Assignment 3

CGRA252 Report

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Introduction

The project's core objective was to develop functions capable of creating images focused at various distances and positions differing from the actual camera. Utilizing the provided 17x17 2D-array of light field images, I implemented multiple functionalities.

Access the light field - Core Part 1

To access the light field, I created a function called “accessLightFieldPixel” that would access any specified value in the 4D light field using given parameters without the need for interpolation. This functionality was verified by successfully accessing and returning the color values at a specified 4D point, which matched the expected results precisely.

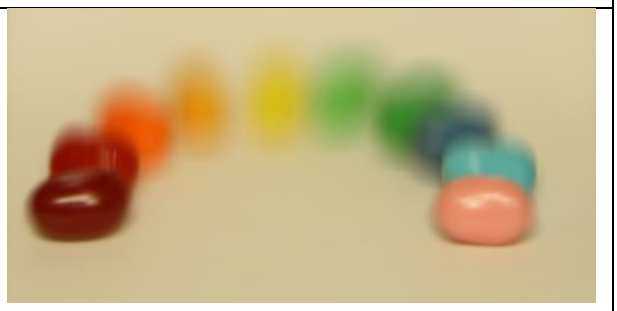
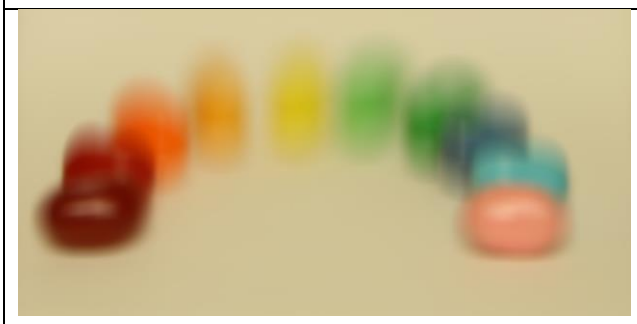
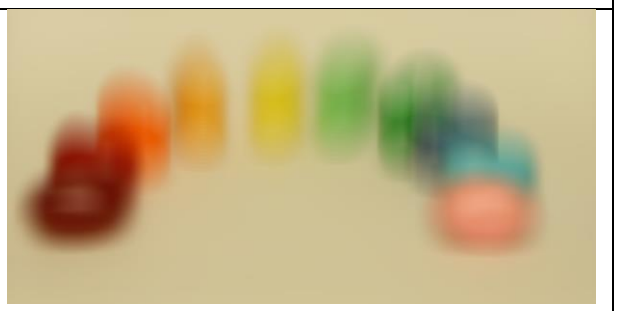
```
Finished loading light field
Pixel value at (7, 10, 384, 768): [99, 135, 219]
```

Generate ST-Array - Core Part 2

For this, I reconstructed sensor images to represent different main aperture sizes of a sub-lens-based light field camera. By sampling the original light field with specified aperture radii, I generated two distinct sensor images, showcasing my ability to manipulate and visualize light field data effectively.

Focal-Stack - Completion/Challenge

This part of the assignment involved creating a focal stack by refocusing light field data at various virtual focal lengths.

Focal Depth: 0.0	Focal Depth: 1.0
	
Focal Depth: 2.0	Focal Depth: 3.0
	
Focal Depth: 4.0	
	

The table above shows the results of the “refocus” function with the respective focal depth. When the focal plane is near (focal depth: 0.0), the results are quite accurate and clearly show the jellybeans that are nearest to the viewer. However, as the focal depth increases, although the focus becomes slightly clearer towards the farther jellybeans and becomes less focused around the nearer jellybeans, the farther jellybeans are not clear.

How to run

In a terminal, change directory (cd) to the directory of the executable (in /build), and run this command:

./a3 <relative path to images directory>

This will run all the functions in the program including core part 1, core part 2 and Challenge/Completion.

Functions:

For Core Part 1: “accessLightFieldPixel( )”

For Core Part 2: “isWithinAperture( )” & “constructUVImage( )” & “generateSTArray( )”

generateSTArray is the main function that will run the code for Core part 2.

For Completion/Challenge: “refocus( )” & “runFocalStack( )” & “incrementalFindBest( )”

runFocalStack is the main function that would generate the images using depths {0, 1, 2, 3, 4}

IncrementalFindBest is the function I used to find the best focal depths using an incremental approach. (This will be commented out in the main() function).