

# Linear Block Codes

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*Linear Block Codes*

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## ERNESTO JULISSA

**Linear Block Codes - BrainKart** Linear Block Codes In coding theory, a linear code is an error-correcting code for which any linear combination of codewords is also a codeword. Linear codes are traditionally partitioned into block codes and convolutional codes, although turbo codes can be seen as a hybrid of these two types. Linear codes allow for more efficient encoding and decoding algorithms than other codes (cf. syndrome decoding). Linear code - Wikipedia Linear block codes are a group of block codes that follow a special set of rules when choosing which set of outputs to use. The rules are as follows, using a (6,3) code for illustrative purposes: Let  $V_n$  = the set of all possible 64 6-bit sequences.  $U$  = the set of eight 6-bit sequences output at the channel coder. Using this notation, the rule is this:  $U$  must be a subspace of  $V_n$ . Linear Block Code - an overview | ScienceDirect Topics Linear block coding is a generic coding method. Other coding methods, such as Hamming and BCH codes, are special cases of linear block coding. The codeword vector of a linear block code is a linear mapping of the message vector. The codeword  $x$  and the message  $m$  have the relationship.  $x = mG$ . where  $G$  is a  $K$ -by- $N$  matrix and is known as the ... Linear Block Codes - BrainKart

6.1 Encoding Linear Block Codes Recall that a linear block code takes  $k$ -bit message blocks and converts each such block into  $n$ -bit coded blocks. The rate of the code is  $k/n$ . The conversion in a linear block code involves only linear operations over the message bits to produce codewords. For concrete-6.02 Notes, Chapter 6: Linear Block Codes: Encoding and ... Some elementary concepts of block codes are introduced in Chapter 1. In general, it is known that the encoding and decoding of  $2^k$  codewords of length  $n$  can be quite complicated when  $n$  and  $k$  are large unless the encoder has certain special structures. In this chapter, a class of block codes, called linear block codes, is discussed. Linear Block Codes | SpringerLink

Vahid Meghdadi Chapter 5: Linear Block Codes. Outline Basic principles Linear Block Coding Systematic codes Definition: If in all the codewords we can find exactly the corresponding information sequence, the code is called systematic. It is convenient to group all these bits either at the end or at the beginning. Chapter 5: Linear Block Codes - Université de Limoges

Y. S. Han Introduction to Binary Linear Block Codes 15 Hamming Weight and Hamming Distance (1) 1. The Hamming weight (or simply called weight) of a codeword  $c$ ,  $W_H(c)$ , is the number of 1's (the nonzero components) of the codeword. 2. The Hamming distance between two codewords  $c$  and  $c'$  is defined as  $d_H(c, c')$  = the number of components in ... Introduction to Binary Linear Block Codes A linear block code with this structure is referred to as a linear systematic block code. The (7, 4) code given in Table 1 is a linear systematic block code; the rightmost four digits of each code word are identical to the corresponding information digits. A linear systematic (n, k) code is completely specified by a  $k \times n$  Linear Block

Codes - University of Technology, Iraq Encoding Binary Linear Block Codes Definition A generator matrix for a  $k$ -dimensional binary linear block code  $C$  is a  $k \times n$  matrix  $G$  whose rows form a basis for  $C$ . Linear Block Code Encoder Let  $u$  be a  $1 \times k$  binary vector of information bits. The corresponding codeword is  $v = uG$  Example (3-Repetition Code)  $G = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}$  12/26 Linear Block Codes - Indian Institute of Technology Bombay Linear Block Codes. In the linear block codes, the parity bits and message bits have a linear combination, which means that the resultant code word is the linear combination of any two code words. Let us consider some blocks of data, which contains  $k$  bits in each block. These bits are mapped with the blocks which has  $n$  bits in each block. Here ... Digital Communication - Error Control Coding - Tutorialspoint If the block code is a linear block code, then the square brackets in the notation  $[u, p]$  are used to represent that fact. For binary codes with  $q = 2$   $\{\displaystyle q=2\}$ , the index is sometimes dropped. Block code - Wikipedia For the general case of linear block codes, all the  $n$  digits of  $X$  are formed by linear combinations (modulo-2 additions) of  $k$  message bits. A special case, where  $x_0 = m_0$ ,  $x_1 = m_1$ ,  $x_2 = m_2$ , ...,  $x_{k-1} = m_{k-1}$  and the remaining digits from  $x_k$  to  $x_n$  are linear combinations of  $m_0, m_1, m_2, \dots, m_{k-1}$  is known as a systematic code. Linear Block codes | Information Theory and Coding ... Introduction to Linear Block Codes For any (n, k) linear block code  $C$ , there exists a  $k \times n$  matrix  $G$  whose row space given  $C$  There exist an  $(n - k) \times n$  matrix  $H$  such that an  $n$ -tuple  $v$  is a code word in  $C$  if and only if  $v \cdot HT = 0$  If  $G$  is of the form given by (3.4), then  $H$  may take form given by (3.7), and vice versa Chapter 3 Linear Block Codes 7) The minimum distance of linear block code ( $d_{min}$ ) is equal to minimum number of rows or columns of  $H$ , whose \_\_\_\_\_ is equal to zero vector. a. sum b. difference Linear Block Codes - Electronic Engineering (MCQ ... Linear Block Codes Bounds on the minimum distance of linear block codes over  $GF(q)$  with  $q \leq 9$  for given length and dimension including information on the construction. query form. Quantum Error-Correcting Codes Bounds on the minimum distance of qubit block codes for given length and dimension CodeTables.de Introduction to Linear Block Codes Linear Block Codes The output of an information source is a sequence of binary digits  $0$  or  $1$ . Information sequence is segmented into message block of length  $k$ , denoted by  $u$ . Each message block consists of  $k$  information digits. There are a total of  $2^k$  distinct messages. Linear Block Codes - JNNCE ECE Manjunath 6.1 Encoding Linear Block Codes Recall that a linear block code takes  $k$ -bit message blocks and converts each such block into  $n$ -bit coded blocks. The rate of the code is  $k/n$ . The conversion in a linear block code involves only linear operations over the message bits to produce codewords. For concreteness, let's restrict ourselves to codes over  $FH$ APTER Linear Block Codes: Encoding and Syndrome Decoding Figure 93: Bounds on the Size of Block Codes VII-7 Linear Codes Def: An  $n \times k$  linear code over  $GF(q)$  is a  $k$  dimensional subspace of the  $n$  dimensional vector space of vectors with components in  $GF(q)$ . ( $q$  now must be a prime number or a power of a prime number) Equivalent

definition: An  $n \times k$  linear code over  $GF(q)$  is a  $q^k \times n$  block code for Lecture Notes 7: Linear Block Codes linear code over  $GF(q)$  is a  $q^k \times n$  block code for which the sum of any two codewords is also a codeword. (If  $q$  is a prime addition is done "mod  $q$ ". If  $q$  is not a prime more complicated addition is required). Def: Let  $C$  be a linear code. A matrix  $G$  whose row space equal  $C$  is called a generator matrix for  $C$ .

If the block code is a linear block code, then the square brackets in the notation  $[u, p]$  are used to represent that fact. For binary codes with  $q = 2$   $\{\displaystyle q=2\}$ , the index is sometimes dropped.

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Linear Block Codes. In the linear block codes, the parity bits and message bits have a linear combination, which means that the resultant code word is the linear combination of any two code words. Let us consider some blocks of data, which contains  $k$  bits in each block. These bits are mapped with the blocks which has  $n$  bits in each block. Here ...

*Linear Block Codes*

6.1 Encoding Linear Block Codes Recall that a linear block code takes  $k$ -bit message blocks and converts each such block into  $n$ -bit coded blocks. The rate of the code is  $k/n$ . The conversion in a linear block code involves only linear operations over the message bits to produce codewords. For concrete-

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Encoding Binary Linear Block Codes Definition A generator matrix for a  $k$ -dimensional binary linear block code  $C$  is a  $k \times n$  matrix  $G$  whose rows form a basis for  $C$ . Linear Block Code Encoder Let  $u$  be a  $1 \times k$  binary vector of information bits. The corresponding codeword is  $v = uG$  Example (3-Repetition Code)  $G = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}$  12/26 [Linear Block codes | Information Theory and Coding ...](#)

Linear Block Codes Bounds on the minimum distance of linear block codes over  $GF(q)$  with  $q \leq 9$  for given length and dimension including information on the construction. query form. Quantum Error-Correcting Codes Bounds on the minimum distance of qubit block codes for given length and dimension

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Introduction to Linear Block Codes For any (n, k) linear block code  $C$ , there exists a  $k \times n$  matrix  $G$  whose row space given  $C$  There exist an  $(n - k) \times n$  matrix  $H$  such that an  $n$ -tuple  $v$  is a code word in  $C$  if and only if  $v \cdot HT = 0$  If  $G$  is of the form given by (3.4), then  $H$  may take form given by (3.7), and vice versa

**Linear Block Codes - Electronic Engineering (MCQ ...**

For the general case of linear block codes, all the  $n$  digits of  $X$  are formed by linear combinations

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*Linear code - Wikipedia*

Linear Block Codes

A linear code over  $\mathbb{F}_q$  is a  $q^k \times n$  block code for which the sum of any two codewords is also a codeword. (If  $q$  is a prime addition is done "mod  $q$ ". If  $q$  is not a prime more complicated addition is required). Def: Let  $C$  be a linear code. A matrix  $G$  whose row space equals  $C$  is called a generator matrix for  $C$ .

*Lecture Notes 7: Linear Block Codes*

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*Block code - Wikipedia*

Linear block codes are a group of block codes that follow a special set of rules when choosing which set of outputs to use. The rules are as follows, using a (6,3) code for illustrative purposes: Let  $V_n =$  the set of all possible 6-bit sequences.  $U =$  the set of eight 3-bit sequences output at the channel coder. Using this notation, the rule is this:  $U$  must be a subspace of  $V_n$ .

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Systematic codes Definition: If in all the codewords we can find exactly the corresponding information sequence, the code is called systematic. It is convenient to group all these bits either at the end or at the

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**Linear Block Codes - University of Technology, Iraq**

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*Chapter 3 Linear Block Codes*

In coding theory, a linear code is an error-correcting code for which any linear combination of codewords is also a codeword. Linear codes are traditionally partitioned into block codes and convolutional codes, although turbo codes can be seen as a hybrid of these two types. Linear codes allow for more efficient encoding and decoding algorithms than other codes (cf. syndrome decoding).

*Digital Communication - Error Control Coding - Tutorialspoint*

Y. S. Han Introduction to Binary Linear Block Codes 15 Hamming Weight and Hamming Distance

(1) 1. The Hamming weight (or simply called weight) of a codeword  $c$ ,  $WH(c)$ , is the number of 1's (the nonzero components) of the codeword. 2. The Hamming distance between two codewords  $c$  and  $c'$  is defined as  $dH(c, c') =$  the number of components in ...

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Figure 93: Bounds on the Size of Block Codes VII-7 Linear Codes Def: An  $n \times k$  linear code over  $\mathbb{F}_q$  is a  $k$ -dimensional subspace of the  $n$ -dimensional vector space of vectors with components in  $\mathbb{F}_q$ . ( $q$  now must be a prime number or a power of a prime number) Equivalent definition: An  $n \times k$  linear code over  $\mathbb{F}_q$  is a  $q^k \times n$  block code for

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*HAPTER Linear Block Codes: Encoding and Syndrome Decoding*

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7) The minimum distance of linear block code ( $d_{min}$ ) is equal to minimum number of rows or columns of  $H^T$ , whose \_\_\_\_\_ is equal to zero vector. a. sum b. difference