Autumn 2021
ITT305: Programming Assignment 2

27 October 2021

Objective: Simulate realistic error detection and correction by implementing Cyclic Redundancy Check (CRC) and 7-bit Hamming code using binary symmetric channel and random error generation.

Specifications:

- Cyclic Redundancy Check with Binary symmetric channel Model.

  - Input: Digital data stream. No. of hops in communication = 1 or 2 (give option to user). Ask user for the crossover probability for binary symmetric channel(s).

  - Procedure: Consider a digital data stream of 32 or more bits. Tokenise it into 16-bit datawords, change it to polynomial form and perform CRC on each dataword using standard **CRC-8**$=x^8+x^2+x+1$. Once codeword is formed, use binary symmetric channel to send codewords to the receiver end i.e., now bits will be flipped with crossover probability (p) and they will remain as such with probability $1-p$ for one hop, similarly repeat it for 2 hops. Now, at receiver end decode the received codewords to check if the data is corrupted or not.

    To generate an event A with probability p, generate a random no. x between 0 and 1, then if $(x \leq p)$ perform event A else don't perform it. In this case, event is defined as flipping of bit from 0 to 1 or vice-versa.

  - Output: Digital data stream that was fed to the system, codeword formed for each dataword at the sender site, codeword received at the receiver after one or two hops (as selected by user) pass through binary symmetric channel, whether error is detected or not by performing CRC on the given codeword, if error is detected then return message 'Discard' else extract the dataword from the codeword received and represent it in digital form.

- 7-bit Hamming code with random error generation

  - Input: Digital data stream.

– Procedure: Consider a digital data stream of 16 or more bits. Tokenise it into 4-bit datawords, using even parity compute the codeword at the sender end. Now, use random error generation to generate a random error in the codeword and send that to the receiver end. At the receiver end, check if there has been an error and correct the error.

– Output: Digital data stream that was fed to the system, codeword formed for each dataword at the sender site, codeword received at the receiver after random error generation, whether error is detected or not, if there is one error return its location and correct it to extract correct dataword.

Language used: Any programming language can be used.

Due date and expected deliverables: 10 November 2021. You are expected to submit your code and a one-page specification report mentioning the language and libraries used, assumptions considered, how to run the code, references, etc.

Note: You can do your project individually or at maximum in groups of two students. Any help taken from any source or discussions regarding the project should be acknowledged. *Any case of plagiarism found will be severely penalized.*