Principles of coding

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Principle of detecting

Let be C a code (Channel encoder).
t denote the transmitted message
and r is the received one

Principle of error detecting :

1) All stored or transmitted words, are words beloing in C,
2) At the reception or reading a word not belonging to the code is a word that carries an error.

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Examples

Let $C = \{0000, 1011, 0101, 1110\}$.
t denote the transmitted message and r is the received one.

1) If $t = 1011$ is sent and $r = 1111$ **is received** then $r \notin C$:
Recieved message : error

good detection.

2) If $t = 1011$ and $r = 1001$ then $r \notin C$ **Recieved message : error**.

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3) If $t = 1011$ and $r = 1011 \in C$ **received message :1011**.

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4) If $t = 1011$ and $r = 1110 \in C$ received message :1110.

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Let be C a code (Channel encoder).
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Principle

The job of the decoder is to decide which codeword y was most likely transmitted.

To decide, many code use :

The nearest neighbor decoding scheme.

The received word **r** is corrected by the word **y** $\in C$ such as $d_y :=$ The number of bits in **y** that are different from the bits in **r** **is minimal on** C.

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Let $C = \{u = 101010, v = 010101, w = 111111\}$. t denote the transmitted message and r is the received one.

1)(Assumption : r contains 1 error)
If $t = 101010$ and $r = 101110$.
Since $r \notin C$ then the received message is : **error**

good detection.

r well be corrected by y such that $d_y :\leq d_x, \forall x \in C$.
$d_u = 1, \ d_v = 5, \ \ d_w = 2$ so $y = 101010 = t$

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Let $C = \{u = 101010, v = 010101, w = 111111\}$. t denote the transmitted message and r is the received one.

2) (Assumption : r contains 2 error).
If $t = 101010$ and $r = 101\mathbf{11}1$. $r \notin C$: **error**

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$d_u = 2,\ d_v = 4,\ \ d_w = 1$ $y = w = 1111 \neq t$

bad correction

3) (Assumption :
r contains 3 error).
If $t = 101010$ and $r = 1\mathbf{1}1\mathbf{1}1\mathbf{1}1$
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