International Journal of Electrical, Electronics and Computer Engineering **1**(1): 52-54(2012)

ISSN No. (Online) : 2277-2626

Review Paper On Communication By Hamming Code Methodologies

Brajesh Kumar Gupta* and Rajeshwar Lal Dua*

Department of Electronics and Communication Engineering,
**Jaipur National University, Jaipur, (RJ)*

(Recieved 22 April. 2012 Accepted 5 May 2012)

ABSTRACT : In communication system, a secure data transmission from transmitter to receiver is very major issue because all type of communication is possible by the channel between the transmitter and the receiver, this channel may be noisy. Due to this noisy channel transmitted data may be get corrupted and receiver receives this corrupted data. To find that this received data is corrupted or not we again used hamming code error detection and correction technique. Hamming code error detection and correction methodology is used for error free communication in communication system.

Here I am writing a review paper on communication by hamming code methodologies on the basis of some published papers, articles, power point presentation and books.

Keywords : Hamming Code, Even Parity, Odd Parity, VHDL, Verilog

I. INTRODUCTION

I am quite pleased today to find myself to have an opportunity to write a review paper on a well known and established communication by hamming code. Here I am just discussing about different method used for communication by hamming code methodologies. There are number of technique used to make error free communication possible in between source and destination. It is not possible to me to cover all methodologies used to make error free communication in between source and destination so that I am representing some of them methods used for error free communication. These methods are describe in section 2 different methods used for communication system by hamming code.

II. DIFFERENT METHODS USED FOR COMMUNICATION SYSTEM BY HAMMING CODE

In this section I describe some number of methods are used for communication system by hamming code methodologies. Basically, hamming code method work on single bit error detection and correction technique by even parity or odd parity check method.

A. Hamming R.W Error Detection and Correction Code

After studied this paper I found that the small size of the ransistors or capacitors, combined with cosmic ray effects, causes occasional errors in stored information in large, dense RAM chips, particularly those that are dynamic. These errors can be detected and corrected by employing error-detecting and -correcting codes in RAMs. The most common error detection scheme is the parity bit. A parity bit is generated and stored along with the data word in memory. The parity of the word is checked after reading the word from memory. The word is accepted if the parity of the bits read out is correct. If the parity of the bits read is incorrect, an error is detected, but it cannot be corrected [1].

An error-correcting code uses multiple parity check bits that are stored with the data word in memory. Each check bit is a parity bit for a group of bits in the data word. When the word is read back from memory, the parity of each group, including the check bit, is evaluated. If the parity is correct for all groups, it signifies that no detectable error has occurred. If one or more of the newly generated parity values is incorrect, a unique pattern called a syndrome results that may be able to identify which bit is in error. A single error occurs when a bit changes in value from 1 to 0 or from 0 to 1 while stored or if it erroneously changes during a write or read operation. If the specific bit in error is identified, then the error can be corrected by complementing the erroneous bit [1].

The most common types of error-correcting codes used in RAM are based on the codes devised by R. W. Hamming. In the Hamming code, k parity bits are added to an n-bit data word, forming a new word of $n + k$ bits. The bit positions are numbered in sequence from 1 to $n + k$. Those positions numbered with powers of two are reserved for the parity bits. The remaining bits are the data bits [1].

B. Hamming Code Error Detector/ Decoder

After studied this article I find Hamming Code Error Detector/Decoder chip will be designed based on a reliability concept called (7,4) Hamming Code. The chip will accept a seven-bit code word, the b-vector, and determine if the signal contains any errors utilizing a three-by-seven binary matrix,

the H-matrix. The b-vector contains seven bits of information and three parity check bits and the H-matrix is predetermined. This chip will be able to detect up to two errors and correct one error within the b-vector. If an error is detected, a signal will be sent back requesting that the vector be resubmitted. If no errors are detected, the code word will be decoded and the four-bit information word will appear on the output pins [2].

C. Design Hamming Code Using Verilog

In this paper Mr. Varun Jindal describe that designing of communication system for Hamming code using Verilog HDL for 7 bit information data transmission and reception. According to Mr. VARUN JINDAL need 11 bit for transmission for 7 bit information data string. He writes Verilog HDL code for transmitter and receiver for transmitting and receiving actual information by using even parity check method [3].

D.www.britannica.com/Ebchecked/Topic/253662/ Richardwesleyhamming#Ref1073410

Richard Wesley Hamming,(born Feb. 11, 1915, Chicago, Ill., U.S.—died Jan. 7, 1998, Monterey, Calif.), American mathematician. Hamming received a doctorate in mathematics from the University of Illinois. In 1945 he was the chief mathematician for the Manhattan Project. After World War II, he joined Claude E. Shannon at Bell Laboratories, where in 1950 he invented Hamming codes, which are used in telecommunications. He realized that, by the appending of a parity check (an extra bit or block of bits) to each transmitted "word," transmission errors could be corrected automatically, without having to resend the message [4].

E. Calculating the Hamming Code.mht

In this article the calculation of redundancy bit are describe for 7 bit information data string to make it 11 bit data string for transmission by even parity and odd parity check method at transmission section . At receiver section how can find the error bit location for even parity and odd parity check method also describe [5].

F. Http://Www.cs.prince On.edu/Courses/Archive/ Spring12/Cos126/Assignments/Hamming.html

In this article they use TOY Theory for generation 3 redundancy bits for 4 bit information data string with even parity check method at transmitter. They also used TOY Theory for finding error bit location at receiver end for 7 bit data string [6]

G.. Datacommunication and Networking

In this book Mr.Behrouz a. Forouzan describe about Hamming code. In this book they also gives the example of 4 bit information data transmission using 8 bit data string and the method for generating 3 redundancy bits at transmitter section. At receiver section how we can find the error bit location if any single bit or double bit error is coming also described in this book. How we will correct them this error bit if only single bit error is occurred also described in this book by even parity check method [7].

H. Communication Network

In this article, Communication is done by 11 bit data string for 7 bit information with even parity check method. They use transmitter in transmission section for transmit 11 bit data string. At receiver section, receiver receives this 11 bit data string from environment if any error is occurred its correct them only and pass to it another circuit for removing redundancy bit those are added before transmission at transmission section to make secure communication [8].

I. Http://Www.britannica.com/Ebchecked/Topic/585799/ Telecommunication/76275/Repetitioncodes#Ref608200

One simple, but not usually implemented, FEC method is to send each data bit three times. The receiver examines the three transmissions and decides by majority vote whether a 0 or 1 represents a sample of the original signal. In this coded system, called a repetition code of block-length three and rate one-third, three times as many bits per second are used to transmit the same signal as are used by an un coded system; hence, for a fixed available bandwidth only one-third as many signals can be conveyed with the coded system as compared with the un coded system [9].

J. Logic and Computer Design Fundamental 4th Edition Error Detection And Correction

In this article they describe, what is Hamming code, where we used Hamming code and how can generate redundancy bit for information data string for transmission and how can find the error location with even parity check method. They gives example for generate 12 bit data string at transmitter by 8 bit information data [10].

K. Computer Architecture And Interfacing

In this presentation, they describe about serial and parallel communication, even parity and odd parity check method for hamming code. They gives the example with even parity check method for generate 2 redundancy and 3 redundancy bit for 3 bit transmission and 8 bit transmission at transmission section . And recovering of these 3 bit data sting and 8 bit data string without any error at receiver section [11].

L. Datacommunication Technique

In this PPT they describe different type of serial communication, like synchronous type communication, asynchronous type communication. They also describe different methods for generating redundancy 7 bit for

information data. In these methodologies one of them is hamming code with even parity check method [12].

III. CONCLUSION

After reading some article, books and research papers we conclude that till now communication is possible by transmitting 11 bit data string from source section to destination section. Up to today we can transmit only 7 bit information data string from source section to destination section. The speed of communication system is depends on the number of frame can be transmitted per second; frame size depends on the number of bits it contains. Up to today the frame size is 11 bit only (because to transmit 7 bit information data string we need to add 4 redundancy bits).

Till now, communication is possible only in simplex mode (one end can transmit only and other end can receive only). In simplex mode communication, source section can transmit data string but cannot receive and destination section can receive data string but cannot transmit.

One more thing we have seen here is that, till now communication was possible by Hamming code even parity check method only and destination section needs minimum two circuits, one for error detection and correction and another for regenerating actual information data from intended data string.

REFERENCES

[1] Hamming R.W error detection and correction code, bell sys. Tech. J.29:147-60 1950 bell telephone laboratories, Murray Hill.

[2] Hamming code error detector/decoder by Jennifer Dilliner and Melissa Depriest, advisor: Dr. Vinod Prasad.

[3] Design Hamming code using Verilog by Varun Jindal

[4] Http://www.britannica.com/ebchecked/topic/585799/telecommunication/76275/repetitioncodes#ref608200

[5] Calculating the Hamming code.mht

[6] Http://www.cs.princeton.edu/courses/archive/spring12/cos126/assignments/hamming.html

[7] Data communication and networking , Behrouz A. Forouzan , 2nd edition Tata McGrawHill publication.

[8] .http://www.pragsoft.com/books/CommNetwork.pdf

[9] Http://www.britannica.com/ebchecked/topic/253662/richard-wesley-hamming#ref1073410

[10] Logic and computer design fundamental 4th edition error detection and correction

[11] Computer architecture and interfacing by dr. T itagaki — http://people.brunel.ac.uk/~eesttti

[12] Data and computer communication , chapter 6 digital data communication technique.