ABSTRACT

A DESIGN AND IMPLEMENTATION OF GEOMETRICAL LEARNING ALGORITHM FOR VECTOR QUANTIZATION

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In this thesis, the learning vector quantization, one of the frequently used methods in machine learning, is examined in detail. Furthermore, an alternative model with a geometrical approach is proposed to reduce workload and to increase the speed of convergence to the solution of classification problem, by eliminating some arbitrary parameters. The main principle of the proposed learning algorithm is that the boundaries of the classes are determined by moving the reference vectors to or away from not only the sample input vector but also the centroid of the classes using reference hyperspheres.

The thesis is organized into five chapters. The first chapter introduces the classification problem in machine learning from a strictly mathematical viewpoint. Furthermore, some geometrical approaches for solving the classification problems in the literature are mentioned in the same chapter.

Chapter 2 lays out the mathematical foundation of the learning vector quantization, one of the neural network models designed specifically for the classification problem. In the Chapter 3, a fundamental problem encountered, when the generalized learning rule is applied, in some competitive approaches is explained. In order to solve this problem, a geometrical learning approach is presented in the Chapter 3.

In Chapter 4, the proposed method is compared with some variants of learning vector quantization via some experimental studies. The observations obtained with experimental studies are discussed.

Key Words
Machine Learning, Learning algorithm, Vector quantization, Kohonen vectors, Geometrical learning approach, LVQ