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(*) Examples on maximum likelihood decoding technique.

1) Consider the (3,6) encoding function $e: B^3 \to B^6$ defined by

$e(000) = 000000$ $e(001) = 001100$
$e(010) = 010011$ $e(011) = 011111$
$e(100) = 100101$ $e(101) = 101001$
$e(110) = 110110$ $e(111) = 111010$

decode the following words relative to a maximum likelihood decoding function.

a) 000101
b) 010101.

⇒

Prepare decoding table.

000000	001100	010011	011111	100101	101001	110110	111010
000001	001101	010010	011110	100100	101000	110111	111011
000010	001110	010001	011101	100111	101011	110100	111000
000100	001000	010111	011011	100001	101101	110010	111110
010000	011100	000011	001111	110101	111001	100110	101010
100000	101100	110011	111111	000101	001001	010110	011010
000110	001010	010101	011001	100011	101111	110000	111100
010100	011000	000111	001011	110001	111101	100010	101110

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a) 000101

If we receive the word 000101, we decode it by first locating it in the decoding table. It appears in the 5th column, where it is underlined. The word at the top of the 5th column is 100101. Since e(100) = 100101. we decode 000101 as 100.

b) 010101.

If we receive the word 010101, we first locate it in the third column of the decoding table, where it is underlined twice. The word at the top of the third column is 010011. since e(010) = 010011. we decode 010101 as 010.

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(2) Consider the (3,5) group encoding fun^n $e : B^3 \to B^5$ defined by

e(000) = 00000
e(010) = 01001
e(100) = 10011
e(110) = 11010
e(001) = 00110
e(011) = 01111
e(101) = 10101
e(111) = 11100

Decode the following words relative to a maximum likelihood decoding fun^n.

a) 11001 b) 01010 c) 00111

⟹ (1) Prepare decoding table :-

000	001	010	011	100	101	110	111
00000	00110	01001	01111	10011	10101	11010	11100
00001	00111	01000	01110	10010	10100	11011	11101
00010	00100	01011	01101	10001	10111	11000	11110
00100	00010	01101	01011	10111	10001	11110	11000
01000	01110	00001	00111	11011	11101	10010	10100
10000	10110	11001	11111	00011	00101	01010	01100
10001	10111	11000	11110	00010	00100	01011	01101
10010	10100	11011	11101	00001	00111	01000	01110

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11001.

i) If we receive the word 11001, we first locate it in the 3rd column of the decoding table. Where it is underlined once. The word at the top of the 3rd column is 01001. Since e(010) = 01001.
we decode 11001 as 010.

ii) 01010
If we receive the word 01010, we first locate it in the 7th column of the decoding table. Where it is underlined twice. The word at the top of the 7th column is 11010. Since e(110) = 11010. we decode 01010 as 110.

iii) Similarly 00111 is located in 2nd column of the decoding table where it is underlined thrice. The word at the top of the 2nd column is 00110. Since e(001) = 00110. we decode 00111 as 001.