

Noise Qualification in Bali Palm Leaf Image with Gaussian Filter Method

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Abstract

In improving the quality of the image basically makes the appearance of an image better than before. One thing that is done in improving the image quality is noise qualification. This noise qualification aims to reduce the level of noise contained in a digital image. In this study, the image used is the image of Bali palm leaf. There are many methods that can be used to qualify for noise. One of them is the Gaussian filter. In this study, Gaussian Filter is used as a method to qualify the noise contained in the palm leaf image. The image quality after the noise qualification process is calculated using PSNR (Peak Signal to Noise Ratio). The higher the PSNR value obtained, the better the image quality. In this study, the PSNR value obtained in the palm leaf image after processing the noise qualification is 54.7625 db.

Keywords: *Gaussian Filter, Noise, PSNR, Bali Palm Leaf, Image*

1. Introduction

Bali palm leaf is one of the cultural heritages of Bali. The existence of ejection is very important for people in Bali, because the ejection is an ancient manuscript whose contents are in the form of writings such as puppet stories, traditional medicine, instructions for carrying out religious ceremonies, to ethics in life. With old age, the quality of information contained in palm eucers decreases in accuracy and even disappears. The cause of missing or decreased accuracy of information on the ejection is the Noise. Noise or noise is simply a disturbance or defect in the image that results in unclear images and loss of information []. In digital image processing, noise can be reduced by using various methods and filters. In this paper, the Gaussian Filter method is used. The aim is to qualify for the noise contained in the Bali palm ejection image, so that the information contained in the Bali palm ejection image can be clearer. Besides to reduce noise, this method is also to find out the types of noise contained in digital images and determine whether the Gaussian filter method is suitable for all noise or not. The Gaussian Filter method basically uses convolution in carrying out the processes in it and this Gaussian Filter is included in the sinusoid filter.

2. Research Methods

2.1. Digital Image

Digital image is a function of $f(x, y)$ having the size of M rows and N columns, where x and y are spatial coordinates and f is the amplitude at the coordinates (x, y) . From the values of red, green, and blue (RGB), the types of images consist of RGB, grayscale, and binary images.

a. RGB Image

RGB image or color image is an image that has 3 color channels in it. Generally this image is formed from red / red (R), green / green (G), and blue / blue (B) components that are modeled into

the RGB color space [3]. RGB itself is a standard used to display color images. Each element in an RGB image contains a range value of 0 - 255.

b. Grayscale Image

Grayscale image is an image that only has 1 channel value in each pixel, in other words the value Red = Green = Blue. This value is used to indicate the level of intensity. Grayscale image has colors from black, gray, and white. Grayscale image has a color depth of 8 bits [3].

c. Binary Image

Binary digital image is a type of digital image that has only two possible pixel values, namely black and white [3]. Binary imagery is also called B&W (Black and White) or monochrome image. In binary images only 1 bit is needed to represent the value of each pixel of the binary image. The possible range of values from the binary image is 0 or 255. Pixels from white have RGB values (255, 255, 255) and black pixels have RGB values (0, 0, 0).

2.2. Gaussian Filter

Gaussian filter is a filter that operates by convoluting images with a Gaussian kernel of a certain size from the top left corner to the lower right corner of the image [3]. Gaussian filters are very good for removing noise that is normal distribution[2], which is often found in the image distribution resulting from the digitization process using a camera because it is a natural phenomenon due to the nature of light reflection and sensitivity of the light sensor on the camera itself. In general, Gaussian filters are used to blur the image and eliminate noise. In the Gaussian Filter there is a distribution of filters, namely distribution for 1D and 2D filters. The distribution of the following Gaussian filter equation in for the 1D distribution [1]:

$$G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}}$$

For 2D distribution as follows:

$$G(x, y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

2.3. Types of Noise

Noise is simply a disturbance found in digital images that causes the information contained in these images to be less clear. Noise itself is an image or pixel that can interfere with image quality. Noise is divided into several types including:

a. Speckle Noise

Speckle noise is a type of noise that has multiplicative characters or tends to be large. Speckle noise, including the type of noise that can give a black color at the point or area affected by noise. The main cause of Speckle noise is random noise when image restore is performed.

b. Salt and Pepper Noise

Salt and Pepper noise is noise that is marked by the presence of spots on the image. When salt and pepper noise occurs in grayscale images, the spots will have black and white colors [3]. That is the reason for this noise called salt and pepper, where salt is white like salt and pepper is black like black pepper. Whereas in color imagery, this noise will display colorful spots.

c. Gaussian Noise

Gaussian noise is noise that is distribution to images with a normal distribution. The density held by Gaussian noise depends on the probability density function. Gaussian type noise is caused by lack of lighting, high temperature, and an error when transmitting images [3].

2.4. PSNR (Peak Signal to Noise Ratio)

Peak Signal to Noise Ratio or PSNR is a calculation that uses a comparison between the maximum value of the measured signal and the amount of noise that affects the signal. PSNR is used to determine the comparison of image quality before and after processing. The formula for calculating the PSNR value is defined as follows:

$$PSNR = 10 \log_{10} \frac{C_{max}^2}{MSE}$$

Before calculating the PSNR value, the MSE value must first be calculated. MSE is the Mean Square Error or the average square error value. MSE can be calculated using the following formula:

$$MSE = \frac{1}{MN} \sum_{x=1}^M \sum_{y=1}^N (S_{xy} - C_{xy})^2$$

Where x and y are the coordinates of the image, M and N are the dimensions of the image.

3. Result and Discussion

This research was conducted using the MATLAB Programming Language and data using the palm ejection of Bali which has been scanning, in order to obtain a digital image of the palm ejection. Before qualifying for noise, the Bali palm leaf image is processed first in the preprocessing stage. The preprocessing stage involves the conversion of images into grayscale, and binary. After the preprocessing phase, then the binary image will enter the noise qualification process by applying the Gaussian Filter method.

3.1. Preprocessing

a. Grayscale

In the grayscale process, the Bali palm leaf image which has many colors or can be called an RGB image is converted into an image with a degree of gray, as shown below:

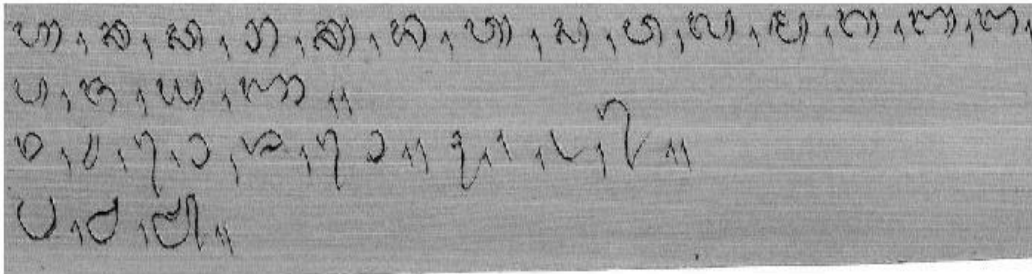


Figure 1. Grayscale Image of Bali Palm Leaf

b. Binary

After the conversion process becomes grayscale image, the image resulting from the process is then converted again into binary image. In the binary image there is no background, but only writing. The results of the conversion of images into binary images are as shown below:

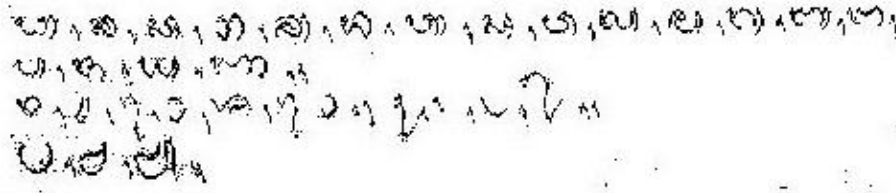


Figure 2. Binary Image of Bali Palm Leaf

3.2. Noise Qualification

The noise qualification process in this article is done by the Gaussian Filter method. The converted image into binary image is then processed using the Gaussian Filter method.

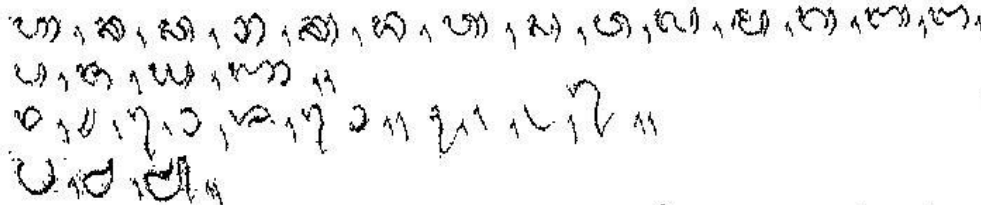


Figure 3. Noise Qualification Image Results

4. Conclusion

From these studies, PSNR values obtained from the lontar image after the noise qualification process was carried out at 54.7625 db. PSNR value in this study indicates the quality of the image is good or bad. A high PSNR value indicates better image quality. In this study, the PSNR value is calculated using the matlab program where the calculation uses the help of syntax `[peaksnr, snr] = psnr (A, ref);`. The syntax automatically calculates the PSNR value on the image of the results of the noise qualification.

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