A FAST COMPUTATIONAL ALGORITHM FOR DISCRETE COSINE TRANSFORM

SUNG-OK KIM

Implementing Discrete Cosine Transform for the two-dimensional input data such as image data in the computer, we need a great number of arithmetic operations. The object of this paper is to develop 2-D DCT algorithm that is more efficient and explicit than those that exist in the literature.

By multiplying the given 2-D DCT matrix, which is the Chronecker product of two 1-D DCT matrices, by the row permutation matrix and column permutation matrix, we get two submatrices with half order. While performing this process repeatedly until we get 2×2 matrix, we decompose some matrices into sparse matrices in a quite different way.

Finally the given 2-D DCT matrix is expressed as the product of a sparse matrix, some permutation matrices and some other matrices, whose elements are 1 or 0. Therefore the number of arithmetic operations is reduced a great deal.

This paper presents a theoretical and systematical process of the matrix factorization.

Specially by factorizing matrices so that most of non-zero terms become the form of $\begin{bmatrix} a & b \\ b & -a \end{bmatrix}$, we can reduce again the number of multplications considerably.

Han Nam University
Daejeon 300-791, Korea