



STATE DIAGRAM

REPRESENTATION

For a convolutional code.

Consider the code,

$$C_0(j) = \underline{x(j)} + \underline{x(j-2)}$$

$$C_1(j) = \underline{x(j)} + \underline{x(j-1)} + \underline{x(j-2)}$$

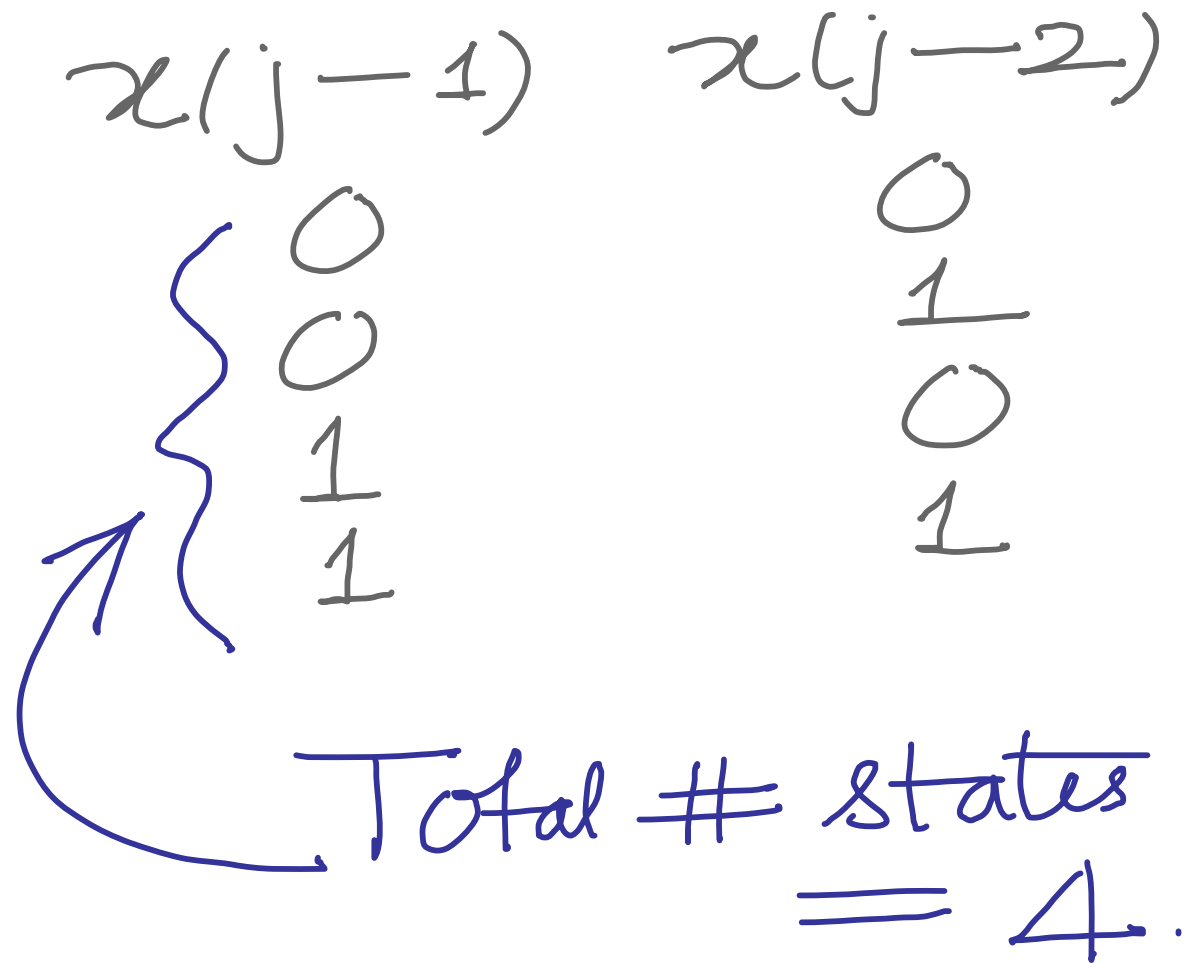
At any time
instant j , to
generate the
code bits, we
need knowledge
of $x(j-1), x(j-2)$.

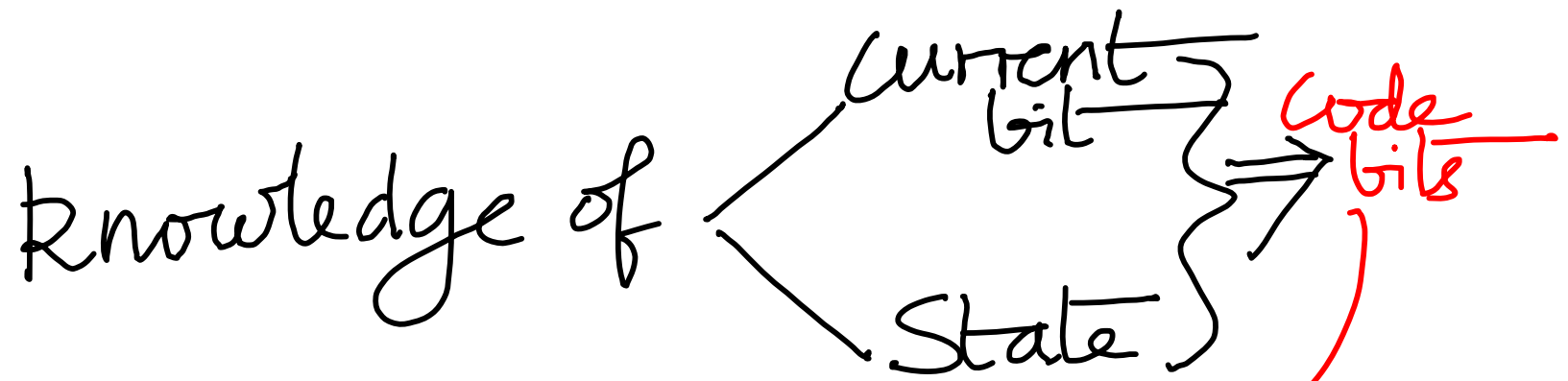
given $x(j-1), x(j-2)$
one does NOT need
any other past samples.

$x(j-1) x(j-2)$

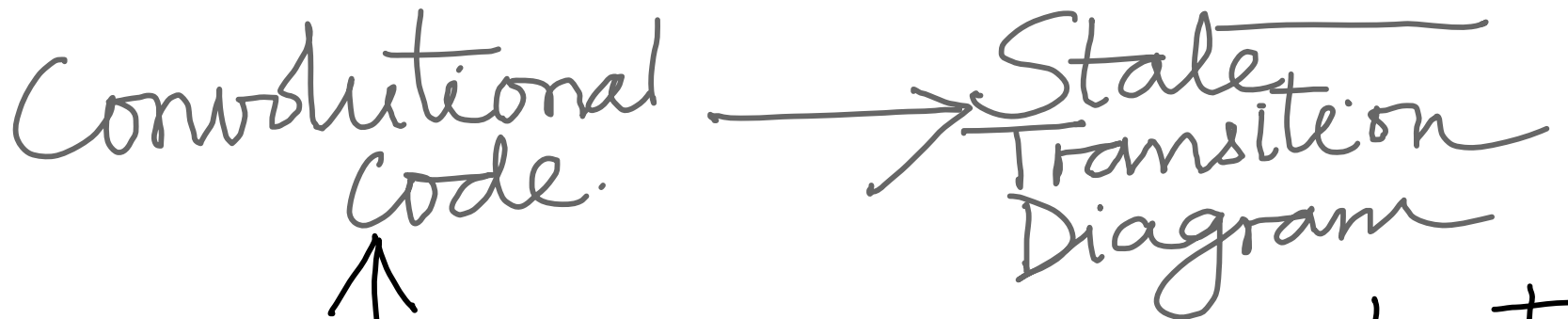
represents STATE
of the encoder

How many possible States
are there?





For any given time instant.



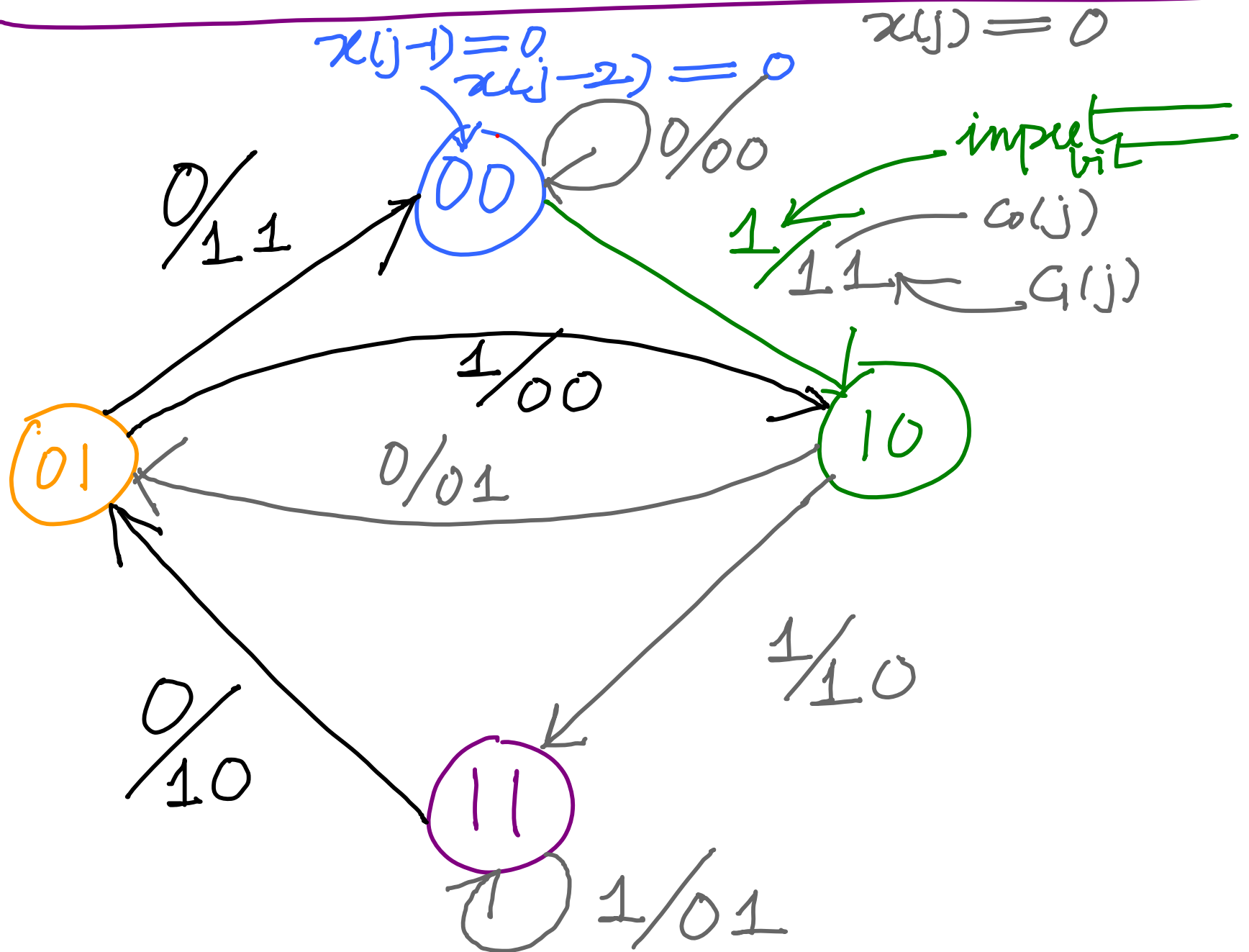
At every time instant is in a state transitions to a another state in next time instant & generates codebits



Evolution of encoder
can be captured by
state transitions.

Mechanism of Transitioning
from one state to
another is represented by
a State Transition Diagram

STATE TRANSITION DIAGRAM:



Time j : State = 00

outputs

$$Co(j) = 1 + 0$$

$$x(j-1) = 0$$

$$x(j-2) = 0$$

$$C(j) = 1 + 0 + \overline{0} + \overline{0} = 1$$

$$x(j) = 1$$

Information
bit at time j

Time $j+1$: State = 10

$$x(j) = 1$$

$$x(j-1) = 0$$

From state 00, input bit = 1
Transitions to 10.

$$\text{output} = 1 \quad 1$$

$Co(j)$

$C(j)$

Time j :

$$x(j) = 1$$

$$\text{State} = 1 \ 0$$

$$\Rightarrow x(j-1) = 1$$

$$x(j-2) = 0$$

Transition to state 11
at time $j+1$

$$\begin{aligned} C_0(j) &= x(j) + x(j-2) \\ &= 1 + 0 = 1 \end{aligned}$$

$$\begin{aligned} C_1(j) &= x(j) + x(j-1) \\ &\quad + x(j-2) \\ &= 1 + 1 + 0 \\ &= 0 \end{aligned}$$

Input Sequence:

A assume starting from state 00

x_j

1 0 1 1 0 0 1 0 1 1
0 1 2 3 4 5 6 7 8 9.

Time	Input	State	Output
0	1	00	11
1	0	10	01
2	1	01	00
3	1	10	10
4	0	11	10
5	0	01	11
6	1	00	11

$C_0(j)$ $C_1(j)$
Output C_0 C_1

7	0	10	01
8	1	01	00
9	1	10	10
		11	

$$\begin{aligned}
 C_0 &= 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 1 \ 0 \ 0 \ 1 \\
 G &= 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0
 \end{aligned}$$

check!