Mini-project

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Implement a Meggitt decoder

- The project basically consists of a main function and two subfunctions:
- The two subfunctions:
  1. Cyclic code encoder.
  2. Meggitt decoder.
- In the main function:
  1. Generate message vector
  2. Encode message vector by the cyclic code encoder
  3. Transmit code vector through an artificial communication channel, i.e., introduce errors to the code vector
     - It would be good to make an option for introducing the errors manually.
     - As we don't make a complete error detection and correction analysis in this project, you can set some options to decide how many errors are introduced during transmission.
  4. Decode the received vector by the meggitt decoder
     - It would be nice if visualizing the steps of the decoding process, e.g. visualize the change in the Buffer register and Syndrome register

Implement a Meggitt decoder

- Implementation program language: MATLAB, Java, or C++.
- Clear and detailed comments should be inserted into the programming codes.

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Encoder (Use MATLAB as example)

- Implement a MATLAB function to encode a message vector into a systematic cyclic code.
- Requirements:
  - The function has two inputs:
    1. Generator polynomial
    2. Message vector
  - The function has one output:
    1. Code vector

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Meggitt decoder (Use MATLAB as example)

- Implement a MATLAB function which can decode cyclic codes based on Meggitt Algorithm.
- Requirements:
    - The function has four inputs:
        1. Received vector
        2. Generator polynomial
        3. Code length: n;
        4. Message length: k
    - The function has three outputs:
        1. Error vector
        2. Code vector
        3. A tag: to indicate if if it is decodable, or undecodable but detectable.

Conditions

- Code length: 15
- Message length: 7
- The given generator polynomial:

$$g(x) = 1 + X^4 + X^6 + X^7 + X^8$$

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Hints

- Study the slides with the complement materials on Meggitt Decoding.
- Study some relevant information on Meggitt decoding on the Internet.
- The given Cyclic code is capable to correct 2 errors. There are 15 error patterns that corresponding to that the highest bit is erroneous, i.e.,
  - one error pattern with only 1 error, the erroneous bit at e_{14}.
  - 14 error patterns with 2 errors, one of the erroneous bits is located at e_{14}.

About Report

- What should be included in the report?
    - Describe how you implement the Meggitt decoder, showing your understanding of the decoding process of Meggitt decoder.
    - What's the key and difficult part in the implementation?
    - How do you test the program?
    - What are the test results?
- The report and program should be handed in through Assignment folder in CampusNet by 20/03/2014.
    - Source code of the program should be handed.
    - If the Meggitt decoder is implemented in Java or C++, please deliver the executable file as well, e.g., .jar file.
    - The report should be handed in pdf file (max 15 pages and 5 Mbytes).

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