

# Fast VQ codeword search algorithm by multiple eliminating conditions

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## ABSTRACT

Vector Quantization (VQ) is a widely application technology in recent ten years such as video, speech and image. During the encoding process for image vector quantization compress technology, is require search the close codeword in codebook by Full Search. The complexity is proportional to the dimensions  $K$  of codeword and the size  $N$  of codebook. In this paper, for reduce the complexity of Full Search(FS), we employed the Mean-distance ordered Partial codebook Search algorithm (MPS) [1] to determine initial codeword and search sequence. In addition, we calculated out four projected values for the block that will be encoding, and the four projected values for the codeword by fast projection algorithm. According to four eliminate rule that are formulate under four projection value, we delete the codeword that is impossible become the close codeword. On the other hand for the codeword that is selected, we speed up the search for the close codeword to arrive the goal of reduce the search and execution time by the partial distance elimination (PDE) [2] algorithm. In the experimental result, when the dimensions of codeword  $K$  is 16, and the size of codebook  $N$  is 128, the overall average time is 11.69ms, the percentage of Full Search(FS) execution time is 5.89%, when the size of codebook  $N$  is 256, the overall average time is 17.17ms, the percentage of FS execution time is 4.34%, when the size of codebook  $N$  is 512, the overall average time is 26.73ms, the percentage of FS execution time is 3.39%, when the size of codebook  $N$  is 1024, the overall average time is 43.35ms, the percentage of FS execution time is 2.75%. When the dimensions of codeword  $K$  is 64, and the size of codebook  $N$  is 128, the overall average time is 10.53ms, the percentage of FS execution time is 5.48%, when the size of codebook  $N$  is 256, the overall average time is 16.48ms, the percentage of FS execution time is 4.27%, when the size of codebook  $N$  is 512, the overall average time is 26.88ms, the percentage of FS execution time is 3.59%, when the size of codebook  $N$  is 1024, the overall average time is 44.08ms, the percentage of FS execution time is 3.25%. According to data of experiment, the effect of this method is fast and efficiency. That the proposed algorithm using the four eliminate rule, avoid unnecessary Euclidean distance calculation out to save consumption of vector projection conversion calculation, only integer calculation, to reduce the vector floating point time calculation, PDE can early stop Euclidean distance calculation, and use early detection to stop the search and reduce the time to achieve results fast searching.

Keywords : Vector quantization、Fast search、Fast encode、Speech、Video、Image vector quantization

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