

Homework assignment #4 of Error-Correcting Codes

Due date Dec. 31, 2021

Consider a (63,55) Reed-Solomon code over $GF(2^6)$ with generator polynomial $g(X) = (X + \alpha)(X + \alpha^2)(X + \alpha^3)(X + \alpha^4)(X + \alpha^5)(X + \alpha^6)(X + \alpha^7)(X + \alpha^8)$, where the primitive element α of the finite field $GF(2^6)$ satisfies $1 + \alpha + \alpha^6 = 0$.

1. Let $r(X) = \alpha^{36} + \alpha^{34}X + \alpha^{56}X^4 + \alpha^{52}X^5 + \alpha^{47}X^6 + \alpha^{13}X^7 + \alpha^{39}X^8 + X^9 + \alpha^5X^{10} + \alpha^{11}X^{23} + \alpha^{37}X^{60}$ be the received sequence. Use Berlekamp-Massey decoding algorithm to recover the transmitted codeword.
 - (a) Show $r, \Delta_r, T(X), B(X), \Lambda(X), L$ for each iteration r .
 - (b) Find the error locations and error values.
 - (c) Find the decoded codeword.
2. Let $r(X) = \alpha^{36} + \alpha^{34}X + \alpha^{56}X^4 + \alpha^{52}X^5 + \alpha^{47}X^6 + \alpha^{13}X^7 + \alpha^{39}X^8 + X^9 + \alpha^5X^{10} + \alpha^{11}X^{23} + \alpha^{37}X^{60}$ be the received sequence. Use Euclidean algorithm to recover the transmitted codeword.
 - (a) Show $s^{(r)}(X), t^{(r)}(X), Q^{(r)}(X), A^{(r)}(X)$, for each iteration r .
 - (b) Find the error locations and error values.
 - (c) Find the decoded codeword.
3. Let $r(X) = \alpha^{34}X + \alpha^{52}X^5 + X^6 + \alpha^{11}X^{23} + \alpha^{37}X^{60}$ be the received sequence. Use Berlekamp-Massey decoding algorithm to recover the transmitted codeword.
 - (a) Show $r, \Delta_r, T(X), B(X), \Lambda(X), L$ for each iteration r .
 - (b) Find the error locations and error values.
 - (c) Find the decoded codeword.
4. Let $r(X) = \alpha^{34}X + \alpha^{52}X^5 + X^6 + \alpha^{11}X^{23} + \alpha^{37}X^{60}$ be the received sequence. Use Euclidean algorithm to recover the transmitted codeword.
 - (a) Show $s^{(r)}(X), t^{(r)}(X), Q^{(r)}(X), A^{(r)}(X)$, for each iteration r .
 - (b) Find the error locations and error values.
 - (c) Find the decoded codeword.