EE5175 - Lab 6 Report

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1 Shape from Focus

In this experiment, we explore the concept of Shape from Focus (SFF), a technique used to determine the depth of a scene based on the amount of optical blur present in images captured with different camera lens settings.

1.1 Introduction

The degree of blur in an image due to optical defocusing varies based on the distance between the camera and the scene. By analyzing this blur, we can estimate the depth of each pixel in the scene.

1.2 Methodology

We were provided with a set of images taken using different camera lens settings, resulting in varying levels of optical blur. We used these images to implement the Shape from Focus algorithm, which utilizes the Sum-Modified Laplacian (SML) operator as a focus measure.

The parameter Δd was set to 50.50, representing the distance between focal planes. We observed the 3D structure of the scene for different neighborhood sizes (q) for the SML window, specifically $q = 0$, $q = 1$, and $q = 2$.

1.3 Implementation

We loaded the images from the provided dataset and processed them. For each q value, we calculated the depth of each pixel in the scene and displayed the resulting 3D structure.

2 Results

2.1 Observations

- The depth maps for different q values provide insights into the 3D structure of the scene.

- Higher q values tend to produce smoother depth maps.

- Using larger values of q makes the depth map smoother and clearer compared to using smaller values of q. This means that when we average the local measurements more, we get better results in estimating the depth.
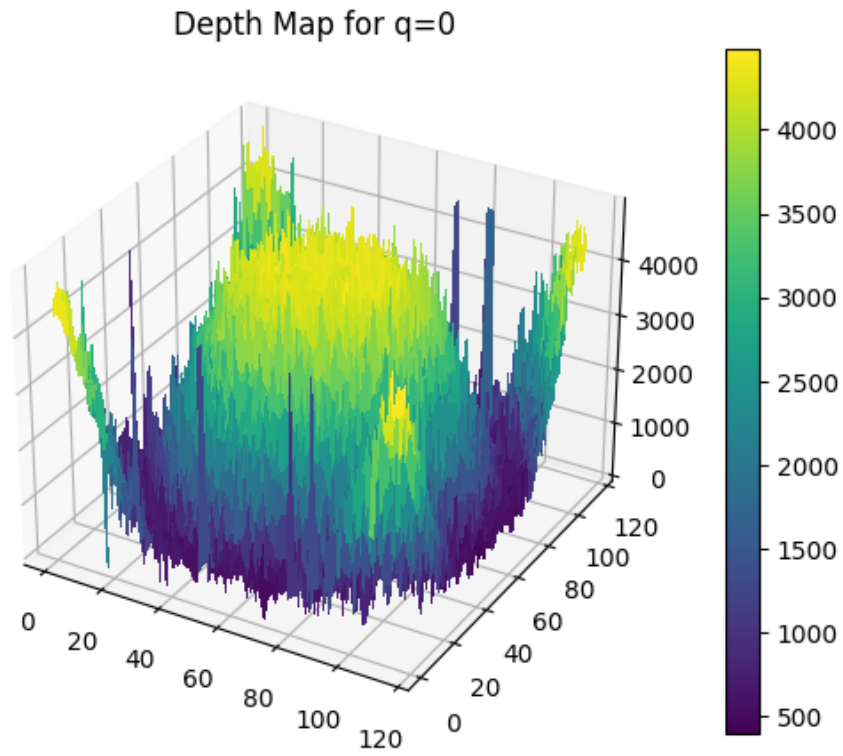
Depth Map for q=0

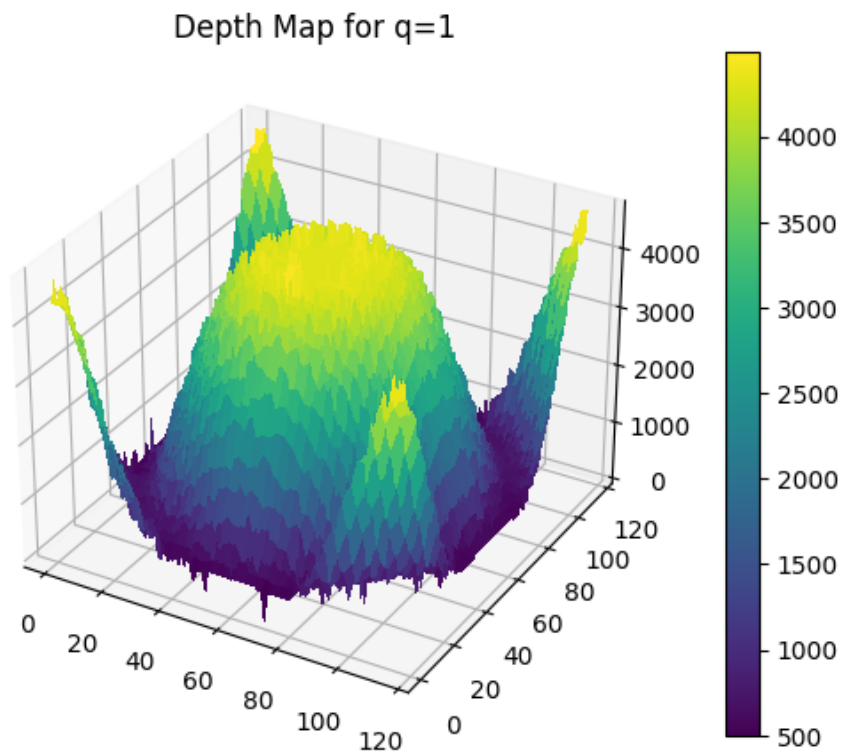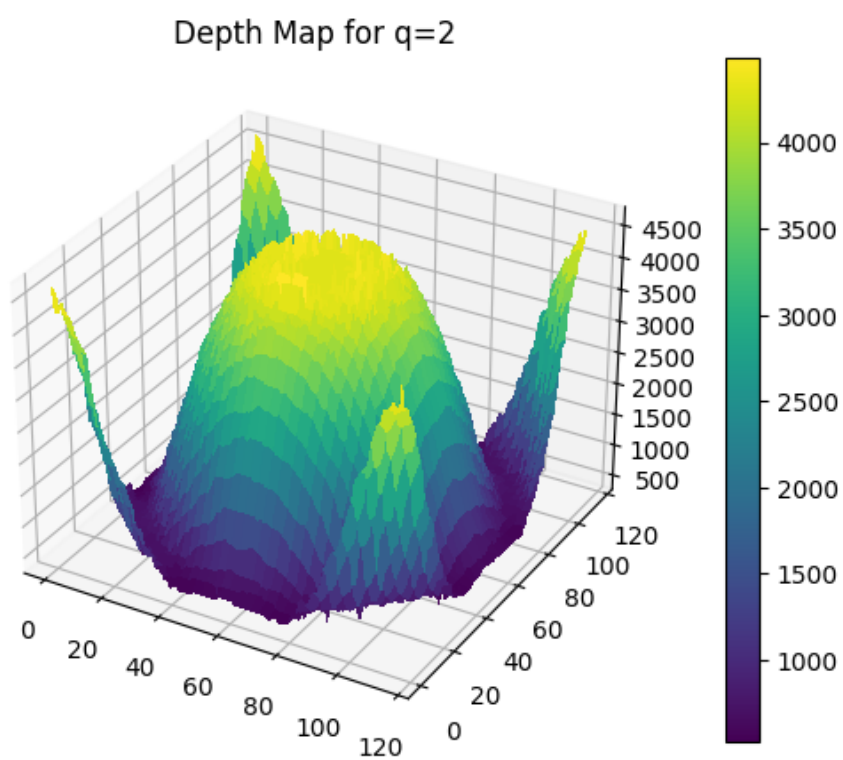
Figure 1: Depth Map for $q = 0$

Depth Map for q=1

Figure 2: Depth Map for $q = 1$

Figure 3: Depth Map for $q = 2$