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24 Bit Image Noise Reduction with Median Filtering Algorithm

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Abstract: noise in the image is a common thing to happen because of many factors, to the reduction of noise can use special software that already applies some algorithms, one algorithm that can be utilized is the median filtering, algorithms median can be used to perform a wide variety of noise reduction on the image, one of which is the salt and pepper noise commonly found in color image and by using median filtering noise will reduce.
Keyword: Noise, Noise Reduction, Median Filtering, Salt and Pepper Noise, Noise Reduction Algorithm

I. INTRODUCTION

Image processing process on many kinds but in general, image processing can classify into several types, image enhancement is one of the process [1] [2] [3] [4]. Image enhancement aims to obtain images with better quality than the original image [5]. This process seeks to improve the quality of the image by manipulating pixels or objects in the picture [4] [6]. One type of image enhancement is noise reduction [7] [8].

Image may have noise caused by environmental factors, or channel data delivery were not good [8], the noise in the picture usually in the form scattered points all over the image or only partially [1] [4], reduction of noise is a technique that can be used to correct the noise in an image by changing the pixel noise of image with a pixel image that is not affected by noise [4] [7], median filtering algorithm could be used in the noise reduction process by taking the median value of a neighboring pixel values that exist in an image, in this research using Salt and Pepper Noise [7].

II. THEORY

2.1 Digital Image Processing

Digital image processing is a process of changing the shape of the original image into image in another form in accordance with desired [2] [3] [4] [7], with digital image processing, an image that degraded, the color is too much contrast, less sharp, blur, and else, can be manipulated into image quality better [6] [7] than before or also change a picture that has either become blurred, etc.

2.2 Median Filtering

Median filtering is included into filter types Mask Processing [1] [4] [7] [8], where the workings of the algorithm is to calculate the value of pixels within the window of neighborhood in the image [7], an image is a pixel which has the intensity value quantization result of the digital equipment. Image has three color components which each color component storage use 8 bits or 1 byte, it means the number of bits in one pixel is as much as 3 x 8 bits = 24 bits [2], so to calculate the number of pixels of an image by dividing the image intensity values with 24 bit, noise reduction with median filtering algorithm using the following formula

$$f_0(x,y) = \left(\frac{f^r(x,y) + f^g(x,y) + f^b(x,y)}{3} \right)$$

Based on the formula above that the examination of noise in the image carried in stages starting from the beginning of a matrix pixel to pixel until the end of a matrix.

III. RESULT AND DISCUSSION

Noise in the picture will be eliminated by median filtering using detection rules noise, by evaluating each point in the picture by forming a spatial window 3x3 uses rules to detect noise by comparing the average of the same pixel by pixel center, the following is an example of the value of a point in an image contained in the picture has a noise, a value below is just an example from 24 Bit image color to prove the value of the application of median filtering method.

Table 1. Value Point On Image

43	143	101	198	61	51	34
13	56	143	131	61	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

The above table is that the authors assume the pixel value as the value of the pixel image, to take the pixel values of a picture can not be done by hand still need special software like Matlab. From Table 1 above created table 3x3 matrix to calculate the value of noise based on the center point of noise, the process is as follows:

Table 2. Matrix 3x3 Position (1,1)

43	143	101	198	61	51	34
13	56	143	131	61	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

The 3x3 matrix of the table carried the following formula to check noise

$$F(0) = \sum_{x=0}^{7} f(x).\exp[0]$$

$$F(0) = \sum_{x=0}^{7} f(x)$$

$$F(0) = f(0) + f(1) + f(2) + f(3) + f(4) + f(5) + f(6) + f(7)/x$$

$$F(0) = (43+143+101+13+65+98+131+143)/9$$

$$F(0) = 81.88 = 82$$

Furthermore, the center point of the window shifts to the position (1,2). The same steps were performed to calculate the average value of the center point of the window, the value of F (0) = 82 is the value that will replace the median value of the value matrix image, in this case, is the fifth that gave a color marker yellow, numbers 56 is replaced with 82 which is the result of the calculation of median filtering.

Table 3. Matrix 3x3 Position (1,2)

43	143	101	198	61	51	34
13	82	143	131	61	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

Here is the median filtering process:.

$$F(0) = \sum_{x=0}^{7} f(x).\exp[0]$$

$$F(0) = \sum_{x=0}^{7} f(x)$$

$$F(0) = f(0) + f(1) + f(2) + f(3) + f(4) + f(5) + f(6) + f(7)/x$$

$$F(0) = (143+101+198+82+98+131+60+131)/9$$

$$F(0) = 10488 = 105$$

Furthermore, the center point of the window shifts to the position (1,3). The same steps were performed to calculate the average value of the center point of the window.

Table 4. Matrix 3x3 Position (1,3)

43	143	101	198	61	51	34
13	82	105	131	61	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

Shown in Table 3.3 pixel values have been changed to 5, which previously was 6, the following is the process for the position (1,3)

$$F(0) = \sum_{x=0}^{7} f(x).\exp[0]$$

$$F(0) = \sum_{x=0}^{7} f(x)$$

$$F(0) = f(0) + f(1) + f(2) + f(3) + f(4) + f(5) + f(6) + f(7)/x$$

$$F(0) = (101+198+61+105+131+60+62+61)/9$$

$$F(0) = 865 = 86$$

Furthermore, the center point of the window shifts to the position (1,4). The same steps were performed to calculate the average value of the center point of the window.

Table 4. Matrix 3x3 Position (1,4)

43	143	101	198	61	51	34
13	82	105	86	61	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

Shown in Table 3.4 pixel values have been changed to 6 previously was 160, the following is the process for the position (1,4)

$$F(0)=\sum_{x=0}^{7} f(x).\exp[0]$$

$$F(0)=\sum_{x=0}^{7} f(x)$$

$$F(0)=f(0)+f(1)+f(2)+f(3)+f(4)+f(5)+f(6)+f(7)/x$$

$$F(0)=(198+61+51+86+60+62+54+66)/9$$

$$F(0)=70.8=71$$

Furthermore, the center point of the window shifts to the position (1,5). The same steps were performed to calculate the average value of the center point of the window.

Table 5 Matrix 3x3 Position (1,5)

43	143	101	198	61	51	34
13	82	105	86	71	66	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

Here is the process for the position (1,5)

$$F(0)=\sum_{x=0}^{7} f(x).\exp[0]$$

$$F(0)=\sum_{x=0}^{7} f(x)$$

$$F(0)=f(0)+f(1)+f(2)+f(3)+f(4)+f(5)+f(6)+f(7)/x$$

$$F(0)=(61+51+34+61+62+54+17+19)/9$$

$$F(0)=39.88=40$$

Process improvements have been made to move the image to produce a matrix table as follows:

Table 6 Results of End Process

43	143	101	198	61	51	34
13	82	105	86	71	40	19
65	98	131	60	62	54	17
14	156	97	19	69	54	55
13	132	738	31	37	58	59
67	198	99	83	81	45	49

The above process is still in a 3x3 matrix on line 1.3, and for the same steps until the end of the process carried last bit until all bits are checked, the selection of a 3x3 matrix due to the process of the count 3x3 matrix processed value is not much and the median value is more easily obtained than the value matrix bigger such as 5x5 or 10x10.

IV. CONCLUSION

Reduction of noise by using median filtering using spatial window 3x3 can run well and the results of the calculation process proposed is different from the median filtering can usually reduce the noise quite well in color images of 24 bits, the development of algorithms median filtering is quite a lot and can be applied to various noise case.

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