## **0.1** Burst-Trapping Algorithm

Demonstration of Binary Cyclic Code's Ability in decoding burst-error.

#### **Definition 0.1**

Suppose then that C is a burst-b error correcting code, and that the syndrome S(x) satisfies the two conditions:

$$S(0) \neq 0 \tag{1}$$

$$deg(S(x)) \le b - 1 \tag{2}$$

#### Remark

deg(S(x)) is the highest degree of S(x)

Suppose we use a (7,3) Abramson Code with generator polynomial characterized by

$$g(x) = x^4 + x^3 + x^2 + 1 (3)$$

with a burst-correcting ability b=2; the received bit-stream is characterised by

$$R(x) = x^6 + x^5 + x^2 + 1 \tag{4}$$

#### Remark

In matrix form R(x) = [1010011]

Then the first syndrome is

$$S_0(x) = R(x) \mod g(x) = (x^6 + x^5 + x^2 + 1) \mod (x^4 + x^3 + x^2 + 1) = X^3 + x^2$$
 (5)

#### Remark

Use polynomial long-division

#### **Definition 0.2**

Meggitt's lemma

For  $i \ge 0$  define:

$$S_i(x) = [x^i R(x)]_n \mod g(x)$$
(6)

$$S_{j+1}(x) = [xS_j(x)] \mod g(x) \tag{7}$$

Remark

 $S_i(x)$  is the remainder syndrome of the jth cyclic shift of R(x)

We therefore have the following:

$$S_1(x) = [xS_0(x)] \mod g(x) = x^2 + 1$$
 (8)

$$S_2(x) = [xS_1(x)] \mod g(x) = x^3 + x$$
 (9)

Remark

 $xS_1(x)$  is degree-insufficient and therefore remainder is itself

$$S_3(x) = [xS_2(x)] \mod g(x) = x^3 + 1$$
 (10)

$$S_4(x) = [xS_3(x)] \mod g(x) = x^3 + x^2 + x + 1$$
 (11)

$$S_5(x) = [xS_4(x)] \mod g(x) = x + 1$$
 (12)

5th Syndrome finally satisfies definition one with degree of 1. Therefore transforming into matrix form, the burst error is 11 of location  $-5 \mod 7 = 2$ .

The error vector is therefore E = [0011000] and the corrected sequence is R + E = [1001011]

# **Chapter 1** Heading on level 0 (chapter)

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## 1.2 Lists

## **1.2.1** Example for list (itemize)

- # First itemtext
- Second itemtext
- Last itemtext
- \* First itemtext
- Second itemtext

# Example for list (4\*itemize)

- First itemtext
  - ★ First itemtext
    - First itemtext
      - First itemtext
      - Second itemtext
    - Last itemtext
  - **★ First itemtext**
- Second itemtext

## 1.2.2 Example for list (enumerate)

- 1. First itemtext
- 2. Second itemtext
- 3. Last itemtext
- 4. First itemtext
- 5. Second itemtext

# **Example for list (4\*enumerate)**

1. First itemtext

- a. First itemtext
  - i. First itemtext
    - A. First itemtext
    - **B.** Second itemtext
  - ii. Last itemtext
- **b.** First itemtext
- 2. Second itemtext

# **1.2.3** Example for list (description)

First itemtext

Second itemtext

Last itemtext

First itemtext

Second itemtext

# **Example for list (4\*description)**

First itemtext

First itemtext

First itemtext

First itemtext

Second itemtext

Last itemtext

First itemtext

**Second** itemtext