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Image Sharpening for Indistinct Images by Using Cellular Neural Networks

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1. Introduction

In image processing, there is a method to process sharp images from images referred to as Unsharp Masking. Some researches are reported that it is possible to process Unsharp Masking in Cellular Neural Networks (CNN). However, Unsharp Masking is not much effective for indistinct images. Therefore, we propose a CNN algorithm to process sharp images from indistinct images. We apply the proposed algorithm to the indistinct image and investigate its performance.

2. Proposed Method

In this section, we show the proposed algorithm by using CNN. The proposed algorithm is composed of four steps and flowchart is described as follows.

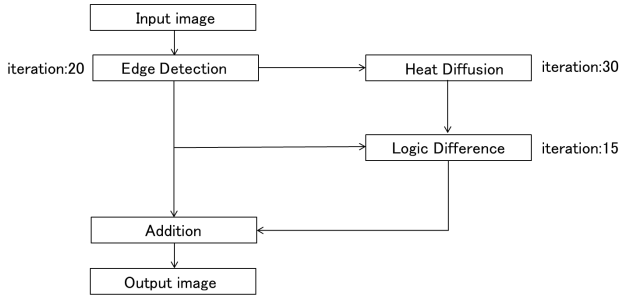

Figure 1: The proposed algorithm.

The processing steps of the proposed method are described as follows.

Step 1(Edge Detection): First, the input image is sharpened by decreasing the number of iterations.

Step 2(Heat Diffusion): Secondly, the sharpened image is blurred to subtract the heat diffused image from the sharpened image.

Step 3(Logic Difference): Thirdly, sharp lines of the sharpened image are detected by decreasing the number of iterations.

Step 4(Addition): Finally, each cell's output value of the sharpened image and the difference image is added. Each step is repeated at every 0.05 [τ].

3. Simulation Results

In this section, we show the simulation results of the proposed algorithm and Unsharp Masking. Figure 2 shows how the image is processed in the proposed algorithm and Unsharp Masking.

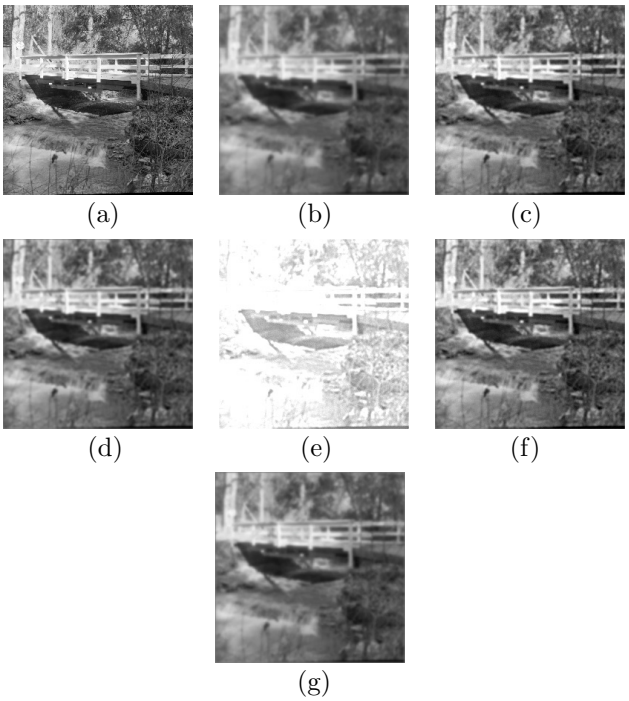

Figure 2: Simulation results. (a) Original image. (b) Input image. (c) Sharpened image. (d) Heat diffused image. (e) Logic difference. (f) Output image. (g) Unsharp masked image.

Figure 2(a) shows the image before processing Heat Diffusion to the input image. In Figs 2(b) to (f), we show the simulation results of each proposed method. In addition, Fig.2(g) shows the output image processed Unsharp Masking by using MATLAB. Fig. 2(g) shows unclear objects are remained. However, Fig. 2(f) shows unclear objects are less remained compared to Fig. 2(g). From the simulation results, the proposed method is more effective than Unsharp Masking.

4. Conclusions

In this study, we have proposed an algorithm for sharpening the indistinct image by using CNN. The simulation results show that the proposed method is more effective to sharpen the input image than Unsharp Masking. Therefore, the proposed method is more effective than Unsharp Masking. In the future work, we will confirm that the proposed method is effective for more indistinct images than the input image.