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Letter

Filtering in Image Processing

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Keywords

Filtering,
Signal processing,
Image processing,
De-blurring,
Bilateral filter.

Abstract

Filtering can be used in various engineering and scientific problems such as signal processing, image processing/analysis, electronic, physics electronic, chemistry and etc. In image processing and analysis, filters are used for de-blurring and smoothing. In addition, with the help of the filters some facts which are clear in the original image will be blurred and the final image will be enhanced. With considering the best sigma value for bilateral filter, after comparing all these four filters we will find out that the bilateral filter is the best.

1. Introduction

Most of the images are influenced by some kind of unwanted noises causing disturbance in image quality and resolution. , Analyzing the images are usually processed right after removing these noises from the images. Filtering has various meanings and applications in most of the engineering and scientific problems. It provides researchers with fine results comparing with other available methods. Researchers in image/signal processing, electrical and electronic, mechanical engineering, chemistry and physics are utilizing filtering in their problems. One of the most common applications of filtering is in image processing to give a better resolution or to emphasize the edges properly.

2. Filtering

Box filter, Gaussian filter and bilateral filters are kind of well-known filters used in image processing. As we know all these filters are used for de-blurring and smoothing. In addition, with the help of these filters some facts which are clear in the original image will be blurred and the final image will be enhanced. With considering the best sigma value for bilateral filter, after comparing all these four filters we will find out that the bilateral filter is the best.

As conserving the edge is needed, we want our image to be blurred and smoothed, so bilateral filtering is very useful in such a case [1][2]. This filter has various applications in engineering and science [3-9]. In this technique, colors and gray levels are joined and close values are more preferred than the far or distant ones. The main aim of the cited method is removing phantom colors in the original image which may be appeared in the edges.

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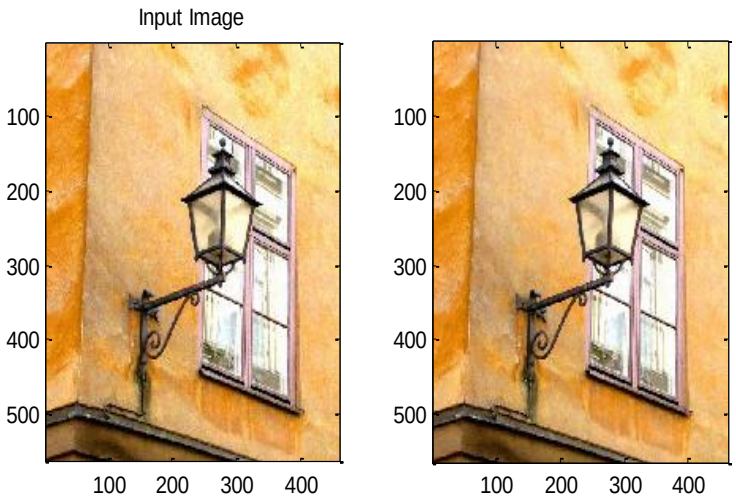
Bilateral filtering is kind of de-noising methods which can preserve sharp edges and remove some colors across the edges. This filter because of weighted mean of neighborhood pixels are easy to understand. In addition, there is a distance between pixel values, so it can be adopted properly. Last but not least, this filter is non-iterative which is very simple.

3. Results and Discussion

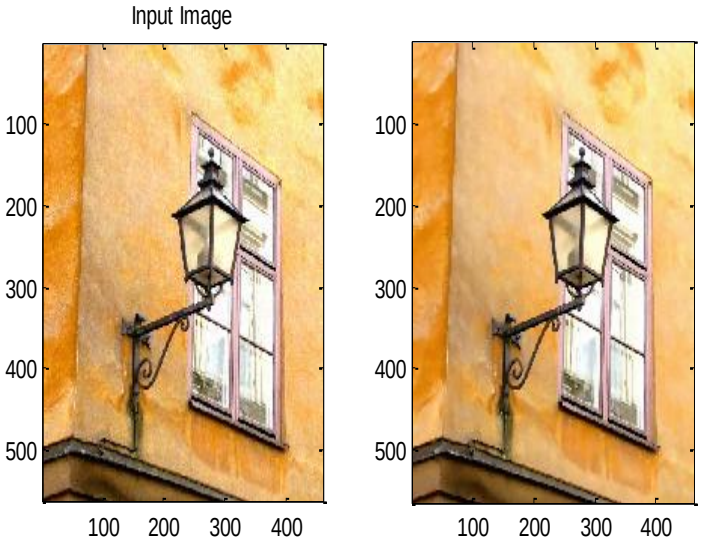
Sigma value=0.08 gives the best result for bilateral filter in comparison with others. It means that by increasing the amount of sigma, the image will be improved and de-blurred. For examples, in a test image, there may be some wrinkles in the face, so with the help of bilateral filter with sigma value 0.08 most of the wrinkles in the face will be removed and at the end, we will get a face which looks younger.

Such a filter is very hard to be analyzed because it is nonlinear. It is slow but it has got some accelerations as well. The approximation is so fast in this method because of its nonlinear nature. It cannot be used for sharpening, it can just blur the image to reduce the disturbing noise. Figure 1 shows the filtering results of box and Gaussian filter. Figure 2 demonstrate the results of bilateral filtering for different sigma values.

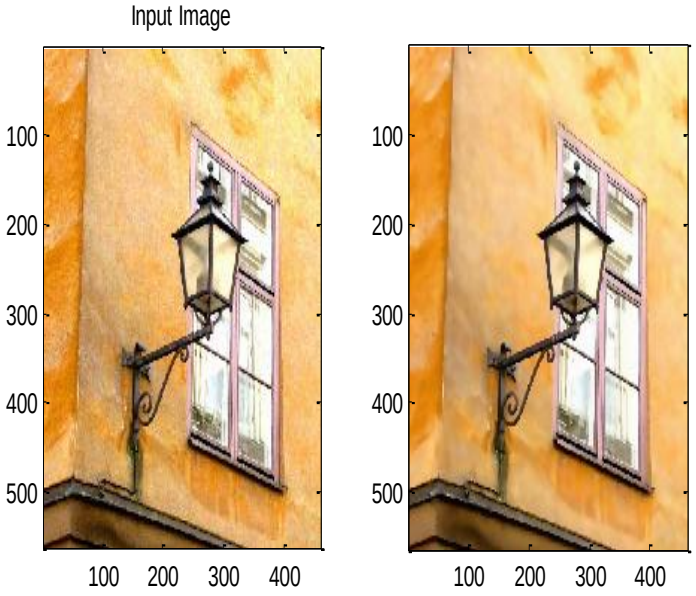
Figure 1. Filtering results of box and Gaussian filters.



a, sigma=0.02



b, sigma=0.05



c, sigma=0.08

Figure 2. Bilateral filtering for various sigma values.

4. Conclusion

In this paper various filtering approaches are utilized to address the issue of image recovery from its noisy counterpart. The image filtering algorithm provides us with smoothness and better resolution from the noisy version.

Experiments are conducted that bilatereal filtering performs better than other filtering techniques which are available in the literature. For the future work, we will deall with applying some optimization algorithms and machine learning approaches [10-25] to check and compare the performance analysis of different methods.

Conflict of Interest Statement

The author declares no conflict of interest.

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