Analysis of Image Signal Compression using Wavelet with Matlab Program

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Abstract. Pengompresanthe signalIt is a method that is very beneficial for the development of digital images. WithPengompressignal, Digital image data that is generally large-sized can be compressed, so it has a smaller size.WithThe development of digital image processing technology has many software or software for image processing facilities. A large part of this software has the ability to compress digital image.This is clearly very mPrefergence for various data exchange applications.Wavelet method can be used to compress digital images. One of the advantages of this method compared to other methods is its ability to compress digital images with villaging qualitythe. Matlab (matrix laboratory) is used as a tool for compressing this digital image. From the results obtained from a digital image compression withadThis Etode Wavelet is the file size and image quality (digital image) can be adjusted That we want.
Keywords*:* Signal, Digital Image, Wavelet, Software

I. INTRODUCTION

In an analystis this is a collection of formulas and steps, which will be combined from one with the other. So it forms a system mathematics. The mathematical system is a means to change and channel data to achieve the results that are subject to and this is a key in advances that are very necessary for the continuity of analysis.

Wave system shortor (wavelet) will analyzeis Compressant image signal with the Matlab program. The initial stage in analyzing a system is to build a mathematical model that represents the system.Mathematically decreased model based on the input data - output of a system In the control community it is often referred to as system identification. In the research This system identification is done by using collaboration between wavelet theory and image signal compression.

Matlab as a technical computing language provides freeGai is convenient in studying and axisien a system. Matlab also provides a graphical analysis output of a system behavior based on the method used. With easy language and short calculation, Matlab is also often used on Mathematical calculations even though a simple form.

LITERATURE

The signal

The concept of signal and system plays a very important role in the field of science and engineering, like comuniknication, acoustic, control, signal processing and other - lain. To understand the signal concept, the following description will be discussed by the signal involvement.

Signal according to the American Heritage Dictionari of the English Language, Fourth Editiion, which has many meanings, including the following;

- An indicator, likeIT cues or colored lights, which are used as a communication tool.
- A message that is communicated in various ways.
- An impulse or flictuations of electrical quantities such as voltage, current, powerful electricity, which variations -Variate the menGkodekan information.
- Sound, image, or message sent or received in Telegrafi, Telephony, Radio, Television, or Radar.

Important aspects in compression

Important transformation in compressiveness, namely Sparsity Transform and Projecttion Transform. TransformFirst ASI is used to find a sparse component from the signal, while the second is used in measuring operations or observations.This paper provides a simple example of how to compress and reconstruct signal exactly from compressed.

PaDA discussion of the signal decomposition and ideal base search, it has been explained how to find a vector stership base a signal of the results of the synthesis K fruit vector dictionary baseϕ. Found exactly.

Compressive disclosure works based on principle yeslike inabove, which is given information from the Observation of the K-Sparse signal, the origin of origin along the n >> M> K will be able to be reconstructed if M≥CKlog (N) withC depends on the selected base system. Things you need to look at here, jUmlah needed to be much smaller than N, even in the logarith order. Besides that, the value of M is also influenced by the level of sparsity k from a signal that is considered to describe the information content of the actual signal.ElectionThe dictionaries will determine the performance of compression because it can determine the size of the amount of data needed. Based on this explanation, there are some important things that need to be considered in compressively.

Signal that will be K-SParse Most signals of observations in the real world the base are the basic signals of a particular base, although not necessarily in the signal area are measured. Base system or transformation that makes a signal into a balanceIfat Sparse is referred to as the Transformation of Noodle (Sparsity Transform). Included in this category other anatara, various orthogal transformation systems that have been mentioned in previous writings such as, DCT, Hadamard, DFT, Wavelet.

AspectErpenting is an observation or measurement (Observation / measurement) the classic process can be considered a process of observation of a continuous signal.In general observation can be expressed as a signal projection on a particular base.

Image processing Digital

Digital image can be defined as a function of two variables,*f (x, y)*Where*x*and*y*is spatial coordinates and value*f (x, y)*is the intensity of the image on the coordinates, it is illustrated atGAmbar 1. Basic technology for creatingAN Color Displays Colors in Digital Images Based on the study that a color is a combination of three basic colors, namely red, green, and blue (Red, Green, Blue- RGB). The composition of the RGB color can be explained on Figure 1.

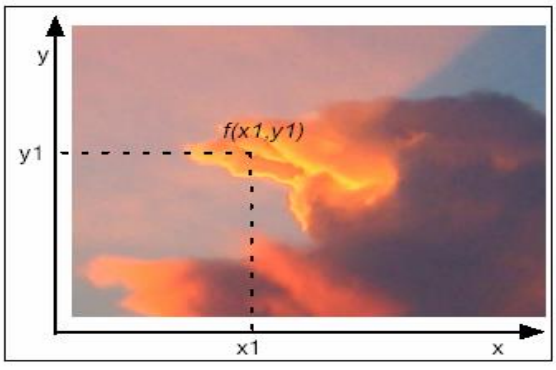


Figure 1. Digital image

Citra has been converted into the form of an image modified to digital form so that it can be stored in computer memory or other media.The process of changing images to digital forms can be done with some perLift, for example*the scanner*, digital cameras, and*camcorders*. When a digital (hereinafter referred to as digital image), a variety of image processing processes can be treated to the image.

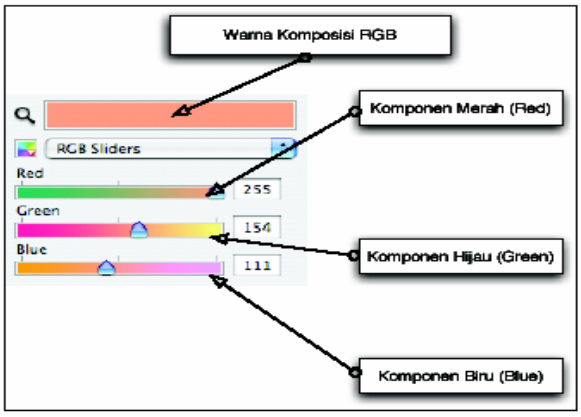


Figure 2. RGB Color Composition

Image compression

Compression the image aims to minimize the number of bits needed to representimage. If a color photo measuring 3 inches x 4 inches is changed to shape digital with a resolution rate of 500*dot per inch*(dpi), then 3 x 4 x 500 is neededx500 = 3,000,000 dot (pixels). Each pixel consists of 3 *byte* severy where *bytes* Represents red, green and blue. so the digital image requires *volume* Storage of 3,000,000 x 3*bytes*+1080 = 9,001,080 *bytes* bachelor in economic sadded total *bytes* which is needed to save*format* (*header*) Citra.

While the image of compression results is called a compressed image (*Compressed image)*. Processthe image and storage image is illustrated on Figure 3.

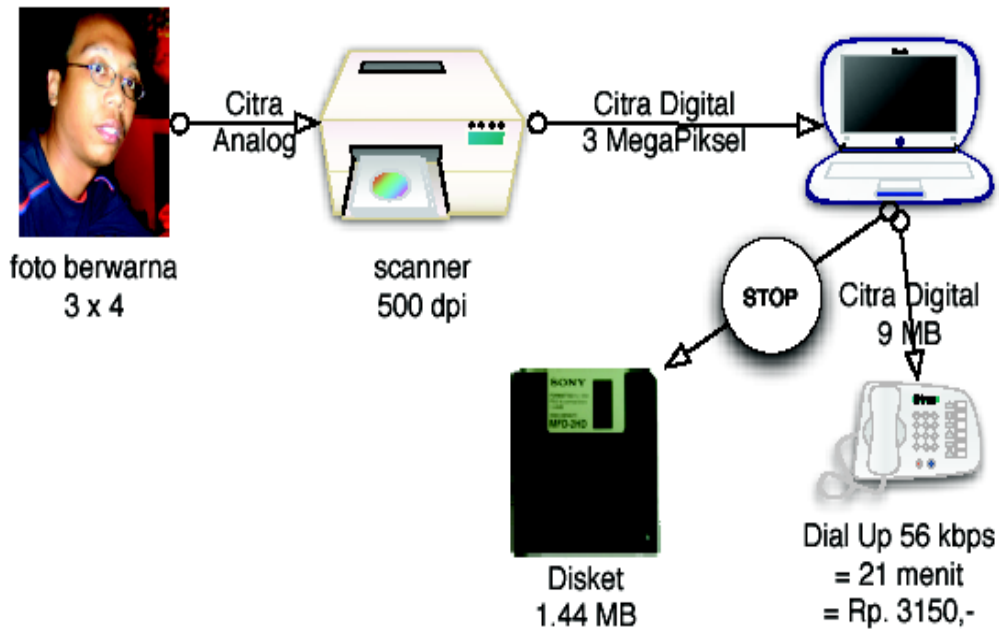


Figure 3. The process of conversion analog image to digital image and its delivery

Citra compression was developed to facilitate image storage and delivery. Techniques existing compression allows the image compressed so that its size becomesfar away Bih small rather than the original size. There are two main types of data compression, namely type compression *loss less*and type compression *lossy*. Type compression *lossy* is compression where there is data lost during the compression process. As a result, the quality of the data produced by JauH is lower than the original data quality. Mean while, type compression *loss less* not eliminating information after the compression process occurs, as a result the quality of the image of compression results is notdecreased. However, the compression ratio used for comptype receipt *lossless* smaller than compression ratio on type compression *lossy*.

RESEARCH METHOD

Research foundation

The use of the Wavelet method in this study is to see how well the use of this method is in the image processing processigital (*Digital Image Processing*) In terms of compression **JPEG** with some quality. Software usage **MATLAB** (***Mat****Rix* ***Lab****oratory*) In this study it functions as a tool for processing the image signal process.

Data retrieval

Collect and collect Lecturing the image signal from the internet.

Research process

In accordance with the research objectives, namely to find out the results of the data analysis sourced from the program **MATLAB** (***Mat****Rix* ***Lab****oratory*), so the research stage is:

- See the comparison of antfig pictures before compression with after compression.
- Seeing the comparison between the histogram before the compressing with after compression.
- See the comparison between the size of the image file before the compressant with the compressant.

ANALYSIS RESULTS

Data Input

Original lamp image before compressing

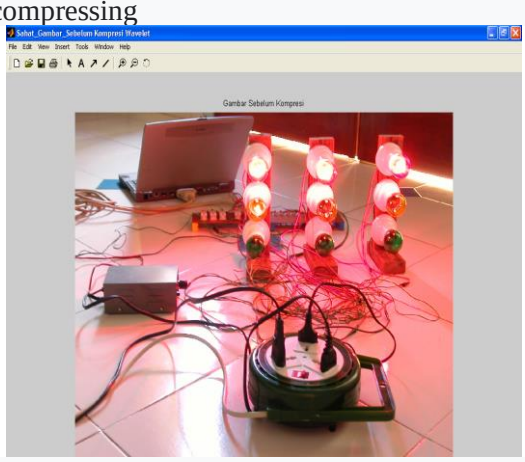


Figure 5. Original lamp image before compressing

Histogram image before compression

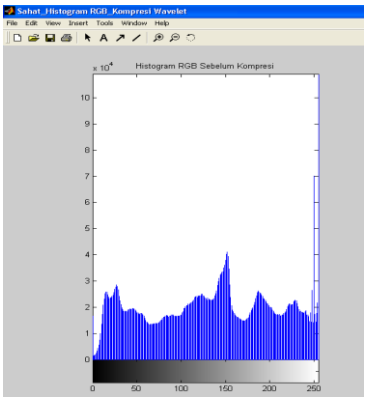


Figure 6. Histograms before compressed

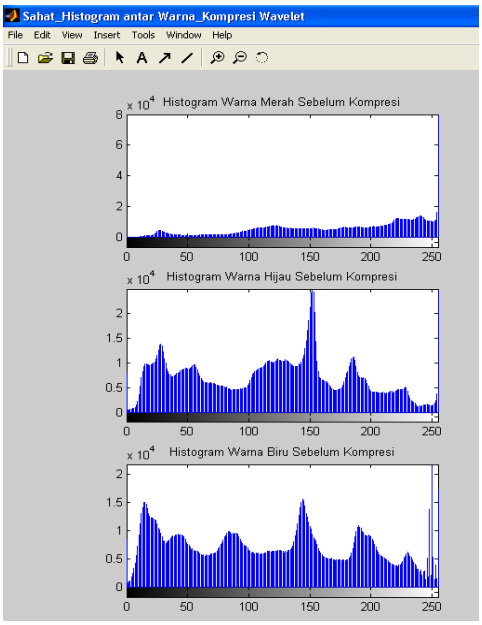


Figure 7. Histograms between colors before compressed

Spesifikasi file (before compressed**)**

Filename	: 'Lamp.JPG'
File Size :	: 729380 byte
Format	: 'jpg'
Width	: 1600
Height	: 1200
Bit Depth	: 24
Color Type	: 'truecolor'

Data compressed

Picture after being compressed with a quality of 10%

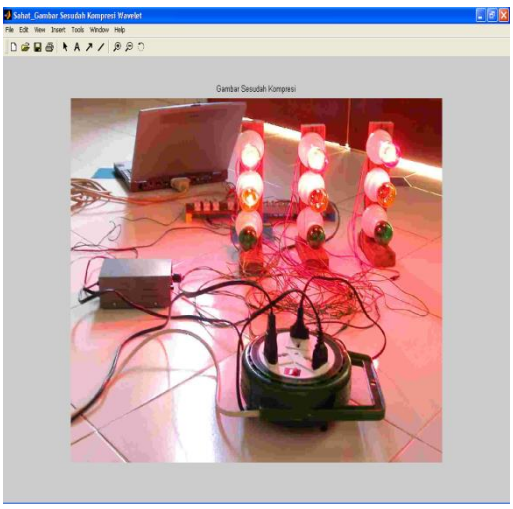


Figure 8. Histogram image after being compressed with a quality of 10%

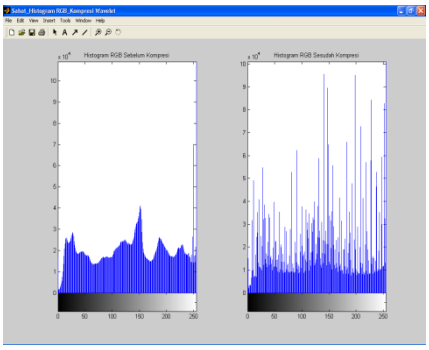


Figure 9. Histogram image between colors after being compressed with a quality of 10%.

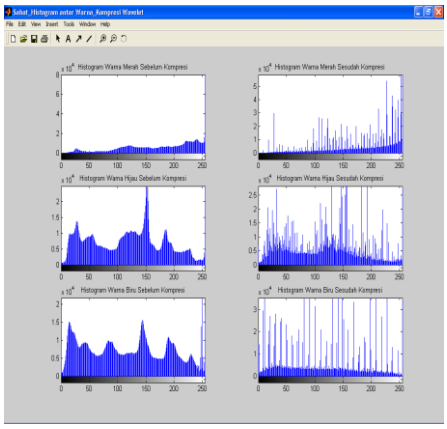


Figure 10. Histogram image between colors after compressed withAn 10% quality.

Comparison of file size before and after compressed

Quality table and file size

File size before compressed**:**729380 bytes

Quality (%)	Size (byte)
10	59998
20	83902
30	104269
40	121799
50	138720
60	157753
70	190411
80	251189
90	426660
100	1181791

Image after compression with 100% quality

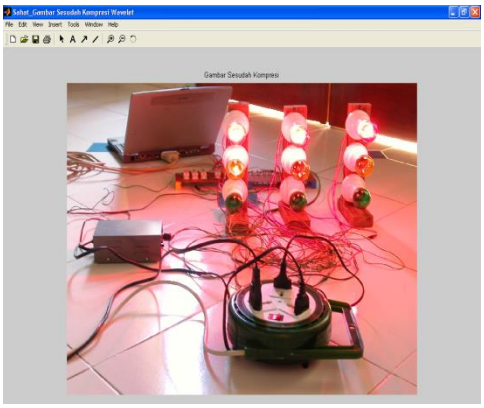


Figure 11. Images are compressed with 100% quality

Histogram image after compression with 100% quality

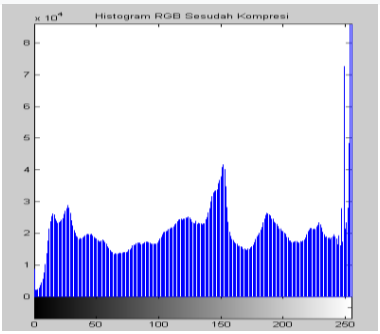


Figure 12. **Histogram image after compression with 100% quality**

Inter-color histogram image after compressing with 100% quality.

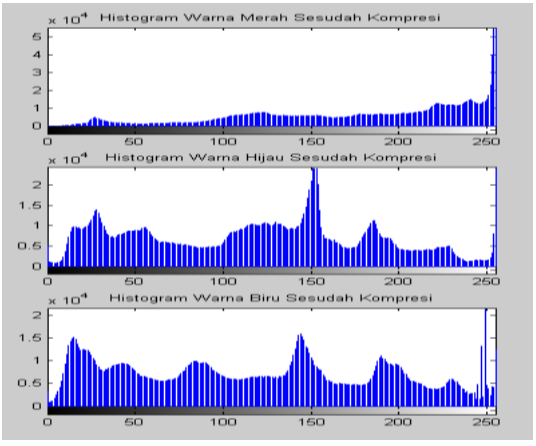


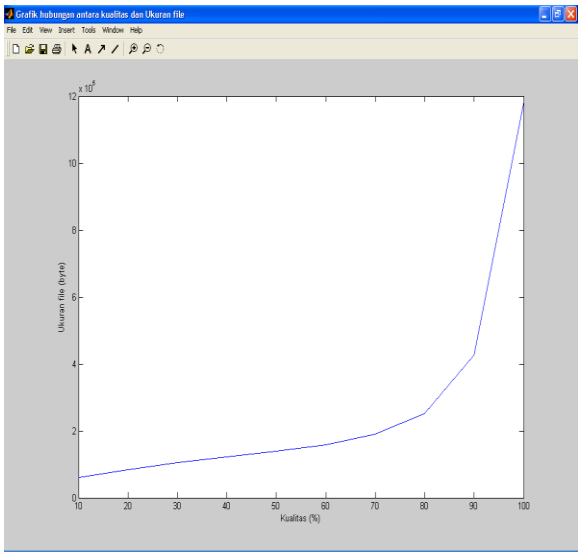
Figure 13.. **Inter-color histogram image after compressing with 100% quality.**

File specifications after compressing with 100% quality

Filename : Gambar_Hasil_Kompres.jpg'
FileSize : 1181791 byte

Format : 'jpg'
Width : 1600
Height : 1200
BitDepth : 24
ColorType : 'truecolor'

Graph relationship between quality and file size



CONCLUSION

From the results of the compressing the image signal with the wavelet method obtained the following conclusions:

1. Compressant image signal withUsing the Wavelet method is a compressile done by changing the image (image) into a number in the form of the matrix then arrange it back according to the quality we want.
2. Image quality affects file size, sthe big quality of the quality of the compensation, the greater the file size
3. In the complementary with a quality of 100% file size (1181791 bytes) will be large compared to the original file size (729380 bytes), it will be upstreamN The use of the prepples, because the understanding of the compensation is minimizing the file size.
4. The smaller the quality of the compensation, the arrangement of the histogram and the inter-color histogram will be less rare than the histogram before compressing.
5. In this compression roses, the user (user) is a factor of his singer, because even though the file size is small but with poor image quality it will make this compression it becomes free.

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