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15-462 Computational Photography

1. Lightfield rendering, focal stacks, and depth from focus
    a. 2D mosaic of sub-aperture views (see files attached)
    b. Focal stack

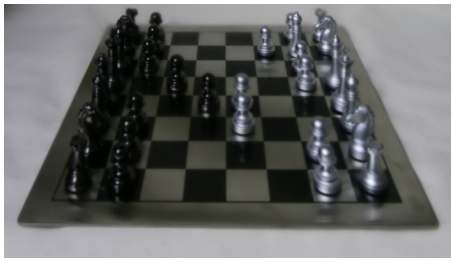
d = 0.0	d = -0.4	d = -0.8
		

d = -1.2	d = -1.6
	

Figure 1: Images focused at 5 different **d** depth values

c. All-focus image and depth from focus

i.

All-focus image	Depth from focus image
	

ii. Discussion

1. There are visual artifacts around the edges of the chessboard shown in the depth map. This is possibly due to the fact that they are considered very sharp edges (high contrast between the end of the chessboard and the table), which get blurred out. You can see artifacts around similar regions in the all-focus image, where the edges appear a lot blurrier in the all-focus image than any of the original subaperture view images.

d. Focal-aperture stack and confocal stereo

i. Focal-Aperture Stack 2D Collage (see attached files)

ii. AFI Images

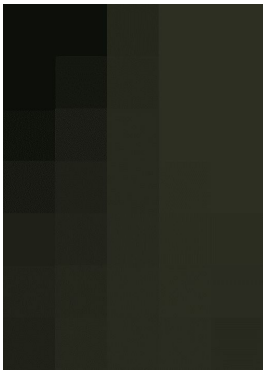
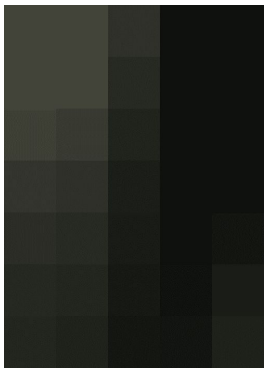
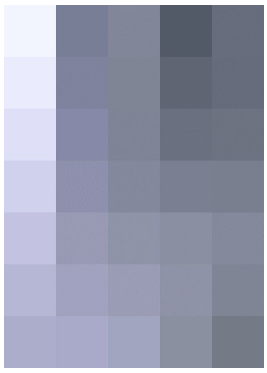
(u, v) = (170, 300)	(u, v) = (170, 400)	(u, v) = (270, 400)	(u, v) = (270, 500)
			

Figure 2: AFI's at 4 different specified (u,v) pixel locations across the focal-aperture stack

iii. Pixel-wise Depth Map

iv. Discussion

1. The pixel wise depth map appears much noisier than the depth map I generated from the depth-from-defocus procedure. True to the nature of being a per-pixel depth map, however, there is a much greater level of detail of depth for each of the chess pieces. I can observe (to a certain degree) the ridges and fine details of the chess pieces rather than a general "blob" such as my previous depth map.

2. N/A
3. Capture and Refocus Your Own Lightfield

Figure 3: Focus on Computer Mouse

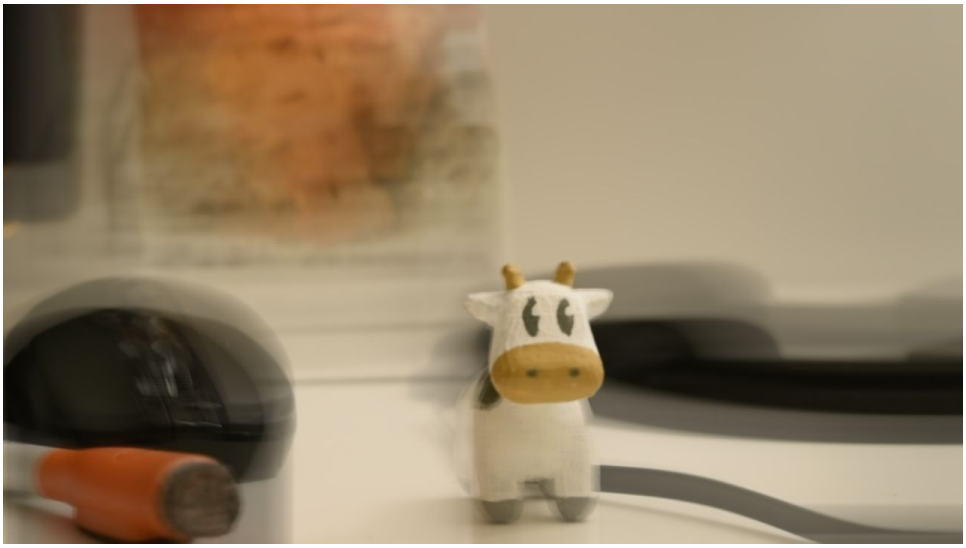


Figure 4: Focus on Cow