Image Deblurring Techniques

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Abstract

The goal of this project is to explore and implement image deblurring techniques. Many of these techniques involve some sort of an image transform, and the most commonly used one is the Fourier Transform. A point spread function, also referred to as a blur kernel, can be applied to an image in the frequency domain after it has been transformed to create a blurry image. The opposite of this can be done by applying an inverse transform to a blurry image, and after removing the point spread function from the frequency domain, a deblurred image can be obtained.

Introduction

Motion blur in images is a common problem for professionals in various fields. When the image is deblurred, the usefulness of the image increases. Parts of the image that were difficult to identify can be rendered to effective clarity. This project will explore and implement image deblurring techniques. By implementing these techniques, users can efficiently remove blur from an image.

Fig. 1 Original Image

Results

The Fourier image is often displayed with F(0,0) in the center of the image. In the frequency domain with this particular shifting, the further away from the center of the image, the higher the frequency is. Visually, one can detect gradients in the Fourier transform that corresponds to the original image in the spatial domain. For example, this image (Fig. 1) has two dominating directions, one along the x-axis and another along the y-axis. This can be seen in the Fourier image (Fig. 2) shown by the strong lines intersecting at the middle, and in the original image shown by the border of the mirror.
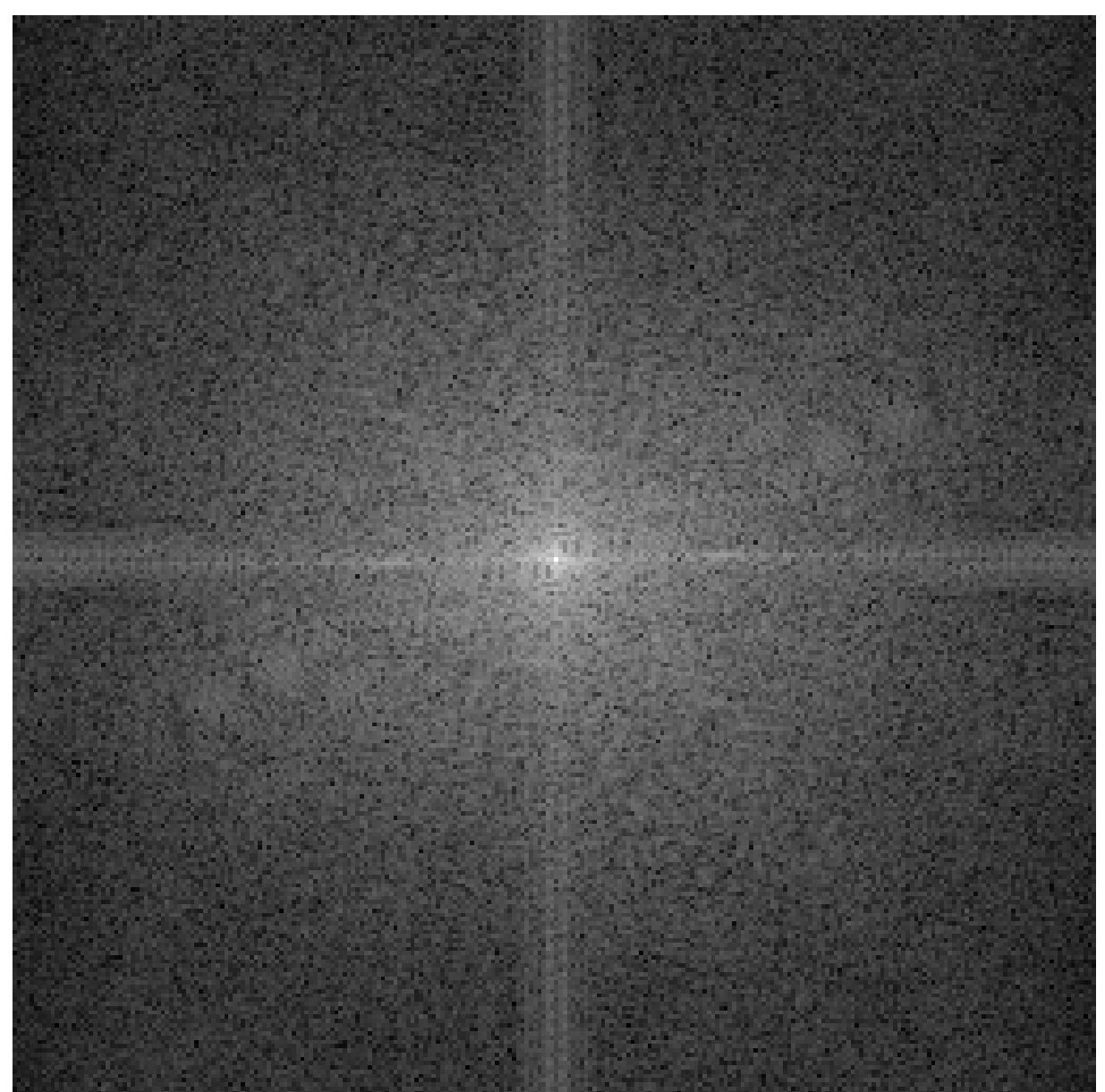

Fig. 2 Fourier Transformed Image