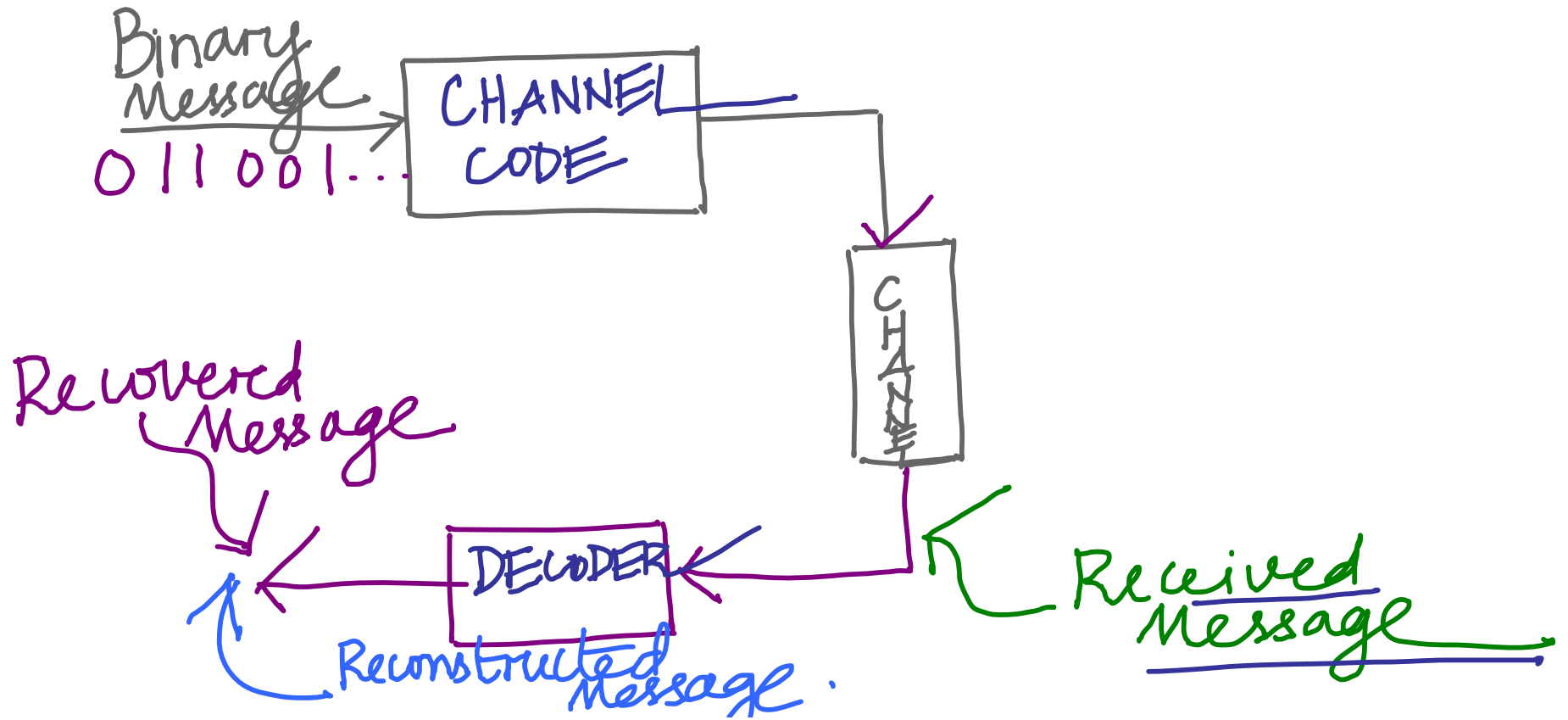


*CHANNEL

CODING:



Transmitted
Message

Received
Message

0 1 1 0 0 1

0 1 1 1 0 1

Bit-Error
over Channel.

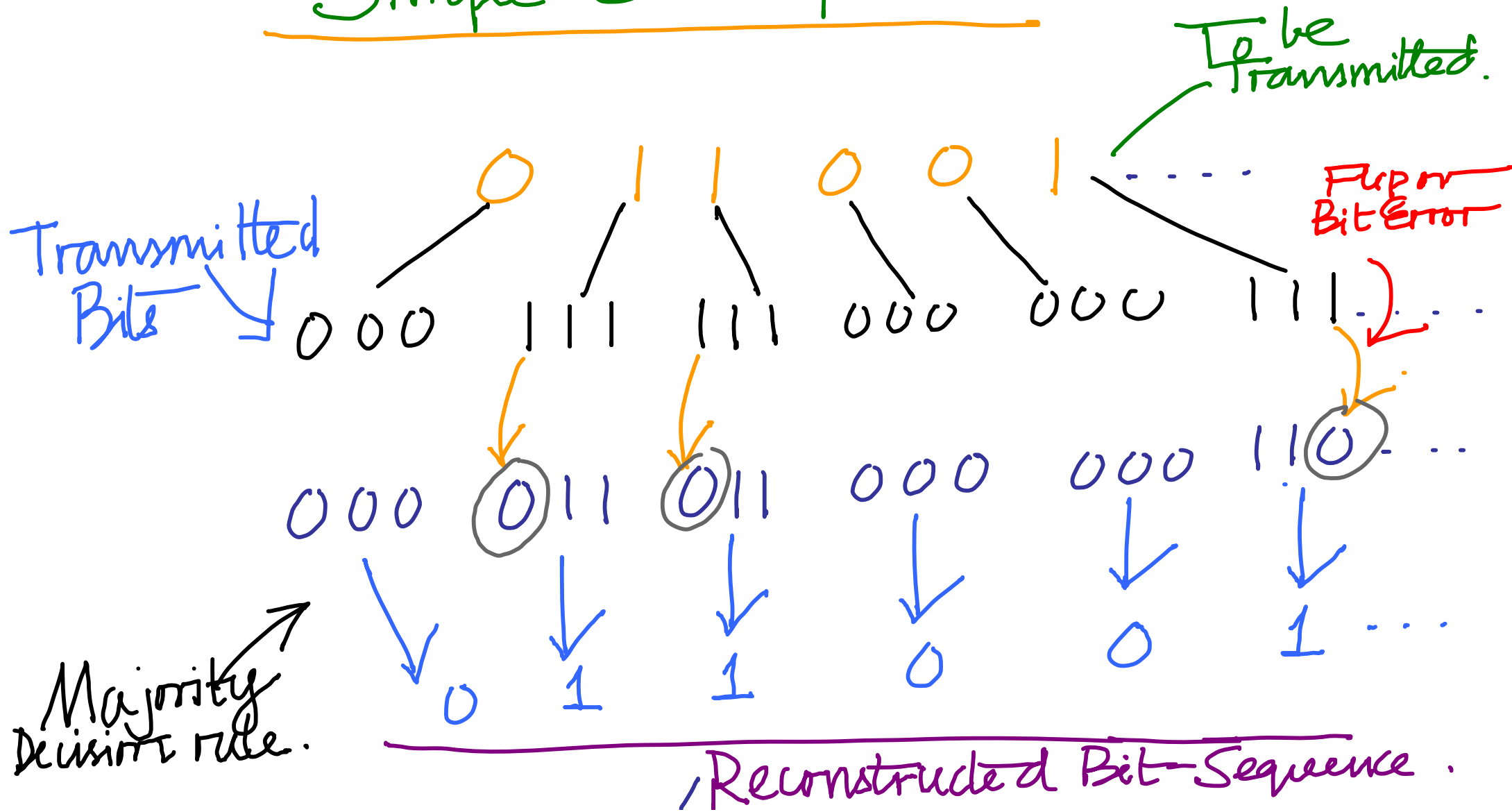
Arising due to
noise over Channel.

Need to be able to
correct errors to the best
possible extent.

Need to make bit-error
rate as low as possible.

1
How?

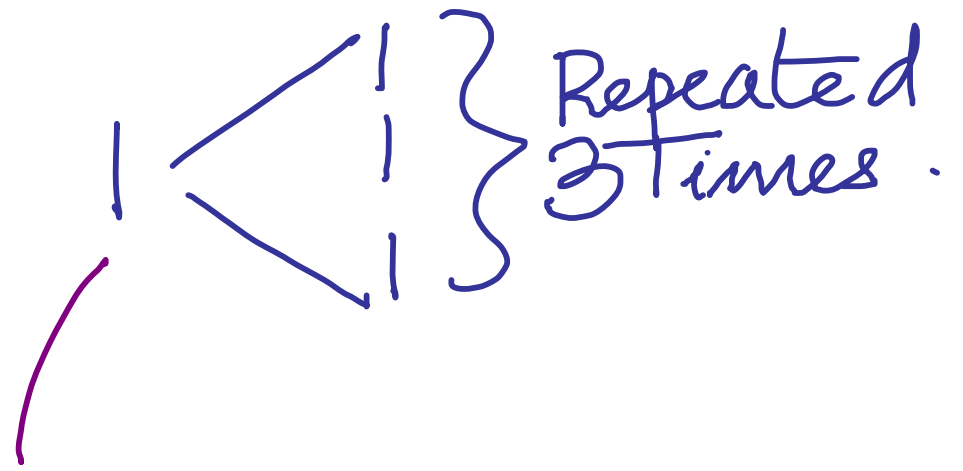
Simple Example:



↓
Reconstructed bit Sequence
= Tx Bit sequence

⇒ we are able to
recover from bit errors.

Observe: To be able to detect
or correct errors, we
need redundancy.

ex:  Repeated
3 times.

↓
Process of introducing systematic redundancy to enable detection and correction of errors over Channel is termed as channel coding.

→ Particular code is termed as Error control code.

Each bit

0 $\left\{ \begin{array}{l} 1 \\ 0 \\ 0 \end{array} \right\}$ Repeated 3 Times.

$$\Rightarrow \frac{1 \text{ info bit}}{3 \text{ code bits}}$$

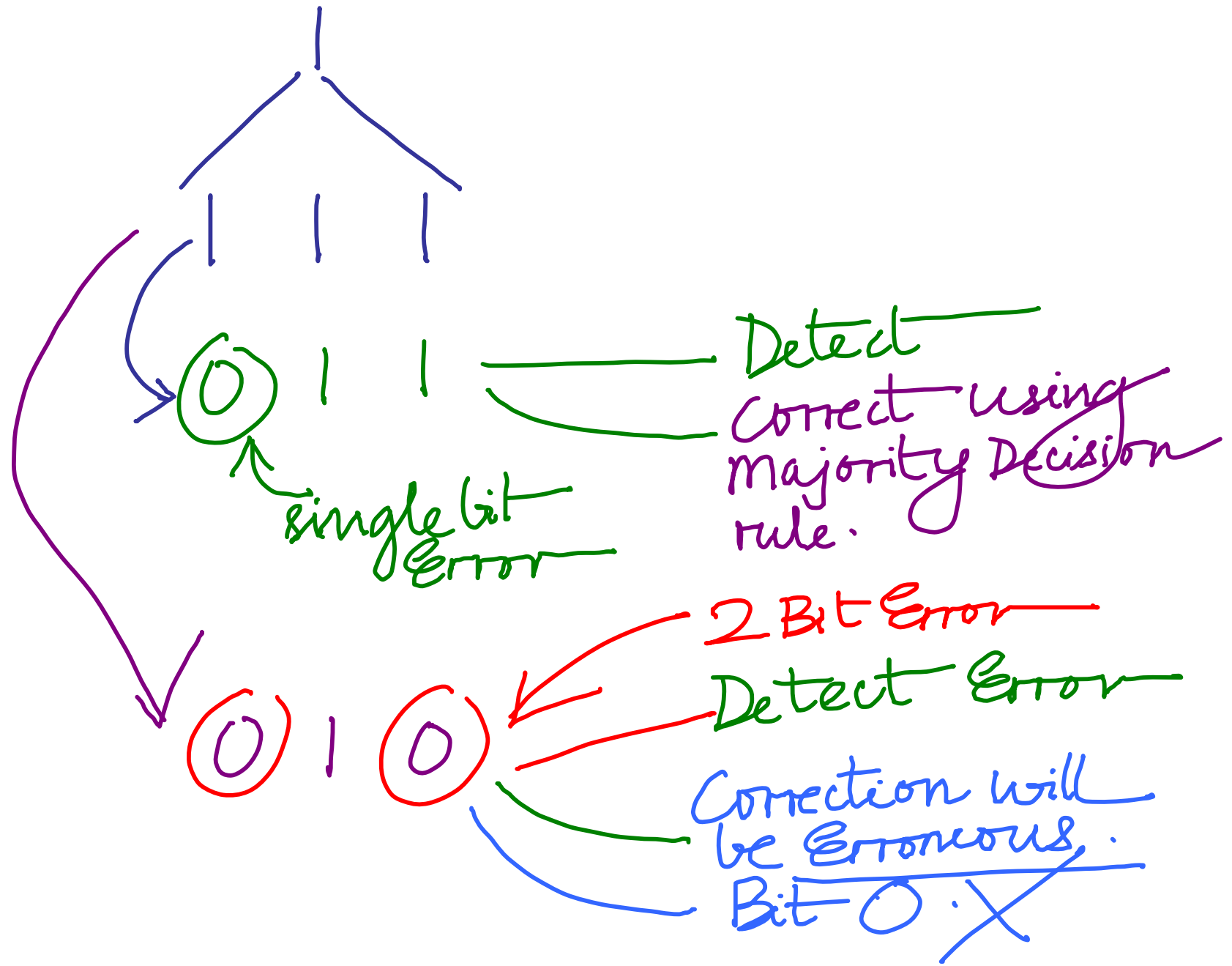
$$= \frac{1}{3} = \text{Rate of code}$$

$$\text{Rate} = \frac{\# \text{ information bits}}{\# \text{ code bits}}$$

As redundancy increases,
rate decreases.

increased redundancy
 $\Rightarrow$ lower efficiency!

Observe:



1 Bit Error
Detected
+ Corrected.

2 Bit Error
Detected. NOT
corrected.

Hamming Distance:
number of Dissimilar
Bits

$\begin{matrix} 1 & 1 & 1 \\ 0 & 1 & 1 \end{matrix} \} d_H = 1$
1 dissimilar bit

$$\begin{array}{ccc} 1 & / & 1 \\ 0 & / & 0 \end{array} \} d_H = 2$$

$\Rightarrow 2$ dissimilar bits.