aula transmissão

9/12/2010

Códigos para controlo de erros

1) $g(x)$ de grau N $= 1 + x + x^3$

$C(7, 4)$ → k

3 de verificação de erros

$D_1 = 1010$ $C_1(001|1010)$ → palavra de código

$D(x) = (1+x^2)\,x^3 = \dfrac{x^3 + x^5}{x^3+x+1} = x^2$

$x^5 + x^3 \;|\; x^3 + x + 1$

$-x^5 - x^3 - x^2 \;|\; x^2$

x^2

$D_2 = 1100$ $C_2(101|1100)$ → palavra de código

$D(x) \cdot x^3 = (1+x)\,x^3 = \dfrac{x^3 + x^4}{x^3+x+1} = x^2 + 1$

$x^4 + x^3 \;|\; x^3 + x + 1$

$\dfrac{x^4 + x^2 + x}{x^3 + x^2 + x} \quad x + 1$

$\dfrac{x^3}{x^2 + 1} \quad x + 1$

0101110

0010111

$D_3 = 1111$

$D(x) = 1 + x + x^2 + x^3$ $(D(x))\,x^3 = x^3 + x^4 + x^5 + x^6$

$x^6 + x^5 + x^4 + x^3 \;|\; x^3 + x + 1$

$-x^6 - x^4 - x^3 \quad x^3 + x^2 + 1$

x^5

$\dfrac{x^5 + x^3 + x^2}{x^3 + x^2}$

$\dfrac{x^3 + x + 1}{x^2 + x + 1}$

$C_3(1111111)$ → palavra

Dados	Codigo	Peso
1100	1011100	4
1111	1111111	7
1010	0011010	3
1110	0101110	4
0111	0010111	4
1011	1001011	4
0101	1100101	4
0010	1110010	4
1001	0111001	4
1101	0001101	3
0110	1000110	3
0011	0100011	3
0001	1010001	3
1000	1101000	3
0100	0110100	3
0000		

→ 2^4 → nº de entradas na tabela

Peso mínimo → 3

$d_{min} = 3$

$3 = ed + 1$

$ed = 2$ detecta 2

$3 = 2e + 1$

$e = \frac{2}{2} = 1$ corrige 1

rendimento $\frac{k}{n} = \frac{4}{7} \simeq 57\%$

2) $g(x) = 1 + x + x^4$ $\quad c(15, 11)$ $\quad d_{min} = 3$

rendimento $= \frac{11}{15} = 0,733 \simeq 73\%$

$D = 00000000011$

$(D(x)) \, x^4 = (x^9 + x^{10}) x^4 = \frac{x^{13} + x^{14}}{x^4 + x + 1}$

$x^{14} + x^{13} \quad | \, x^4 + x + 1$

$x^{14} \quad x^{11} + 1 \quad x^{10}$

$x^{14} + x^{13}$ | $x^4 + x + 1$

$x^{14} \quad x^{11} + x^{10}$ — $x^{10} + x^9 + x^7 + x^5 + x^4 + x^3 + x^2$

$x^{13} + x^{11} + x^{10}$

$x^{13} \quad + x^{10} + x^9$

$x^{11} + x^9$

$x^{11} + \quad x^8 + x^7$

$x^9 + x^8 + x^7$

$x^9 + \quad + \quad + x^6 + x^5$

$x^8 + x^7 + x^6 + x^5$

$x^8 + \quad ? \quad x^5 + x^4$

$x^7 + x^6 + x^4$

$x^7 \quad x^4 + x^3$

$x^6 + x^3$

$x^6 \quad x^3 + x^2$

x^2

(00100 ∞ ∞ ∞ ∞ 11) ← C

$e_c = \frac{d_{min} - 1}{2}$ $\qquad ec = \frac{3-1}{2} = 1$

$ed = d_{min} - 1 = 2$

3) $g(x) = 1 + x + x^4$ $\qquad e(15, 11)$

000 1 | 1 1 1 0 1 0 0 0 0 0 ✓

$(1 + x + x^2 + x^3 + x^5)x^4 = x^4 + x^5 + x^6 + x^7 + x^9$

$x^9 + x^7 + x^6 + x^5 + x^4$ | $x^4 + x + 1$

$x^9 \quad + x^6 + x^5$ — $x^5 + x^3$

$x^7 + x^4$

$x^7 + x^4 + x^3$

x^3