

PHOTOGRAPHIC HOMEWORK

Samuli Siltanen, November 11, 2015

This is a homework assignment for the course *Applications of matrix computations* given in the fall of 2015 at University of Helsinki.

The idea is to take a photograph (with your smartphone or any other digital camera) where something in the picture is in focus and something is not at all in the focus.

The optical construction of a typical camera produces a plane of sharp focus. This means that details located in a two-dimensional plane in the three-dimensional scene under imaging show up sharp and crisp in the photograph, and details away from that plane are blurred. Moreover, the blur becomes worse as the distance grows between a detail and the plane of sharp focus. See Figure 1 for a geometric illustration.

Close-up photography leads almost inevitably to images where only a part is clearly in focus. So one option is to go really close to something small, such as in Figure 2.

Another simple possibility is to take a printed paper with some text and an image; a newspaper or magazine page will do. Place one paper on the floor and put a thick book on top of the paper. Let the camera focus on the book cover; then the paper is out of focus. Varying the distance between the camera and the book will adjust the severeness of blur in the paper. It's also a good idea to use two light sources illuminating the scene with roughly 45 degree angles.

In any imaging arrangement you choose, the use of a tripod (or other support) to keep the camera steady is recommended.

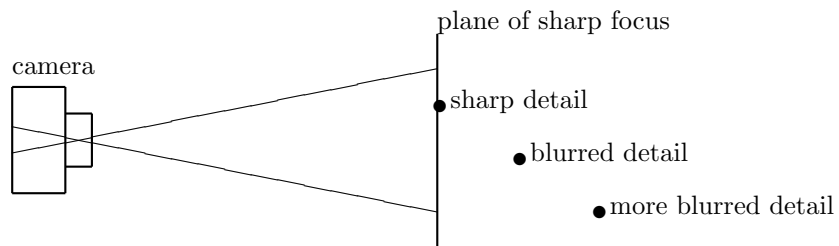


FIGURE 1. Schematic illustration of the focal plane of a camera. Details in the focal plane appear sharp, and details off the focal plane appear blurred. The blurring is stronger if the detail is more far away from the focal plane.



FIGURE 2. Close-up photo of lichen. Copyright of the photo: Samuli Siltanen. All rights reserved.