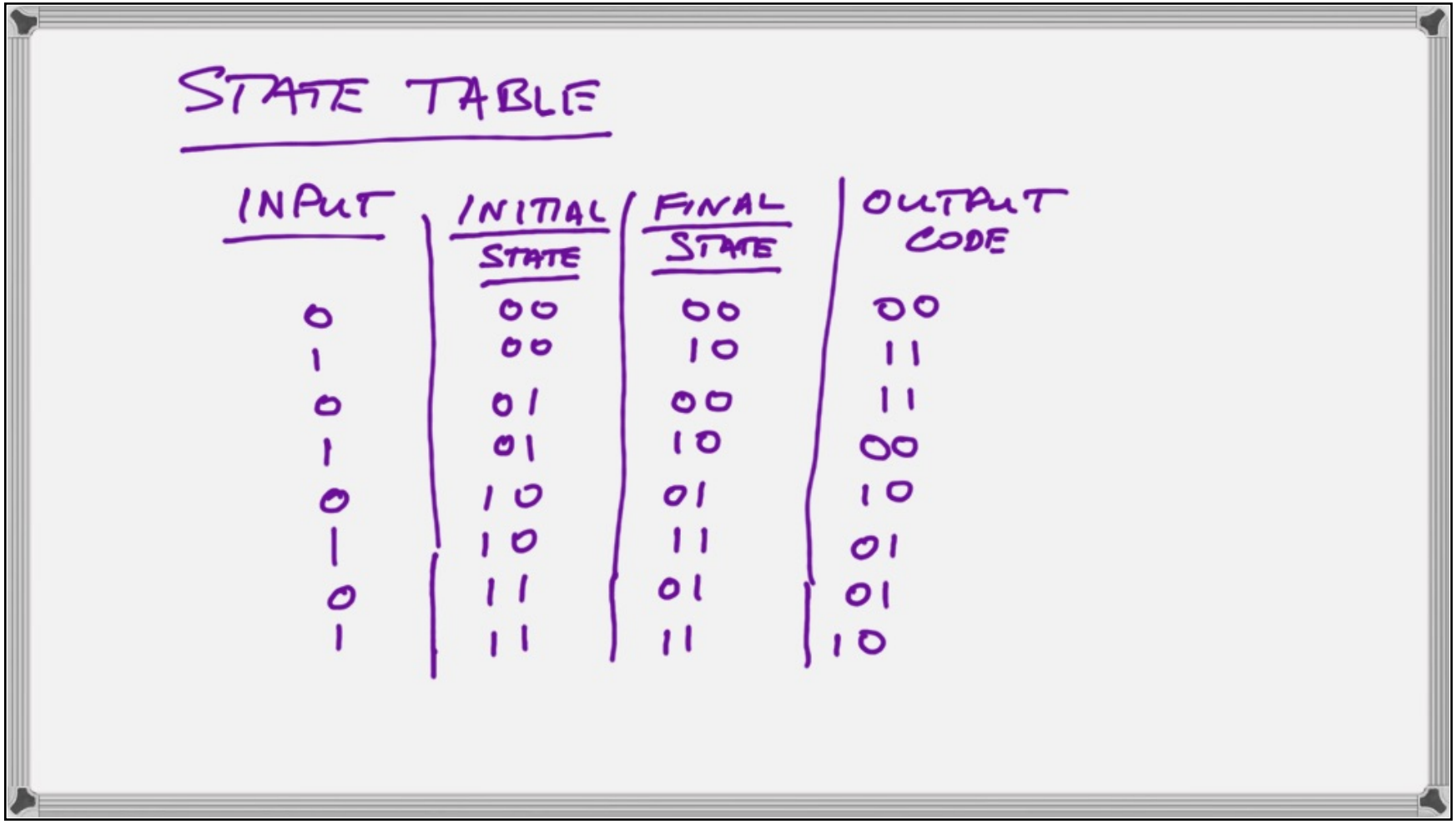

STATE
CONVOLUTIONAL CODER
RATE 1/2
CONVOLUTIONAL CODER
CODE DIGITS
INTERLEAVING THE BITS
WITH THIS SCHEME WE WILL HAVE TWICE THE NUMBER OF CODE DIGITS FOR EACH INPUT DIGITS
XOR GATE →


TAP
0 0 0
1 0 0
0 1 0
0 0 1
1
1
1
1
0
1
0
1

INPUT	1	0	0	1	1
STATE	10	01	00	10	11
OUTPUT	11	10	11	11	01




STATE DIAGRAM
FOR
THE RATE 1/2
CONVOLUTIONAL
CODER
11
10
01
00
1/10
1/01
0/01
0/10
1/00
1/11
0/11
0/00


STATE TABLE
INPUT
INITIAL STATE
FINAL STATE
OUTPUT CODE
0 00 00 00
1 00 10 11
0 01 00 11
1 01 10 00
0 10 01 10
1 10 11 01
0 11 01 01
1 11 11 10

WE CAN USE GENERATOR POLYNOMIALS TO DESCRIBE THE TAP CONNECTIONS TO THE SHIFT REGISTER

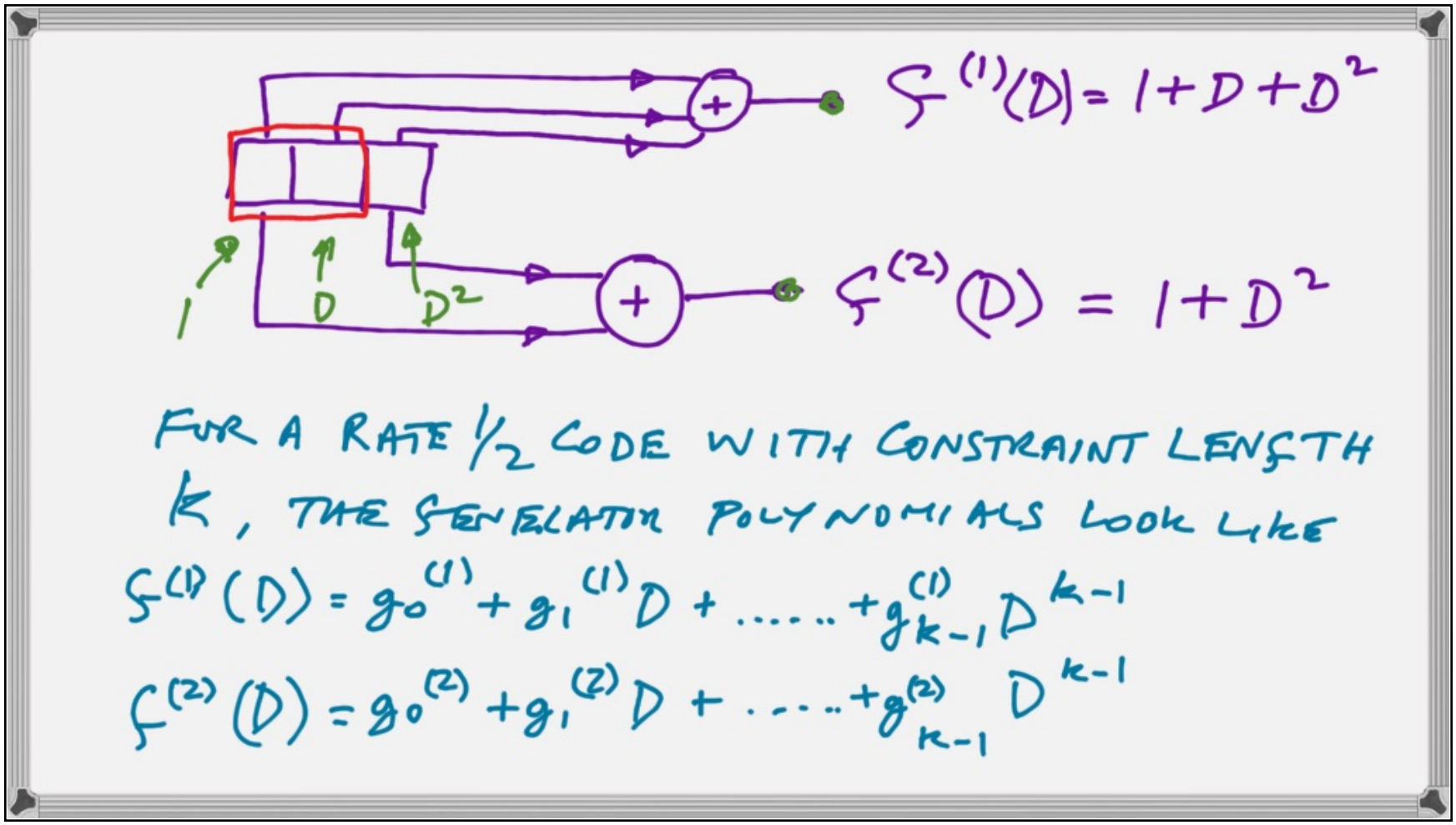
THE UPPER BRANCH HAS

$$g^{(1)}D = 1 + D + D^2$$

THE LOWER BRANCH HAS

$$g^{(2)}D = 1 + D^2$$

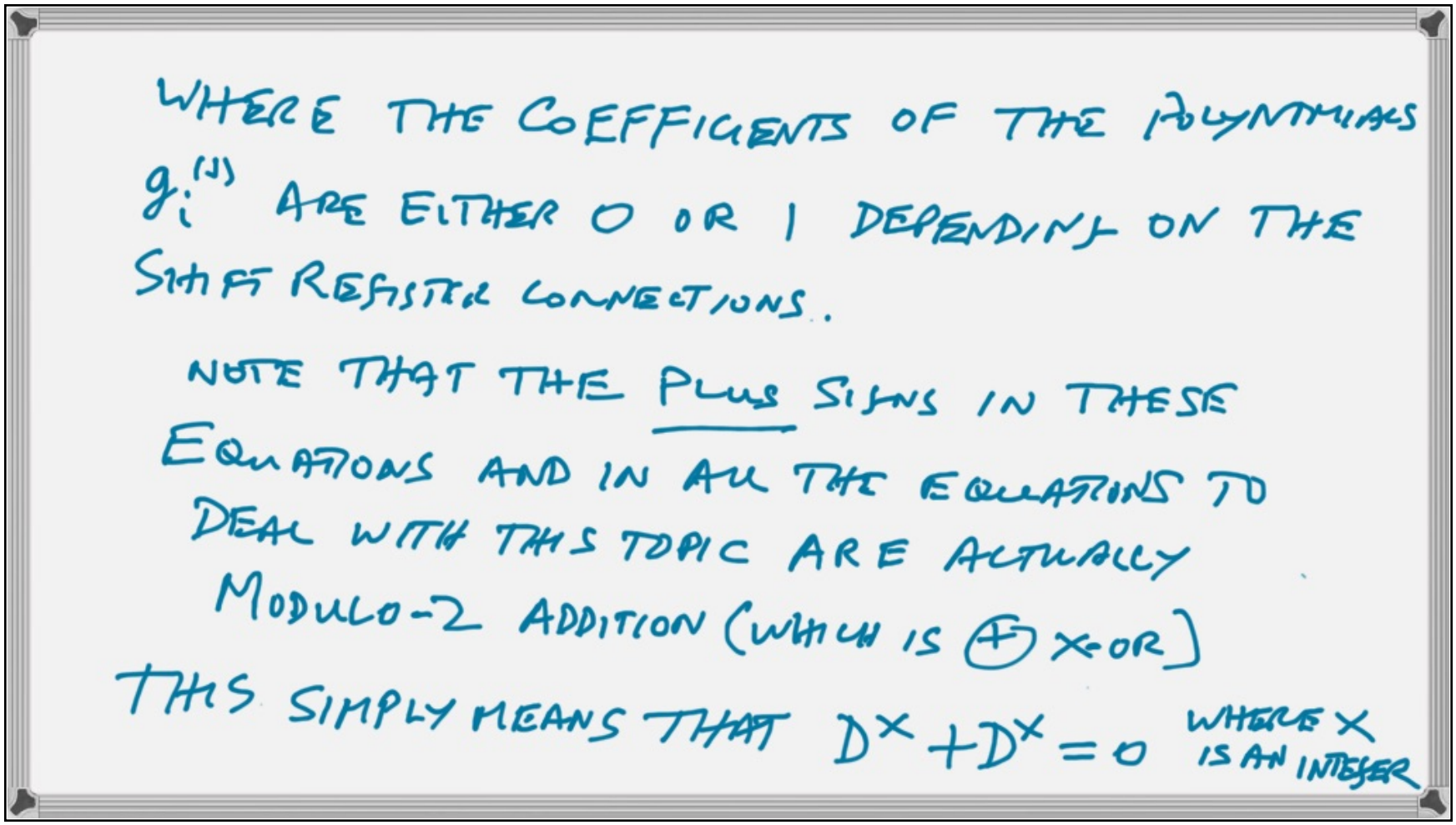
D = DELAY ELEMENT



FOR A RATE $1/2$ CODE WITH CONSTRAINT LENGTH k, THE GENERATION POLYNOMIALS LOOK LIKE

$$G^{(1)}(D) = g_0^{(1)} + g_1^{(1)} D + \ldots\ldots + g_{k-1}^{(1)} D^{k-1}$$

$$G^{(2)}(D) = g_0^{(2)} + g_1^{(2)} D + \ldots\ldots + g_{k-1}^{(2)} D^{k-1}$$


WHERE THE COEFFICIENTS OF THE POLYNOMIALS
$g_i^{(1)}$ ARE EITHER 0 OR 1 DEPENDING ON THE
SHIFT REGISTER CONNECTIONS.
NOTE THAT THE PLUS SIGNS IN THESE
EQUATIONS AND IN ALL THE EQUATIONS TO
DEAL WITH THIS TOPIC ARE ACTUALLY
MODULO-2 ADDITION (WHICH IS ⊕ X-OR)
THIS SIMPLY MEANS THAT $D^X + D^X = 0$ WHERE X
IS AN INTEGER