International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 03 Issue: 01 | Jan-2016 www.irjet.net p-ISSN: 2395-0072

COMPREHENSIVE STUDY OF THE WORK DONE IN IMAGE PROCESSING AND COMPRESSION TECHNIQUES FOR REDUNDANCY

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Abstract : Image processing is one of the latest topics and is used in almost every field of the study. Image processing is used in order to enhance, smoothening, filtering etc. the image. There are number of techniques which are suggested in order to enhance and smoothening the image. When images merged together than pixels may overlap with each other. This overlapping of image will cause redundancy within the image. In our paper we will analyze this redundancy problem. We will also try to rectify the problem. In order to build a base we have analyze large number of papers. Some of the papers have described the problem of redundancy. In this paper review of those papers has been conducted. **Keyword:** Image, image compression, redundancy, lossy compression, lossless compression.

1. Introduction

Today even the naïve user is using the computer. Naïve users do not now much command associated with the computers. So in order to make them understand the computer, Graphical User Interface is required. This interface will be provided with the help of applications of image processing. So main application of image processing is in the field of interface designing. The interface is important as it will lead to the success or failure of the system. When interface is designed we may required in order merging multiple images together. When this happens pixels may overlap with each other. This overlapping of pixel will cause redundancy in the images. Redundancy within the image will cause number of problems. The redundancy will cause extra space requirements. Hence when redundancy is present than extra cost will be encountered. The redundancy can also be

present due to compression technique which is used. The compression method can be lossy or lossless in nature. The redundancy problem is common in lossless compression.

2. Image compression techniques

There are number of image compression techniques which are available to be used. Each compression technique which is used is complex in nature. Compression techniques are divided into following categories.

1) Lossy Compression
2) Lossless Compression

1) Lossy compression techniques

In lossy compression, reconstructed image, after compression is not identical to the original image but close to it. [1] These techniques are applied to those data where loss is tolerable. Following are lossy compression techniques:-

a) Transformation Coding

In this technique Discrete Fourier transformation is used. In this technique the pixel in original image is changed to frequency domain. The overall energy of the entire pixels are concentrated on the few necessary pixels. Only some significant pixels are selected and rest of the pixels is rejected.

b) Vector quantization

In this case dictionary of code vectors are prepared. Code vector is the block of pixel values. The given image is then divided into parts. This is known as image vector. The image vector is than compared with the code vector in order to determine the code for the given image.

c) Fractal Coding

The idea behind this encoding is to divide the image into parts. The image will be divided into parts on the basis of colors, edge detection etc. The technique is useful in case image contain redundancy.

d) Block Truncation Coding

The image in this case is divided into block of non overlapping pixels. For each block threshold and reconstruction values are determined. The values of the block will then be compared against the threshold values. If the pixel values are greater than the threshold values than the pixel values will be rejected. This technique is not useful the redundancy is presented within the images.

2) Lossless Compression Techniques

In lossless compression, reconstructed image, after compression is identical to the original image. [1] It is applied to those data in which we

need accuracy such executable codes. Following are lossless compression techniques:-

a) Run Length Encoding

This is very simple form of encoding. In this case encoding the larger set of string is replaced with the smaller set of code. The Run Length Encoding is useful in a system where large number pixels repeat itself. In order to describe this system we will take following example of string

1122223344444444444443333333333333222222222255555555555

{1,2}, {2,4},{3,2},{4,13},{3,13},{2,10},{5,11}

In this type of encoding the frequency of each digit is included within the braces along with the digit itself. Within the braces first variable represent the symbol which are repeated and second variable represent the length of symbol.

b) Huffman Encoding

Huffman Encoding is used to encode the given image into set of codes. The codes can be represented in the form a tree. The reverse approach is followed in order to formulate a code. The code is generally represented in the form of binary string.

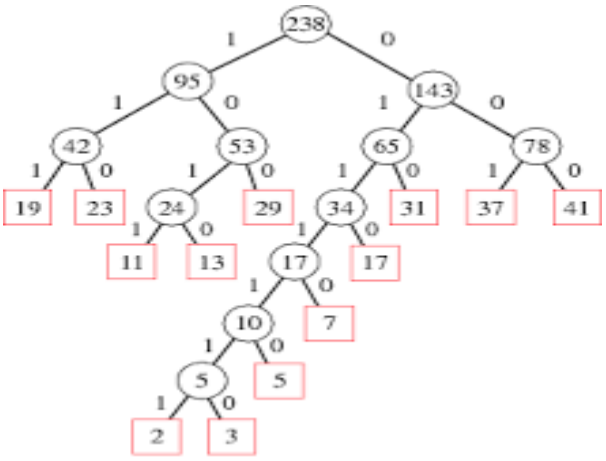

Fig 1. Example of Huffman encoding

The last two bits are extracted and then added together to achieve the value of the root node. This process continues until the root node is reached or tree terminated.

c) LZW Coding

LZW (Lempel- Ziv – Welch) is a dictionary based coding. [2] Dictionary based coding can be static or dynamic. The static dictionary coding describes dictionary as a fixed during the encoding and decoding processes. The dynamic dictionary coding describes the dictionary as updated on fly. LZW is widely used in computer industry and is implemented as compress command on UNIX.

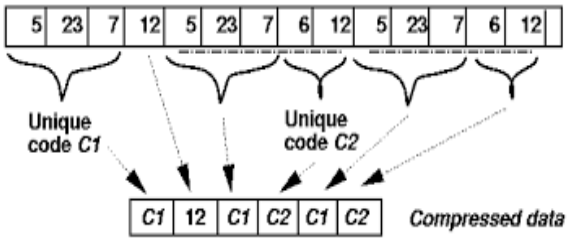

Fig 2. Example of LZW coding

3. Related Work

There are number of papers which described the problem of redundancy in images. In order to build the base we analyze number of such papers. Some of the papers which we have studied will be described in this section. Redundancy will make certain portion of the image much brighter than the other portion of the images. [3] This paper considers the compression technique for jpeg images. The jpeg images are common extension for the images which are being transferred. The transferred images will be compressed so that image should not take much space over the transmitted medium. The transmission media will charge expenses if the data transferred are large. So compression is required. Discrete cosine transform is used in this case to compress the image. If image is compressed properly than less bits per image is required to represent the image. Hence the mechanism of image compression will help in decreasing the cost associated with the image storage.[4] In addition to the redundancy image processing also contains the problem of noise. This considered paper considers the impact of noise on the image. The impact of noise will cause distorted image. Image denoising via sparse and redundant representations over learned dictionaries will be considered in this case. The advantages of the redundancy will be shown. In other word the positive side of the redundancy will be considered in this case. [4] There are number of types of redundancy which are present within the image. The pixels will have large spaces in between the pixels. This is known as inter pixel distance. In order to reduce the distance compression techniques are followed. In order to efficiently compress the images compression techniques are used. Compression technique which is suggested in this paper includes lossless and lossy compression. The redundancies which are considered are interpixel, coding and Psycho visual.[5]The image compression will be considered in this case. Image compression is required so that the space requirements can be reduced. The image compression will be required to reduce the redundancy. The type of redundancy which is considered in this case will include Psycho visual. This redundancy indicates sensitivity to different images by human eye. So some

unnecessary information from the image can be rejected. [6] Image compression techniques are considered. The image compression will be used so that relatively less pixels should be used in order to represents the image. Sometimes image does not contain any relevant data. In that case that irrelevant information has to be eliminated. This is accomplished with the help of compression techniques. [7]The concept of medical images is considered in this case. The MRI is a form of images which are used in the area of medical field. Various types of redundancies are present within the images. These redundancies are eliminated by the use of compression techniques. In this paper the area of concern is medical images. [8]The study of various image compression techniques are considered in this case. Principal Component Analysis technique is considered in this case. Image f(x,y) is fed into the encoder, which creates a set of symbols form the input data and uses them to represent the image. If we let n1 and n2 denote the number of information carrying units(usually bits) in the original and encoded images respectively, the compression that is achieved can be quantified numerically via the compression ratio. The main area of concern is Huffman coding, LZW coding etc. PCA technique suggested in this paper is based upon two factors data reduction and interpretation.

The main focus of all the papers studied is data compression and reducing the redundancy present within the image. The techniques which are suggested within the papers are very complex and time consuming.

4. Conclusion and Future Work

The papers we have analyzed study the compression techniques. The compression techniques which are specified are lossy or lossless in nature. All the suggested techniques use complex mechanisms in order to reduce the redundancies. In the proposed work we will use relatively simple mechanism to reduce the redundancy from the given image. The proposed method will use the buffer in order to store the threshold values which can be compared against the newly generated pixels to reject them if they are repeated.

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