ISSN No:-2456-2165

Digital Image Noise Processing Based on MATLAB Software

Wang Mengyi
Department of Communication engineering
Shandong University of Technology
Shandong Province, China

Abstract:- On the basis of the analysis of digital image effect improvement basic theory research, a clearer processing algorithm of university image effect is proposed to make the image more distinct and more quickly presented.By MATLAB software to write relevant simulation code, respectively using the mean filtering method and median filtering method to denoise the image, so as to improve the image clarity, brightness, finally the two methods are compared, in order to better understand the theoretical knowledge. The software running results show that this method can achieve image denoising succinctly and accurately, and has high learning and practical value.

Keywords:- *Image Denoising; Image Definition; Filtering; MATLAB.*

I. INTRODCUTION

Digital image technology is a new technology proposed under the support of a number of technical achievements and theoretical achievements. In the practical application process, it relies on the functional support of the computer to transform the image information into two-dimensional digital signals, so as to achieve various operations. Therefore, the performance of this technology cannot be separated from the support of the computer, which is also known as computer image processing.This technology includes the functions of denoising, enhancing image sharpness, recognition, coding, restoration, segmentation, etc. With the continuous deepening of research in related fields, the technical performance is continuously enhanced, and the restoration degree of image reproduction is greatly improved. Based on the performance advantages of this technology and the analysis of technical advantages, the digital image processing technology has a more extensive application prospect in the future. However, the indispensable part of life is the impact of noise on the image[1].

Noise has a great impact on image quality and makes it difficult to analyze the image. Image noise is a random variation of brightness or color information in an image. It is generally produced by the sensors and circuits of scanners or digital cameras. It may also be caused by the inevitable loose grain noise in film particles or ideal photodetectors[2]. The most immediate phenomenon is the blurring that occurs when you zoom in.There is no doubt that these noises will have a certain impact

On the beauty of the whole photo. In order to make the picture more clear, it is necessary to eliminate the noise in the picture and deal with the deformation of the picture. The operation of eliminating interference information and retaining relevant information is usually called image preprocessing, and the step of image noise reduction is also called picture smoothing processing[3].

There is a lot of noise in real life (such as grating scanning, film particles, machine parts, signal propagation, etc.), which can be divided into many kinds, including Gauss, pepper salt, Rayleigh, etc. Generally, it can be removed by filtering method. General filtering methods include mean method, median filtering method, adaptive, adjacent average, selective average, low-pass filtering, etc[4].

This paper is based on MATLAB simulation, by adding Gaussian noise and salt and pepper noise to the original image respectively, and then using the mean filter method and median filter method respectively, to compare the effect of noise processing and draw a conclusion.

II. NOISE ADDITION

The gray image polluted by Gaussian noise points has any noise position, but the gray value of this kind of noise points is randomly distributed. The gray image polluted by pepper and salt noise points has random scattered noise positions and is shown in black and white dots on the screen, but they have no connection with the gray value of the original image, usually the gray value of this kind of noise points and the gray value of nearby pixels have a big difference, in general is the extreme value[5].

For the processing of MATLAB image, the imnoise function can be added to the noise, and its imperative parameter is g=imnoise (f, type, parameters), where g is the image after adding noise, f is the original image,type indicates the type of the noise to be added, and parameters indicate some parameters of the noise.

III. NOISE REMOVAL

A. Mean filtering method

Let the signal polluted by noise be g(t), the original signal be f(t), and the noise be n(t).g(t)=f(t)+n(t).The common expression of mean filtering is

ISSN No:-2456-2165

$$\overline{g}(t) = 1/n \cdot [g(t-m) + ... + g(t+m)] \quad (1)$$

Where: $n = 2m + 1$, is the length of the mean filter 5.

B.Median filtering method

The core operation of median filtering is to sort the data in the template. In this way, if the noise of a bright spot is sorted, it will be placed on the most right or left side of the data sequence. Therefore, the value in the middle of the final selected data sequence is generally not the value of the noise point, so as to achieve the purpose of noise suppression[6].

IV. DESIGN OF CODE

A.Code design with added noise

Using the imnoise function, the code of adding Gaussian noise and salt and pepper noise on the basis of the original image is as follows:

```
F=imread('E:\man.bmp');% Image path
G=imnoise(F,'gaussian');% Gaussian noise
K=imnoise(F,'salt & pepper',0.05);% salt and pepper noise
```

The code running effect is shown in Figure 1:

(a) The original image

(b) After adding Gaussian noise

(c)After adding salt and pepper noise

Fig 1 Images before and after adding noise

B.Code design of mean filter

The image with Gaussian noise and salt and pepper noise is filtered by mean value. According to the filtering principle of mean filter, the code is as follows:

```
[height width]=size(G);
X1=G;
X2=K;
for i=2:height-1
   for j=2:width-1
      sum1=uint16(0);
      sum2=uint16(0);
      for i1=i-1:i+1
         for j1=j-1:j+1
            sum1=sum1+uint16(G(i1,j1));
            sum2=sum2+uint16(K(i1,j1));
         end
      end
      X1(i,j)=sum1/9;
      X2(i,j)=sum2/9;
   end
end
```

The code runs as follows:

(a) mean filtering of Gaussian noise

(b) mean filtering of salt and pepper noise

Fig 2 Image processed by mean filter

C.Code design of median filter

The image with Gaussian noise and salt and pepper noise is filtered by mean value. According to the filtering principle of mean filter, the code is as follows:

```
y1 = double(G);
y2 = double(K);
Y1=y1;
Y2=y2;
   for i = 2: height-1
```

ISSN No:-2456-2165

```
        for j = 2:width-1
            mb = y1( i-1:i+1,j-1:j+1 );
            mb = mb(:);
            mm = median(mb);
            Y1( i,j ) = mm;
            mb = y2( i-1:i+1,  j-1:j+1 );
            mb = mb(:);
            mm = median(mb);
            Y2( i,j ) = mm;
        end
    end
```

The code runs as follows:

(a) median filtering of Gaussian noise

(b) median filtering of salt and pepper noise

Fig 3 Image processed by median filter

V. CONCLUSION

For Gaussian noise, the mean filtering effect is better than the median filtering effect. According to its principle, a simple analysis can be made: Gaussian noise amplitude is approximately normal distribution, but the distribution is on every pixel. Because every point in the image is a polluted point, the median filtering method cannot select a suitable clean point, because the mean value of positive distribution is 0, so the mean filtering can reduce the noise. For salt and pepper noise, the median filtering effect is better than the mean filtering effect. The amplitude of salt and pepper noise is approximately equal but randomly distributed in different positions. There are clean points and polluted points in the image. Median filtering is to select appropriate points to replace the value of polluted points, so the processing effect is good. Because the mean value of noise is not 0, mean filtering cannot remove noise well.

VI. REFERENCES

[1]. Shang Y H. Application of Big data and digital image processing technology [J]. Integrated Circuit Applications,2021,38(10):90-91. (in Chinese)
[2]. Yan Zhengguo, Lei Yu, Wang Haoran, et al.Research on digital image watermarking [J]. Industrial Control Computer, 20, 33 (11) : 100-102.(in Chinese)
[3]. Liu Jiamin, Peng Ling, Yuan Jiacheng, Liu Junwei.Image denoising method based on two-dimensional variational mode decomposition and adaptive Median filtering [J]. Application Research of Computers,2017.34(10): 349-3152(in Chinese)
[4]. Xiang Rui, Wang Li.Image denoising method based on wavelet Transform [J]. Electronic Science and Technology,2016.29(7):82-84,87. (in Chinese)
[5]. Yan Hongwen, Deng Xuefeng.Application of Median Filter in digital mage denoising [J]. Computer Times, 2020, 47-48. (in Chinese)
[6]. Zhu Hong. Foundation and Application of Digital Image Processing [M]. Tsinghua University Press, 2013:30-33. (in Chinese)