Abstract

In this thesis, we study the necessary and sufficient conditions for the existence of linear codes correcting `periodic random errors` and `periodical burst errors`. The error patterns are observed by Lange in 1994 in channels like power lines, car electric, compact discs, and CD-ROM. We study the Hamming weight distribution of the error patterns in an n-tuple. Based on the weight distribution, we derived Plotkin's types of bound for the set of the error patterns. The probability of decoding error for the linear codes correcting the error patterns over a binary symmetric channel are also studied. These works are then extended by putting Hamming weight constraint on the error patterns, called `low-density periodic random errors` and `low-density periodical burst errors`. We provide a comparative study on the efficiency of the codes in correcting these different periodic types of error patterns. Furthermore, we present a study on the burst-b distance introduced by Wainberg and Wolf (1972). The burst-b distance is found to be useful for correcting multiple burst errors and erasures. In this thesis, we investigate the connection of burst-b distance of a linear code and the code's periodical burst error -detection and -correction capability. Periodical burst error -detection and -correction of an MDS code C_b (presented by Villalba et al. (2016)) are also studied. Finally, we present a decoding procedure for the code C_b in case of the periodical burst errors.