

ABSTRACT

In order to obtain efficient and reliable data transmission and storage systems, error-correcting codes are used. These codes control the errors occur in transmitted or stored data. There are several types of these codes, one of which is the group codes which have an important class called cyclic codes with which this research is concerned. Every code has three parameters, one of which is the minimum weight. The minimum weight of a code determines the capability of this code to detect/correct errors.

In this thesis we concentrate on solving the problem of determining the minimum weight of cyclic codes. Finding the minimum weight has always been an interesting and challenging problem to coding theorists. This problem has been solved by introducing an efficient algorithm which is based on some results which have been derived in this work. In this algorithm the weight of as few as possible codewords needs to be computed. The number of these codewords was determined, and this number was used to measure the algorithm's time complexity. Also, a comparison has been made between the constructed algorithm and other methods by implementing these methods and measuring their execution time.

Software system has been implemented which is used to give the properties of a given cyclic code. One of these properties is the capability of the code to detect/correct errors. Also, it is used to generate a cyclic code represented by its generator polynomial, which fits the user's requirements. The system which we call **"Code and Characteristics Generator"**, offers a range of capabilities such as generator polynomial editor and file server. It is easy to use and very flexible from the user's point of view. It was implemented using Turbo Pascal language, and it can be run on any IBM PC or its compatible.

A table was generated which contains all the cyclic codes of odd lengths from (65) to (75) with their minimum weights which were computed using the proposed algorithm. This table is an extension to the table given in [36].