Performance Analysis of LDPC Decoding Techniques

Abdel Halim A. Zikry, Ashraf Y. Hassan, Wageeda I. Shaban, Sahar F. Abdel-Momen.

Abstract*: Low density parity checking codes (LDPC) are one of the most important issues in coding theory at present. LDPC-code are a type of linear-block LDPC-codes. Channel coding might be considered as the finest conversant and most potent components of cellular communications systems, that was employed for transmitting errors corrections imposed by noise, fading and interfering. LDPC-codes are advanced coding gain, i.e., new area in coding. the performances of LDPC-code are similar to the Shannon-limiting, this led to the usage of decoding in several applications in digital communications systems, like DVB-S2 and WLAN802.1..This paper aims to know what is LDPC,what its application and introduce encoding algorithms that gives rise to a linear encoding time and also show that the regular and irregular LDPC performance and also introduce different methods for decoding LDPC. I discuss in detail LDPC decoding algorithm: bit flipping algorithm, as a type from hard decision .belief propagation algorithm, sum product algorithm and minimum sum algorithm as examples from soft decision .I expect that at least some students or researchers involved in researching LDPC codes would find this paper helpful.

Keywords*: Low Density Parity Check Code LDPC, Parity Check Matrix H.

I. INTRODUCTION

This is One of the newest subjects in coding theory today is low density parity-check codes. a class of linear block LDPC codes is the Low-density parity-check (LDPC) codes. Channel coding can be seen as the best known and most effective component of cellular communication systems used to correct noise, interference and fading transmission errors. Low-Density Parity-Check (LDPC) codes are a greater gain in coding, i.e. a new coding area. The performance of LDPC code is restricted to the Shannon limit, making decoding very desirable for many digital communication systems applications, such as DVB-S2 and WLAN802.11.in this paper we are intended to attempt to discuss the following, such as What are LDPC codes? So why do we take an interest in them? and H0w, are they functioning? Humanity has been engaged in discovering and understanding the World since the dawn of time. The need for higher-speed wireless communication is likely to continue for the near future .The channel settings can suffer as interference, noise and fading as a message transfer. from the transmitter to the receiver.

Revised Manuscript Received on December 30, 2020.

Abdel Halim A. Zikry *, Emeritus Professor at Electronics Engineering and Electrical Communications, Ain Shams University-Faculty Of Engineering, Egypt. Email: abdelhalim_zekry@eng.asu.edu.eg.

Ashraf Y. Hassan, head of the electrical engineering department of electrical engineering, Benha University, Egypty. Email: Ashraf.fahmey@bhit.bu.edu.eg

Wageda I. Shaban,.Dr.lecture in Department of Basic Sciences, Benha University, Egypty. Email: Wageda_Ibrahim@yahoo.com

Sahar F. Abdel-Momen,phd.student, department of electrical engineering, Benha University, Egypty. Email,Eng.saharabdelmomen@gmail.com

This creates signal errors that make its recovery at the receiver almost unlikely. Interference, multi-path, and time variation are inherent features of wireless channels that make it difficult to reach, differences between LDPC codes and other codes: The big difference is the sparseness of the parity check matrix, Besides the sparseness, the other difference between LDPC codes and classic block codes is the encoding technique. Classic block codes are generally decoded with Maximum likelihood (ML) decoding algorithms however are generally short and algebraically designed to reduce complexity. LDPC codes are decoded iteratively using a graphical representation of their parity-check matrix, so they are designed with the properties of H as a focus.[4] high data rates on these channels. This problem becomes even more challenging if we Considering the practical need for implementation of low-complexity and low-power systems, the need to find effective solutions to the above problem has generated a great deal of research on wireless communication systems in recent years. Low-density parity-check (LDPC) codes can closely approach the Shannon limit capacity in channel coding theory and become one of the most promising channel codes in the world of error control coding. The reliability of error-correcting codes (ECCs) that approach the Shannon limit. Several approaches have been developed to assist the receiver recover the original signal. There really are two types of techniques for correcting errors, ARQ (Automatic Repeat Request) and FEC (Forward Correction of Error). In ARQ, re-sending is a request when the receiver discovers an error in the received information. In several cases, it is not possible to re-send data, FEC If redundant bits are added to the data, these redundant bits really had no new information, but are later used to identify and correct the error according to redundant bits called parity bits [1]. In the irregular structure of the LDPC, the framework gives rise to ensembles that are not possible. In LDPC designs, various new characteristics can be introduced and new constraints brought to bear. This framework has already been used to generate LDPC codes that perform better than traditional irregular LDPC codes over standard channels such as the AWGN channel, particularly for short block lengths, while necessitating lower complexity. It was used to adapt an LDPC design to the structure of a turbo equaliser receiver, achieving significant gains[2]. The framework produces very low high performance codes and high rate codes with low error floors. [3]