

ENHANCE CONTENT, REMOVE NOISE, AND REDUCE MOTION BLURRING IN DIGITAL IMAGES

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ABSTRACT: Image editing contains a wealth of information about how to improve photographs. This technology can be used to create digital images, computer graphics, smart transportation systems, and texture designs, to name a few applications. Motion blur should be applied, noise should be decreased, and brightness should be enhanced as appropriate. To increase contrast, the flexible histogram and scaling of the histogram are applied. These approaches for increasing contrast are effective. A Wiener filter, a median filter, or a MATLAB-written filter can be used to remove background noise. To remove motion blur from the same image, repeat the procedures above. This is why the study creates a graphical user interface (GUI) containing all of the photo-improvement technologies that may be applied to a single image.

Keywords: Linear Filter, Image enhancement, noise removal, Histogram equalization, Contrast enhancement, image processing.

1. INTRODUCTION

Planet researchers utilize computer image processing to improve the appearance of images of Mars, Venus, and other planets. People frequently alter their photographs in order to improve their appearance. To improve an image, you must alter it so that you can see what it depicts. It is critical to increase the image quality such that the end result is superior than the source for which it was created. One important reason to improve photos is to bring out elements that were concealed in low-contrast photos.

A picture can be improved by reducing noise and eliminating distortion. The initial step in many domains, such as computer graphics, smart transportation systems, digitalization, multidimensional systems, combat output, medical output, and commercial output, is to improve contrast. By far the greatest method to grasp what's going on around you is to look. In addition to seeing, you can touch, taste, smell, and

taste. More than 99% of the brain's power is controlled by this portion of the brain.

That is why we need to change the images. Whatever the picture looked like before AHE changed the contrast and added strange effects. The image's nicest part is always the intermediate gray level. This results in histograms that are all the same and poor quality processed pictures. If there is noise in the final image after we took it, we made a mistake. One pixel at a time does not accurately depict how bright another pixel in the image is. Background noise can be removed from a video or image. This is referred to as noise reduction. Signal processing and noise reduction are the same thing. It is critical to understand the raw signal because the desired result is dependent on the type of signal. There are filters that can be used to improve a camera's first image. The thing completed is the end.

When editing digital color photographs, it is quite difficult to remove noise. There are various

techniques to add noise to a photograph, regardless of the technology used to create it. The exposure period, commonly known as the time frame, is the quantity of light absorbed by each pixel in a photograph. Sharper lines appear when the image remains in focus throughout and does not move. Bokeh occurs when the cells, or pixels, of a photograph absorb light from multiple sources at the same time.

The picture edges are usually blurry. A blurry image obscures numerous features. To understand this, pieces of hazy pictures could be reassembled and retrieved. More practice is required to improve your ability to detect motion blur in photographs. If the subject of a photograph is beyond of the lens's depth of field, it may not appear sharp or clear. When the camera is open, light enters from all sides, causing the image to become blurry. When the exposure time exceeds the motion speed, things move erratically. We're looking for motions in images that aren't particularly obvious.

The setting or subject may be too far away, or the camera may be moving. In other words, the scenario should have more than one significant point. When it's finished, everything will be smoother, have less noise, and have more contrast.

IMAGE ENHANCEMENT

These two approaches to improving images are diametrically opposed.

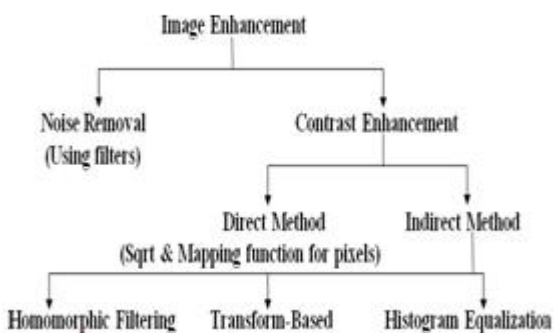


Fig 1: A strategy for keeping your image current A picture can be improved by blurring it, brightening it, removing noise, and sharpening it. Not everything we think we know about what makes an image "good" is correct.

Noise Removal

Things in photographs that you don't want to view

can be removed. It is added to the photograph while it is being captured. Some breaks may be missed by noise-capturing equipment if there is background noise, the person operating the machine or computer isn't doing their job effectively, or a component isn't working properly.

Contrast enhancement

Being conscious of To comprehend contrast, you must first grasp color and brightness. Its major function is to make images easier to understand and "better" for usage by other computer programs that process images.

2. HISTOGRAM EQUALIZATION

There is a reason why this procedure is utilized to improve the appearance of a photograph. Histogram equalization (HE) is a nice approach to demonstrate the difference. HE converts the grayscale to a uniform histogram based on how frequently each level of gray is to appear in the image. The HE approach can usually increase the width and regularity of an image's random distribution.

The contrast of the source image, on the other hand, alters how strong HE is. Sharpening occurs when the contrast level falls. Making it happen is easy since it is obvious. It can be used to understand speech and process medical images, in addition to creating texture.

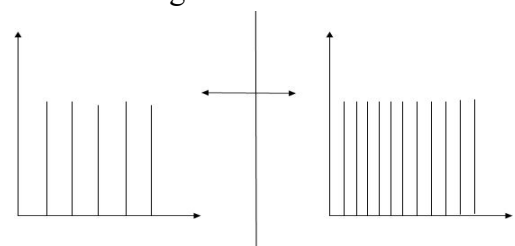


Fig 2: Two or more histograms can be displayed side by side.

Advantage:

This method works effectively since it employs simple code that can be reversed. If you know how to make them all the same, you should be able to find the original histogram.

Disadvantage:

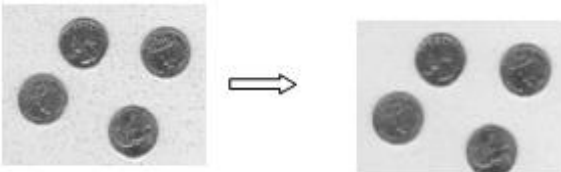
The approach has several flaws, the most serious of which is that it covers far too much ground. There will be increased background noise, making

it difficult to see fine details.

3. FILTERS ROLE IN DENOISING

The fog dissipates when images are viewed. Visual disorder can be employed in the following ways: When viewing an ultrasound image, it can appear very dark or very brilliant.

These are just a few examples of the various types of filters available. To locate broken picture pixels, the filter employs spatial processing algorithms. It examines pixels near to each other to determine which are most likely to contain random noise. You can alter the quantity of comparison as well as the size of the space. A pixel that sticks out because it is not matched up with pixels that are the same as it represents impulse noise. Swap the pixels that are causing you problems with the pixels next to them that are noise-free. This will resolve the issue.



Noise image after applying our filter
Fig 3: Every time the device was placed and removed,

MOTION BLURRING

When the subject or the camera moves during capture, the image becomes less distinct. Partially moving elements cause the image to appear hazy. However, some objects can generate fuzz in a fuzzy image caused by movement. These ideas will assist you in determining whether or not a picture is moving. Because it is so intimately related to motion, the PSF value is the most crucial aspect of motion shift.

L-shaped motion blur is another term for motion blur that remains constant in different locations. It appears to be ordinary motion blur. Motion isn't quite as simple in real life as this example suggests. It's also much more difficult to move around. Taking fuzzy images of thieves is an excellent technique to track them down and keep an eye on them.

The image could help investigators figure out who

the individual is or what license plate number they are driving if they are at the site of a bombing or hit-and-run. Before you can correct a crooked image, you must first understand how the blur function works. The camera may have changed throughout the session, which could account for these errors. Because the camera is moving, the pixels are spread out similarly. Every pixel in the scene is composed of several pixels. This is because the exposure gradually built up the image. This type of image is referred to as "motion haze." Many people believe that math models can be used to create images that blur together motion again.

$$g=f*h+n,$$

f is the unchanged plain image, h is the point spread function that does not change with linear shift, and IZ is the noise. Once you know the PSF, there are numerous approaches to get f from g. Because of moving objects, the PSF is not always clear in real life.

As a result, methods for predicting PSFs from skewed images have been developed, allowing restoration efforts to be based on a PSF. We employ the alternate direction method of multiplier (ADDM) to produce a deblurring filter with the least amount of overall change.

RESULT

MATLAB was used to create a virtual user interface. You can modify the color and graph of the image. You can interact with photographs in a variety of ways, including using a picture histogram, flexible histogram equalization, and histogram equalization. In the next phase, we can apply filters such as the Wiener filter, the median filter, the motion blur filter, and even our own custom noise filter.

We could either start from scratch and draw a new picture, or we could try to fix the first one.

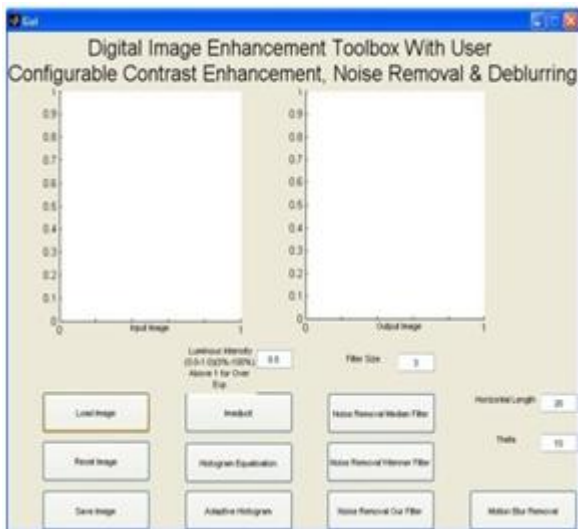


Fig 4: Matlab was used to create the user interface.

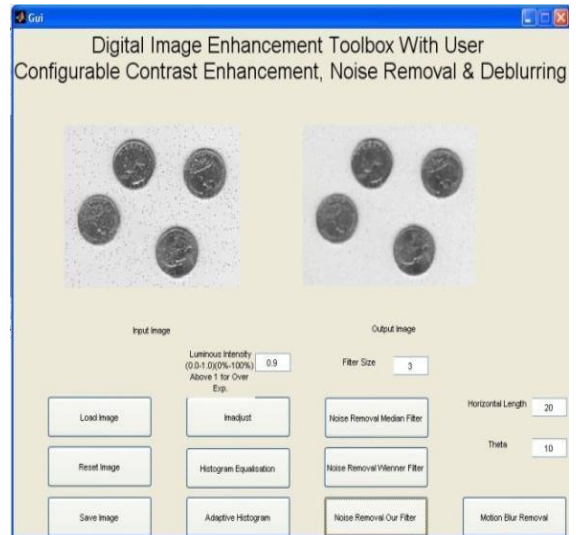


Fig 7: The research enabled the creation of an entirely new show.

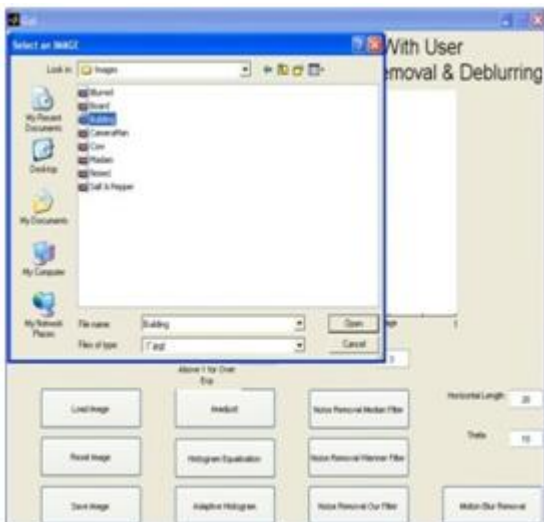


Fig 5: Each shot must be better than the one before it.



Fig 8: The picture improved after the whole transformation.

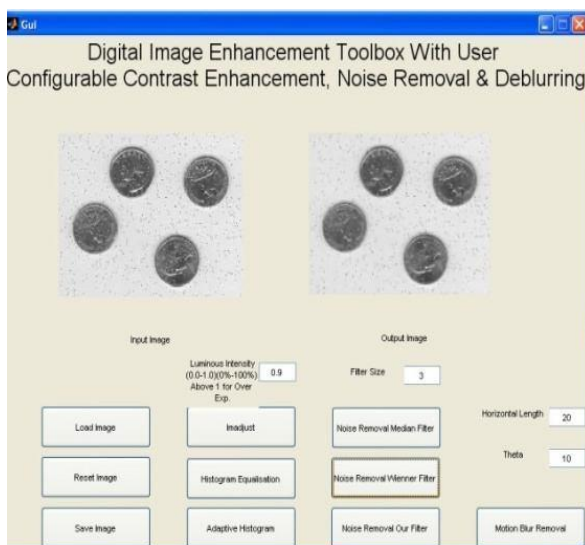


Fig 6: A champion filter can aid in noise reduction.

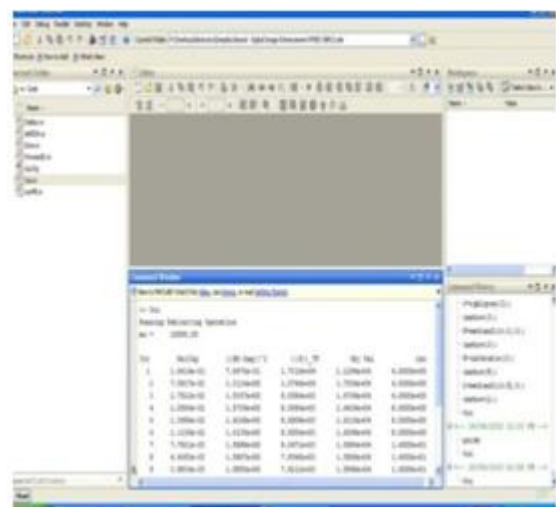


Fig 9: This indicates the length of the background motion delay.

4. CONCLUSION

Since the creation of a new user interface, picture color and contrast can be improved, as well as noise and motion blur removed. To improve contrast, histogram equalization (HE), adjustable histogram equalization (AHE), and other techniques can be utilized. The first strategy, histogram normalization, outperforms the second, contrast improvement. It also works with other types of histogram equalization, such as flexible histogram equalization. Following that, Wiener and median filters are employed to remove the noise. Using a mask, we were able to alter this image. The outcomes are displayed. This virtual user interface also allows you to remove motion blur from images. Each action is represented by an icon in the user interface.

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