

## IMPROVING IMAGE COMPRESSION USING DWT

R. Ranjith Kumar<sup>1</sup>, G. Premalatha<sup>2</sup>, P.Jaya Bharathi<sup>3</sup>

Associate Professor<sup>1</sup>, Assistant Professor<sup>2</sup>, Assistant Professor<sup>3</sup>

Department of Computer Science and Engineering

Dhanalakshmi Srinivasan College of Engineering and Technology, Tamil Nadu, India

### Abstract

Image compression has become a crucial method in today's world of data exchange. Compression assists in effective utilization of high speed network resources. The discrete wavelet transform (DWT) is a technique for changing a proof into elementary frequency parts. it's wide employed in compression. Here some functions for compression of each grey scale and color pictures with DWT and its implementation in MATLAB are developed. The DWT is incredibly kind of like a series, however in many ways, is way a lot of versatile and informative. it's a tool that breaks up information into completely different frequency parts or sub bands and then studies every part with a resolution that is matched to its scale. Not like the Fourier series, it will be used on non-stationary transient signals with glorious results.

Keywords: Image compression, Quantization, DWT, Lossless compression, Lossy Compression,

### I. INTRODUCTION

Compression is a crucial issue in digital image process. The compression is additionally a crucial issue to find the in depth applications in several fields. It is because of nice innovation in show and data technology, the info storage capability for storage of knowledge has exaggerated drastically. Now-a-days the prime quality cameras manufacture prime quality pictures. These prime quality pictures need great amount of cupboard space. For such situation, the info compression technique is applied to supply acceptable resolution. Compression is of 2 varieties lossy and lossless compression. For Lossy compression technique, several standards are developed like JPEG [1] and JPEG 2000 [2] for still pictures. The reconstructed image isn't precisely same because the original image in Lossy compression technique a crucial development in compression is that the institution of the JPEG 2000 normal for compression of color footage. victimisation the JPEG2000 technique, a twenty four bit/pixel color pictures may be reduced to between one to a pair of bits/pixel, while not obvious visual artifacts. The DWT is associate degree improvement over the separate Fourier transform (DFT). Here we've got computed some codes in MATLAB for compression of pictures victimisation DWT. The results are discovered within the laboratory for each the compression of grey scale and color pictures.

### II. COMPRESSION TECHNIQUES

Based on the wants of knowledge reconstruction compression techniques square measure classified into lossless and lossy compression techniques.

#### 2.1 Lossless Compression Scheme:

In this theme, there's no loss of knowledge concerned or accepted. the first knowledge may be recovered specifically from the compressed knowledge. this sort of compression usually is employed in Medical pictures (DICOM), Text compression, satellite pictures and in astronomical knowledge. Huffman committal to writing, Run-length, LZW, space committal to writing and Chain committal to writing square measure a number of the lossless strategies.

## 2.2 Lossy Image Compression:

A compression theme wherever the output of the decoder is totally different from the first input file compressed by the encoder, however the loss in info is suitable to a user. lossy compression theme is appropriate for natural pictures like pictures ,still pictures wherever in some quantity of loss of knowledge or data is suitable to realize a considerable reduction in bit rate.

A Lossy compression technique includes the subsequent types:

Transform committal to writing, pattern committal to writing, Vector quantization, Block truncation committal to writing, sub- band committal to writing

## 2.3 Lossless Compression Theme

### 2.3.1 Huffman committal to writing

Huffman committal to writing is one in every of the foremost well-liked lossless committal to writing for removal of committal to writing redundancy. Huffman code assigns a group of best variable-length codes to a group of symbols on their possibilities. Supported their applied math prevalence the pixels square measure ordered. The image that occur additional oft square measure appointed a lower bit level than the symbols that occur less oft square measure appointed a bigger variety of bits. Huffman constructs a code tree from right to left.

### 2.2.2 Run-length committal to writing

Run-length encryption could be a terribly straightforward knowledge compression, that used runs of identical intensities either within the row of pictures as run-length pairs, wherever every run length pair specifies the beginning of a replacement intensity worth. Run-length committal to writing removes abstraction redundancy this is often significantly helpful in binary compression, because a binary image contains solely black and white and adjacent pixels square measure additional probably to be same. thus extra compression of binary pictures may be achieved by variable length committal to writing. Run-length committal to writing is employed in facsimile machines.

## III. THE NEED FOR COMPRESSION

The modification from the cine film to digital strategies of image exchange and depository is primarily intended by the benefit and suppleness of handling digital image info rather than the film media. whereas getting ready this step and developing standards for digital image communication, one has got to build fully positive that conjointly the image quality of coronary angiograms and ventriculograms is maintained or improved. Similar necessities exist conjointly in diagnostic technique.

Regarding image quality, the foremost crucial step in going from the analog world (cine film or high definition live video within the catheterization laboratory) to the digital world is that the conversion of the signals. For this step, the fundamental demand of maintaining image quality is well translated into 2 basic quantitative parameters:

The rate of digital image information transfer or rate (Megabit per second or Mb/s) and the total quantity of digital storage needed or information capability (Megabyte or MByte).

As a selected example, the spatial resolution of the cine film is mostly assumed to be cherish a digital matrix of a minimum of a thousand by a thousand pixels, every with up to 256 grey levels (8 bit or one byte) of distinction info (see curriculum Unit 1). The subsequent table derives from this principal parameter some examples for necessities on digital image communication and depository during a catheterization laboratory with low to medium volume.

|                                | <b>Film</b>           | <b>Digital</b>      |
|--------------------------------|-----------------------|---------------------|
| Spatial resolution             | 4 linepairs/mm        | 1024*1024 pixels    |
| Data capacity per image        |                       | 1 Megabyte (MByte)  |
| Data rate                      | 31 images per seconds | 31 MByte per second |
|                                |                       |                     |
| Data capacity per patient exam | 2,500 images          | 2,500 MByte         |
| Media                          | one film              | four CD-R           |
| Data for 10 years              | 30,000 films          | 120,000 CD-R        |

Table 1 Development for replacement of cine film by digital imaging with high resolution

From Table 1 we tend to see, that during this state of affairs the big rate of thirty MB per second must be supported. this is often a lot of quicker than even advanced ATM networks (offering but twenty Mbyte/s or a hundred and sixty Mbit/s). trying to find existing off-line media, time period show from compact disc would need a compact disc player with a knowledge rate of 200X, whereas the quickest players on the market presently deliver 50X (1X stands for a knowledge rate of a hundred and fifty KByte per second). the full quantity of information or the 'data capacity' needed during this state of affairs is even additional horrifying (see Table 1).

Computer technology, however, provides versatile principles for process massive amounts of knowledge. Among the algorithms on the market is image information reduction or 'image compression'. The principal approach in information compression is that the reduction of the number of image information (bits) whereas protective data (image details). This technology could be a key enabling consider several imaging and transmission ideas outside of medication. therefore one must raise if medicine very can need to address these huge and whole uncommon needs regarding digital information rates and digital information capability (Table 1), or if compression also can be applied basically in internal organ imaging.

At a more in-depth look one observes that impromptu approaches to image information compression are applied in most digital imaging systems for the catheterization laboratory all the time. associate example is recording the x-ray pictures with a smaller matrix of simply 512 by 512 picture elements (instead of the 1024 by 1024 pixel matrix usually applied for time period displays). so as to objectively assess these and different techniques of image information compression, some systematic data of the tradeoffs understood in several modes of image information reduction is necessary.

## B. Compression Steps

- Digitise the supply image into a symptom  $s$ , that could be a string of numbers.
- Decompose the signal into a sequence of ripple coefficients  $w$ .
- Use threshold to switch the ripple coefficients from  $w$  to  $w'$ .
- Use division to convert  $w'$  to a sequence  $Q$ .
- Entropy coding is applied to convert  $Q$  into a sequence  $e$ .

### **Digitation**

The image is digitized 1st. The digitized image will be characterised by its intensity levels, or scales of grey that vary from 0 (black) to 255 (white), and its resolution, or what number pixels per square measure.

### **Thresholding**

In bound signals, several of the ripple coefficients area unit shut or up to zero. Through threshold these coefficients area unit changed so the sequence of ripple coefficients contains long strings of zeros. In exhausting threshold, a threshold is chosen. Any ripple whose definite quantity falls below the tolerance is about to zero with the goal to introduce several zeros while not losing a good quantity of detail.

### **Quantization**

division converts a sequence of floating numbers  $w'$  to a sequence of integers  $Q$ . The simplest kind is to spherical to the closest whole number. Another methodology is to multiply every range in  $w'$  by a continuing  $k$ , so spherical to the closest whole number. Quantization is termed lossy as a result of it introduces error into the method, since the conversion of  $w'$  to  $Q$  isn't one to 1 perform.

### **Entropy writing**

With this methodology, a whole number sequence  $Q$  is modified into a shorter sequence  $e$ , with the numbers in  $e$  being eight bit integers. The conversion is formed by Associate in Nursing entropy coding table. Strings of zeros area unit coded by numbers one through one hundred, 105 and 106, while the non-zero integers in  $Q$  area unit coded by a hundred and one through 104 and 107 through 254.

#### IV. DWT RESULTS

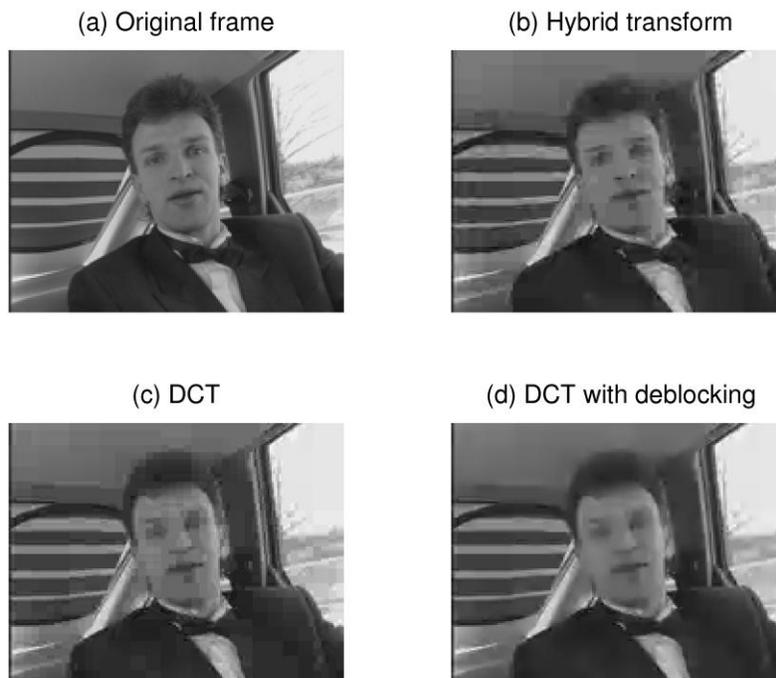


Fig.1. DWT Results

#### V. CONCLUSIONS

DWT is employed as basis for transformation in JPEG 2000 normal. DWT provides prime quality compression at low bit rates. the utilization of larger DWT basis functions or riffle filters produces blurring close to edges in pictures.

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