Ⅰ. INTRODUCTION

Recently, compression technology has been actively studied in the field of multimedia. Since the amount of data of the multimedia is large, a lot of storage space and bandwidth are required for storing and transmitting the data. Therefore, it can be said that the use of the compression technique is essential for storing and transmitting at a minimum cost without distorting the image data. Compression of a video signal means compressing data using properties or characteristics of the video signal. There are two types of image signal correlation: spatial correlation and time correlation. Spatial correlation is the similarity between adjacent pixels in the screen.

The time correlation refers to the similarity between pixels in the same position of the current screen and the previous screen. Only the spatial correlation is used for the encoding of the still image, and both the spatial correlation and the temporal correlation are used for coding the motion picture.

Ⅱ. DISCRETE COSINE TRANSFORM

The following is a general overview of the JPEG
process. We can get a more comprehensive understanding of the process by looking closely at the JPEG method. First, the image is divided into 8 by 8 pixel blocks. Second, working from top to bottom left to right, the DCT is applied to each block. Third, each block is compressed through quantization. Fourth, the array of compressed blocks that make up the image is stored in a greatly reduced amount of space. Finally if desired, the image is reconstructed through decompression, a process using IDCT (inverse discrete cosine transform). The DCT equation (1, 2) computes the \( i,j \)th entry of the DCT of an image. Compression algorithm schemes include predictive coding, transformation coding and vector coding.

\[
p(x,y) = \begin{cases} \frac{1}{\sqrt{2}} & \text{if } n = 0 \\ \frac{1}{\sqrt{N}} & \text{if } n > 0 \end{cases}
\]

\[
D(i,j) = \frac{1}{2\sqrt{N}} \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} p(x,y) \cos \left( \frac{(2x+1)i\pi}{2N} \right) \cos \left( \frac{(2y+1)j\pi}{2N} \right)
\]

\[
D(i,j) = \frac{1}{4} \sqrt{\frac{1}{N}} \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} p(x,y) \cos \left( \frac{(2x+1)i\pi}{16} \right) \cos \left( \frac{(2y+1)j\pi}{16} \right)
\]

Because the DCT uses cosine functions, the result matrix depends on horizontal, diagonal, and vertical frequencies. Thus an image black with a lot of change in frequency has a very random looking resulting matrix, while an image matrix of just one color, has a resulting matrix of a large value for the first element and zeroes for the other elements. To obtain the matrix through equation (1), use the following equation. For an 8 by 8 block it results in this matrix \( T \). The first row \((i = 1)\) of the matrix has all the entries equal to \( 1/\sqrt{8} \) as expected from Equation (4).

\[
T_{ij} = \begin{cases} \frac{1}{\sqrt{N}} & \text{if } i > 0 \\ \frac{1}{\sqrt{2}} \cos \left( \frac{(2j+1)\pi i}{2N} \right) & \text{if } i > 0 \end{cases}
\]

**Table 1. Orthogonal matrix \([T]\)**

<p>| | | | | | | | |</p>
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</tr>
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</table>

**III. CONCLUSIONS**

The discrete Fourier transform is a technique of converting from the time domain to the frequency domain. The discrete cosine transform is based on the discrete Fourier transform. Figure 1 shows the result of visual reconstruction of the discrete Fourier transform using Excel.