



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**IMAGE COMPRESSION WITH DISCRETE  
COSINE TRANSFORM (DCT) BY USING  
MATLAB**

This report is submitted in accordance with the requirement of the Universiti  
Technical Malaysia Melaka (UTeM) for the Bachelor of Electronic  
Engineering Technology (Telecommunication) with Honours.

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: IMAGE COMPRESSSION WITH DISCRETE COSINE TRANSFORM  
(DCT) BY USINGMATLAB

Sesi Pengajian: 2019

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## **APPROVAL**

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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## ABSTRAK

Mampatan imej adalah aplikasi pemampatan data pada imej digital. Pemampatan imej boleh menjadi “Lossy” atau “Lossless”. Dalam makalah ini, ia sedang cuba untuk melaksanakan mampatan JPEG asas dengan hanya menggunakan MATLAB. Teknik pemampatan lossy telah digunakan dalam kertas kerja ini, di mana kehilangan data tidak dapat menjejaskan kejelasan imej dalam bidang ini. Mampatan imej adalah masalah mengurangkan jumlah data yang diperlukan untuk mewakili imej digital. Ia juga digunakan untuk mengurangkan lebih tetapi mengelakkan data pendua. Ia juga mengurangkan kawasan penyimpanan untuk memuatkan imej. Untuk tujuan ini, kami menggunakan JPG. JPG adalah standard mampatan bingkai yang masih berdasarkan, Transformasi Kosin Diskrit dan ia juga mencukupi untuk kebanyakan aplikasi mampatan. Transformasi kosinus diskret (DCT) adalah fungsi matematik yang mengubah data imej digital dari domain spatial ke domain kekerapan.

## **ABSTRACT**

Image compression is the application of data compression on digital images. Image compression can be lossy or lossless. In this paper it is being attempted to implement basic JPEG compression using only basic MATLAB functions. In this paper the lossy compression techniques have been used, where data loss cannot affect the image clarity in this area. Image compression addresses the problem of reducing the amount of data required to represent a digital image. It is also used for reducing the redundancy that is nothing but avoiding the duplicate data. It also reduces the storage area to load an image. For this purpose, we are using JPG. JPG is a still frame compression standard, which is based on, the Discrete Cosine Transform and it is also adequate for most compression applications. The discrete cosine transforms (DCT) is a mathematical function that transforms digital image data from the spatial domain to the frequency domain.

## **DEDICATION**

This study is wholeheartedly dedicated to my beloved parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continually provide their moral, spiritual, emotional and financial support. To my beloved supervisor, lecturer, and best friend who shared their knowledge and words of advice and encouragement to finish this project. Last but not least, I dedicated this project to the almighty God, thank you for your guidance, strength, power of mind, protection and skills and for giving us a healthy life. All of these, we offer to you.



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# TABLE OF CONTENTS

	<b>PAGE</b>
<b>TABLE OF CONTENTS</b>	<b>xii</b>
<b>LIST OF TABLES</b>	<b>xiii</b>
<b>LIST OF FIGURES</b>	<b>xiv</b>
<b>LIST OF APPENDICES</b>	<b>17Error!</b>
Bookmark not defined.	
<b>LIST OF ABBREVIATIONS</b>	<b>xv</b>
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Project Background	2
1.2 Problem statement	2
1.3 Objective	3
1.4 Scope	3
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.0 Introduction	4
2.1 Previous related past project	4
2.1.1 Comparative Study about Compression Techniques of Lossless image	4
2.1.1.2 Lossless Compression	5
2.1.2 A Survey of Lossless Image Compression Techniques	6
2.1.2.1 Comparative Analysis	7
2.1.3 Different Pulse Code Modulation and their Application using Lossless Image Compression.	8-11
2.1.4 Image Compression Techniques	11
2.1.4.1 Methods	12
i: Compression method	12
2.1.5 Lossless Image Compression System for Video Capsule and Endoscopy and Its Performance	13
2.1.5.1 Lossless Compression Algorithms	13

2.1.6	Lossy and Lossless Technique with Various Image compression	14
2.1.7	JPEG Coded Photo Collections of Lossless Compression.	15
2.1.7.1	JPEG COLLECTION	16
a)	The Baseline of JPEG Compression	16
b)	Lossless Compression of Individual JPEG Images	16
2.1.8	Comparison of Image Compression Techniques Using Huffman Coding, Dwt And Fractal Algorithm	17
2.1.8.1	Algorithms Used	18-20
2.1.9	Digital Medical Image Watermarking in Lossless Compression.	21
2.1.10	Lossy Image Compression Using CCSDS Standard Algorithm	22
2.1.11	Domain Competency Assessment of Lossless and Lossy Image Compression	22
2.1.11.1	The table show the analysis of lossy and lossless technique	23-24
2.1.12	Wireless Sensor Networks using a method of Image Compression.	25
2.1.12.1	Proposed combined compression algorithms	25-26
2.0	Comparison Between Articles.	27-28
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	<b>28</b>
3.0	Introduction	29
3.1	Process of Methodology	29
3.2	Project execution Flowchart	30-31
3.3	Flowchart represent process of the project	32-33
3.4	Block diagram of the project	35
3.5	MATLAB software	36
3.6	Discrete Cosine Transform	38
3.7	Coding for the process of system	39-40
3.8	The function of the coding	41
<b>CHAPTER 4</b>	<b>RESULT &amp; DISCUSSION</b>	<b>42</b>
4.0	Introduction	42
4.1	Table of Comparison	43- 44
4.2	Result Analysis	45
4.3	Discussion	
<b>CHAPTER 5</b>	<b>CONCLUSION &amp; FUTURE WORK</b>	<b>46</b>
5.0	Introduction	46
5.1	Conclusion	46
5.2	Future Work	47
<b>REFERENCES</b>		<b>48-49</b>
<b>APPENDIX</b>		<b>51-55</b>

## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
1	Comparison between image X and Y	8
2	Comparison between several images	10
3	Different images pf PSNR compression	11
4	Ratio of Compression Algorithm	14
5/6/7	Huffman/DWT/Fractal	20
8/9	Technique of Lossy and Lossless	23
10	Comparison between articles	27/28
11	Operation/ function in MATLAB	36
12	Comparison between ratio used in MATLAB	43/44

## LIST OF FIGURES

FIGURE	TITLE	PAGE
1.	The Flow of Image Compression	6
2	The comparison of Original and Compressed Images 2	7
3	Proposed Method Block Diagram	9
4	Input Analysis of Baboon Image	10
5	Image Compression Technique	12
6	Algorithm Block Diagram for Lossless Compression	13
7	Sample endoscopy images (a) WLI; (b) NBI	13
8	Image Compression Block Diagram	15
9	Illustration of the baseline JPEG encoder	16
10	Basic Block Diagram for Image Compression	17
11/12/13	The image compressed by using Huffman/ Fractal and DWT	18
14/15	Different Input Images of Compression Ratio and PSNR value	19
16	Comparison of image lossy and lossless compression	21
17	The main block diagram of CCSDS	22
18/19/20	Compression image Lossy and Lossless	24
21	Flow Chart of Compression Algorithm.	25
22	Flow Chart of Decompression	26
23	Shows the Flowchart of planning project	31
24	Shows Flowchart of project development	33
25	Shows the Block diagram of project.	35
26	Show the coding of this project	39
27	Show continued the coding of this project.	40
28	Show the Graph of Compression Ratio	45

## LIST OF ABBREVIATIONS

DWT	= Discrete Wavelet Transform
KB	= Kilobytes
BMP	= Bitmap
LZW	= Lempel-Ziv- Welch
(CE)	= Capsule endoscopy
(WLI)	= White light imaging
(NBI)	= Narrow band imaging
(CCSDs)	= Committee for Space Data System
DCT	= Discrete Cosine Transform
(CR)	= Compression ratio
(MSE)	= Mean square error
GIF	= Graphic Interchange Format
SVG	= Scalable Vector Graphic

## LIST OF APPENDICES

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
Appendix 1	Table comparison between different image and size	51-53
Appendix 2	Gant Chart	54
Appendix 3	Gant Chart	55

# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

Compression of images is a form compression of data / image that encodes the conventional image with the limited bits. To alleviate image data unimportance and redundancy, the purpose of image compression is to allow data to be saved or transmitted in a simple way. Image compression reduces the size of image data and preserves the need. Photo or image had become one of the key things in our daily lives in this new era. Over this, compression of images is vital for many uses for different applications that consist of massive data storage and recovery such as multimedia, documents and medical imaging. The purpose of the image compression technique is to reduce the size of the image data in order to store or transfer data efficiently because uncompressed images require large storage capacity and bandwidth of transmission. In addition, maintaining the image quality is the most important thing when compressing the image. Recently, there are numerous tools for compressing the image through the internet, such as using JPEG Optimizer, Optimizilla, Image Recycle and others. Other than that, image processing or compression is also widely used in medical imaging such as X-ray, MRI / FMRI (Magnetic Resonance Function), Dynamic 3D Ultrasound and others. Because of this, there are several methods of image compression such as Discrete Wavelet Transform (DWT), Set Partitioning in Hierarchical Trees (SPIHT), and other methods required. They all had the same main goal of reducing the size of the image



## **1.1 Project Background**

In our daily life, multimedia images have become an important and universal element. The sum of data encoded in an image is quite big. Although many applications would be too expensive and expensive with superior bandwidth and storage capabilities. Online image file formats such as JPEG Joint Photographic Experts Group, BMP (Bitmap), GIF (Graphic Interchange Format), GIF89a (animated GIF), PNG (Portable Network Graphic), SVG (Scalable Vector Graphic), and TIFF (Tag Image File Format) are also available. Practically, an image consists of a rectangular dot array called pixels. The size of an image depends on the pixel quantity.

Image compression is the process of encoding an image file that reduces the original file's space. This technique was applied without affecting or changing the image quality to an improper condition. Furthermore, this technique enables the supply of extra images in a specified amount of disk or memory space. In general, the compression categories are divided into two types, Lossless and Lossy. Lossless compression acts as image maintenance which has not lost data and detail. Lossy compression is defined because the original image produces less than perfect reproductions.

## **1.2 Problem Statement**

Image is an important component of our daily lives in this new era of globalization. At the same time, image might have been a big issue for people as well. There are therefore several problems that can happen to many people nowadays. First, some people can't simply store and transfer the images to storage devices such as disk memory, flash drive, hard drive and other devices. The reason for this is that the image size is huge and insufficient storage device space. The images stored are therefore less than required or cannot be stored at all due to lack of storage space. Other than that, people may also face the problem of maintaining the image quality after the image size has been compressed. With the use of other compression method, the image quality may decrease. In addition, the result of the compressed output image may be ineffective due to the compression amount or sustainability of the image quality using other compression methods.

### **1.3 Objective**

The vital purposes of this project are:

1. To analyze the viability of the outcomes based on the method proposed.
2. To display a picture in small quantities of bits, the required information content within the actual image is not lost.
3. To keep the value of an image before and after the compression process.

### **1.4 Scope**

Technique of image compression focuses on a large community of people based on the condition required. First of all, it focuses on the community of people who want to store the image in certain quantities of memory card, USB flash drive, hard disk or other required storage devices. Because of this, the smaller image size, the more image can be stored in the required storage. Besides, this technique also targets users who intend to send image data and download images over the Internet. "Whatsapp" and "Telegram" are now one of the most important methods of data transfer. With smaller size, the time required to transfer the image will be reduced and the uses of the data plan will be reduced. Moreover, the focus of this technique is also on the entrepreneur who running printing services. Because of this, the smaller image or image size will decrease the time spent on printing and the image quality is sustainable. So, it will save a lot of time and reduce the cost of printing.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

The journal articles for this related project will be summarized and discussed throughout this section. This chapter will also cover the study and idea based on the preceding as well as the concept to accomplish this project. The method used for the task will explain in detail each section.

#### **2.1 Previous Related Literature review**

##### **2.1.1 Comparative Study about Compression Techniques of Lossless image.**

At image compression, we may lower the sum of pixels used in image representation without excessively switching image visualization. Reducing image size increases image sharing, transmission, and space. This article discusses the performance of a lossless information compression set algorithms that are RLE, Delta encoding, and Huffman techniques on binary image, gray level images, and RGB images.

### 2.1.1.2 Lossless Compression:

While the compression process, if there are no data lost and the particular copy of the real image will reprocessed using decompressing the compressed image. category. The compression of text is usually of a lossless form. Lossless method of compression is divided into two categories:

- Entropy Based Encoding: During the compression process, the occurrence of each pixels of image is the first totals frequency of the algorithm. After that, the generated of the pixels with the pixel are replaces with compression techniques. According to frequency of specific pixels in the original images the size of pixels is generated.
- Dictionary Based Encoding: Well known as exchange encoding at encoding progression. The layout of the information known as ' Dictionary ' in this process is keep in the encoder. The encoder matches the substrings selected from the original pixel and finds them in the dictionary; if effective match is found, the pixels are changed in dictionary orientation in the encoded file.

## 2.1.2 A Survey of Lossless Image Compression Techniques

Memory is a precious resource that should be used effectively. Compression helps us to achieve this objective. To reduce the requirement for image size, the image compression is widely being used. Two categories for compression techniques which are lossy and lossless. In lossless, after the decompression technique, the original image is exactly reconstructed whereas lossy may lose some information from the image data. Lossless is more accurate than lossy compression.

The main need for compression of the image is to the image to be smaller in size for storage purposes without degrading the condition of the image. This kind of technique can reduce the time to send images all the world with internet or download them for the any web pages and also can reduces the time of images to be process. Besides, it also efficient to transforms the data and lessen the redundancy

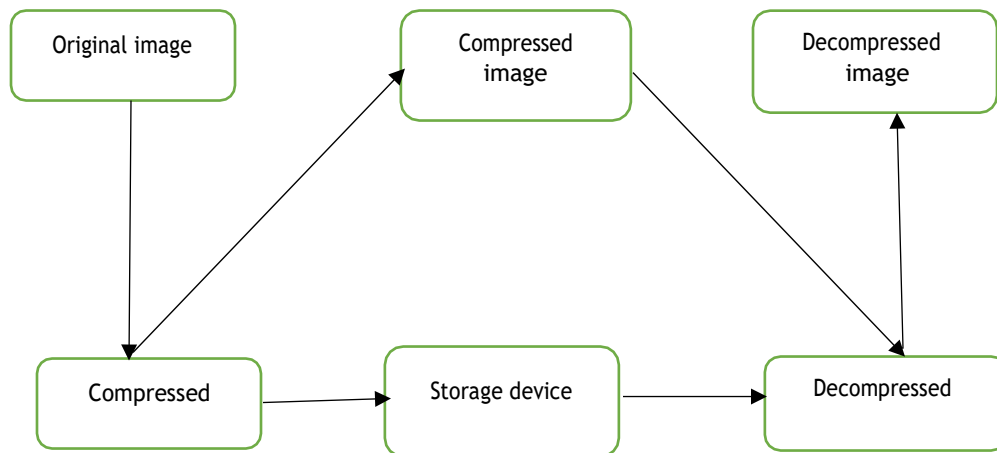


Fig. 1 The Flow of Image Compression

### 2.1.2.1 Comparative Analysis

The original image size to the compressed image size is the compression ratio

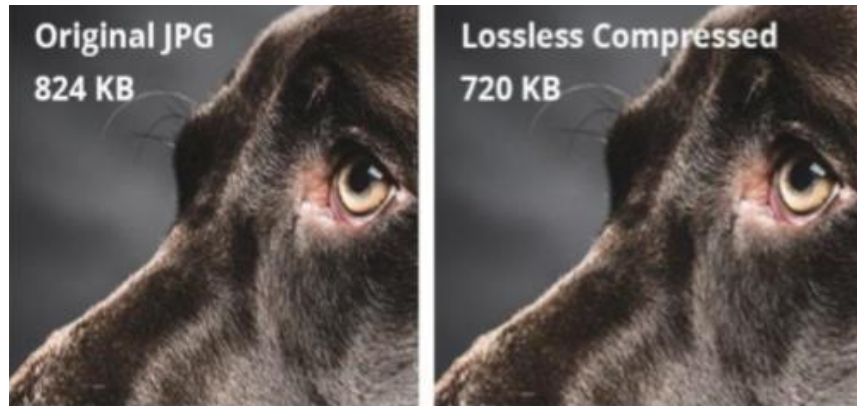


Image X

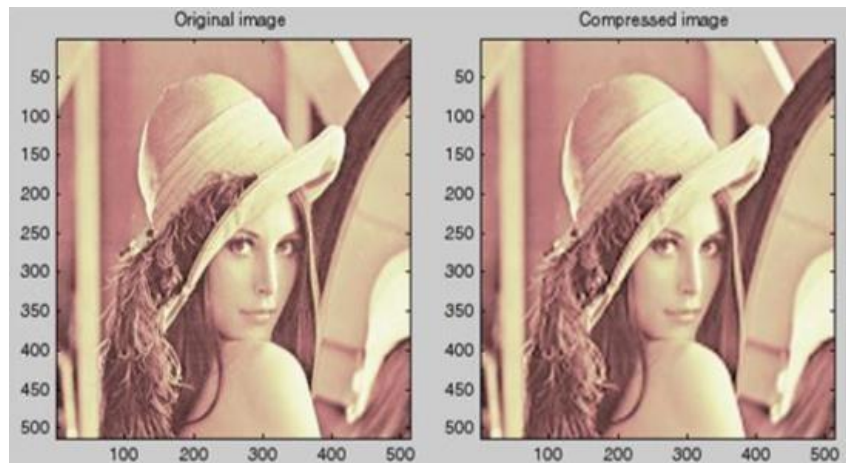


Image Y

Figure 2 The comparison of Original and Compressed Images

Table 1 comparison between image X and Y

Algorithm	Image X	Image Y	Application in Area
	Compression Ratio	Compression ratio	
Run length encoding	1.03	1.02	Widely used for frequently happening arrangements of pixels
Huffman coding	1.57	1.19	Used in JPEG
Arithmetic coding	1.84	1.58	Used in TIFF and GIF files
LZW	1.28	1.36	Used mostly for TIFF, BMP

Based on the comparative study between the Deflate compression algorithms and the Lempel-Ziv-Welch (LZW) data compression algorithm, the deflate algorithm is effective in both compression rate and compression speed.

### 2.1.3 Different Pulse Code Modulation and their Application using Lossless Image Compression.

Photos contain information about the human body that is used for certain reasons, such as the protection of health examinations and others. Image compression is used in some applications, such as data profiling and transmission systems. Concerning the importance of information about images, compression of lossless or loss is preferred. Lossless compressions are JPEG, JPEG-LS, and JPEG2000, few well-known methods of lossless compression. One of the latest with a good compression ratio, peak signal to noise ratio and minimum mean square error, with Huffman encoder we will use differential pulse code modulation for image compression.

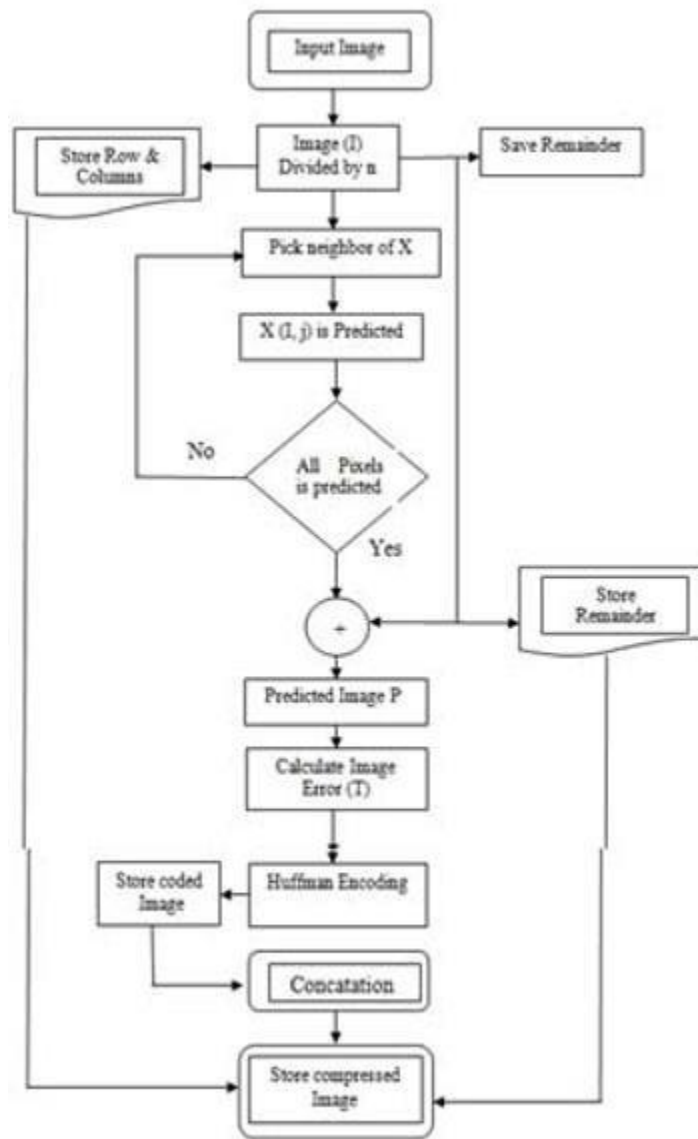


Figure 3 Proposed Method Block Diagram