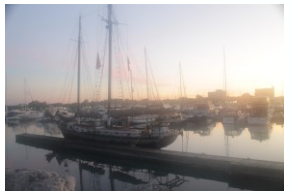
Computational Photography

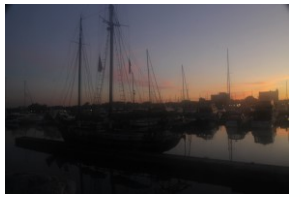
Final Portfolio

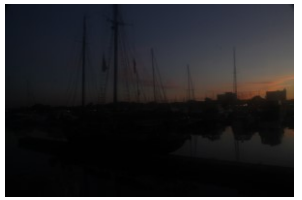
John Ktejik

CS6475 - Fall 2019

Assignment #1: Epsilon Photography







Several pictures taken with different aperture sizes merged into one image

Assignment #1: Epsilon Photography

The purpose of this assignment was to demonstrate the results of changing aperture size when taking pictures. The previous page shows the results of merging five photos, each taken using a different aperture size (measured in f-stops).

As you can see, the smaller the f number, the larger the aperture and therefore the brighter the picture. The lesson is that an appropriate aperture size is required for a good picture. As part of the project I wrote a program to slice images apart and stich them together. The rose on the right demonstrates this result quite nicely.

Assignment #2: Camera Obscura

The view from a ‘pinhole’ projected on the wall of my room.

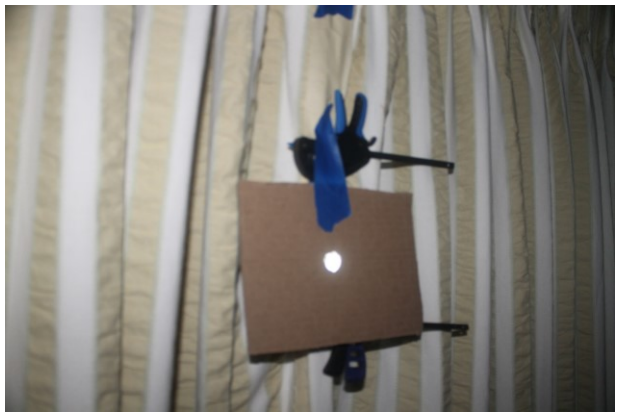
The view from my room

The ‘pinhole’

Assignment #2: Camera Obscura

- The purpose of this assignment was to create one of the oldest types of camera, a ‘camera obscura’, which demonstrates how light can be focused and directed through a hole, to project onto a screen or wall.
- This assignment was simple and a lot of fun, as it required nothing more than equipment found at home and involved hands on building.






Fun steps in building a camera obscura

Assignment #3: Blending

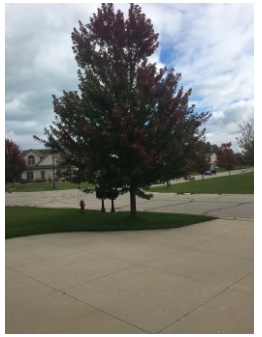
The inputs

The purpose of this assignment was to blend two images to create a novel image. After some failed attempts and experiments (see next page) I ended up choosing this one as my final result. It is, obviously, the blend of an iceberg with a man-o-war jellyfish.

Assignment #3: Blending

Other blending results

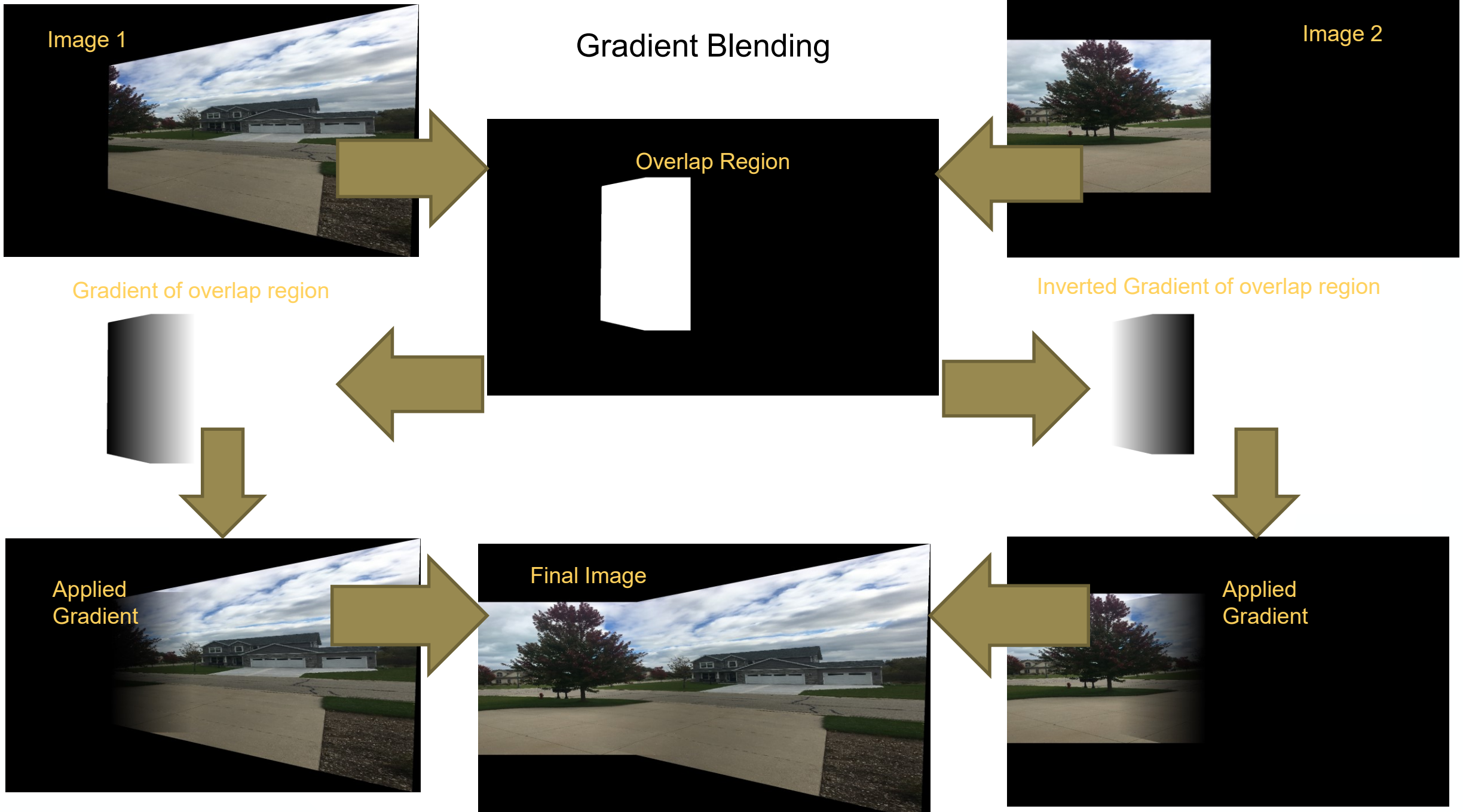
Assignment #4: Panoramas



Input images

This assignment was merging multiple images into a panorama. The trick is merging them without seams showing, and without too much warping.

Gradient Blending



Images generated by generateGradientImages.py

Assignment #5: HDR (High Dynamic Range)

The purpose of this assignment was combining over and under-exposed pictures to recover the full range of colors in the scene

I ended up writing my own algorithm which produced better results than the standard algorithm we were supposed to use for the assignment. Images are a little dark but the colors are all there.

Assignment #6: Video Textures – creating loops in videos

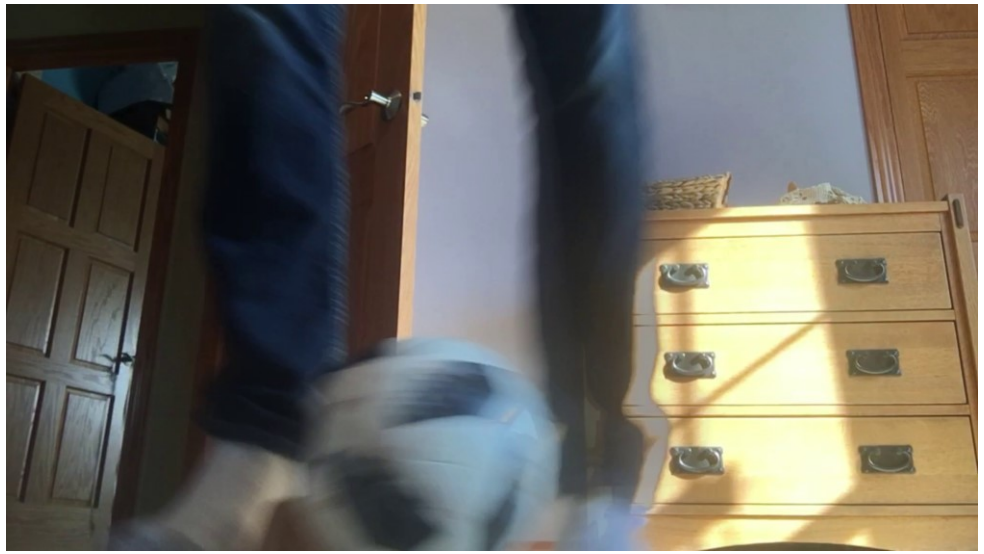
Frame0039.png

Frame0091.png

- The point of this assignment was to take a video and make it loop as seamlessly as possible. We used a simple candle flickering, and a video we created. It's a simple idea but its actually quite hard to find matching frames.
- Working link to your candle video texture gif

https://drive.google.com/open?id=1RC3-hBSWdyxNeNrVuNGDM5JzVy2kIZto

Assignment #6: Video Textures



- Describe your gif. What is it? What is the location?

The gif is myself practicing with a soccer ball. It was done in the spare bedroom of my house, using my iPhone 6.

Working link to your video texture gif - https://drive.google.com/open?id=13-RcRXodoeCuokWKqfVXGLjLItyXXlM6

Working link to the frames (folder) - https://drive.google.com/open?id=1o-9aTbWsyrWU5n75okFHjIu-Q7Q5t7hd

Midterm Project – Seam Finding to shrink/enlarge images

Original Image

Seams (lines with similar pixels on both sides) are found

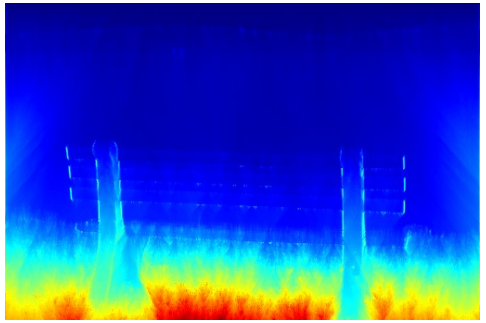
Those seams are added for a more natural-looking image.

Here we had to reproduce the results from a research paper as closely as possible. I did a pretty good job finding the exact seams the paper did.

Original paper results

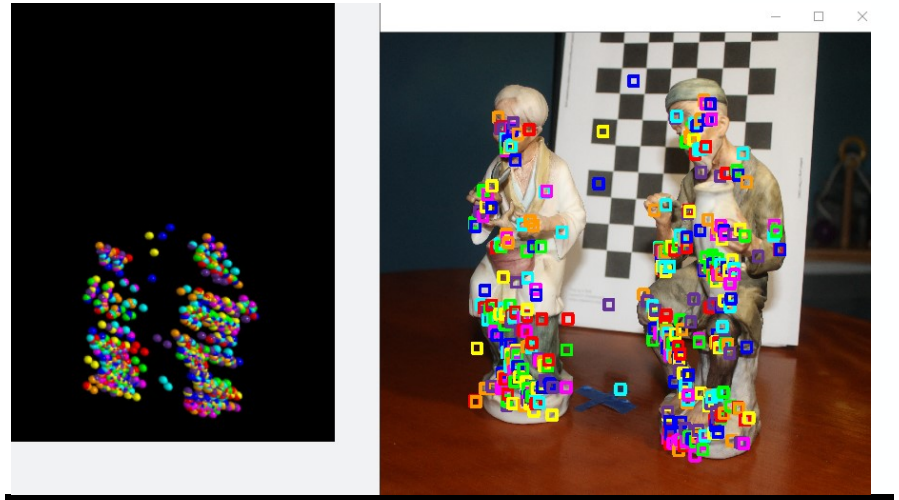
Midterm Project – Seam Finding to shrink/enlarge images

Images can be shrunk or enlarged with minimal distortion using seam carving.

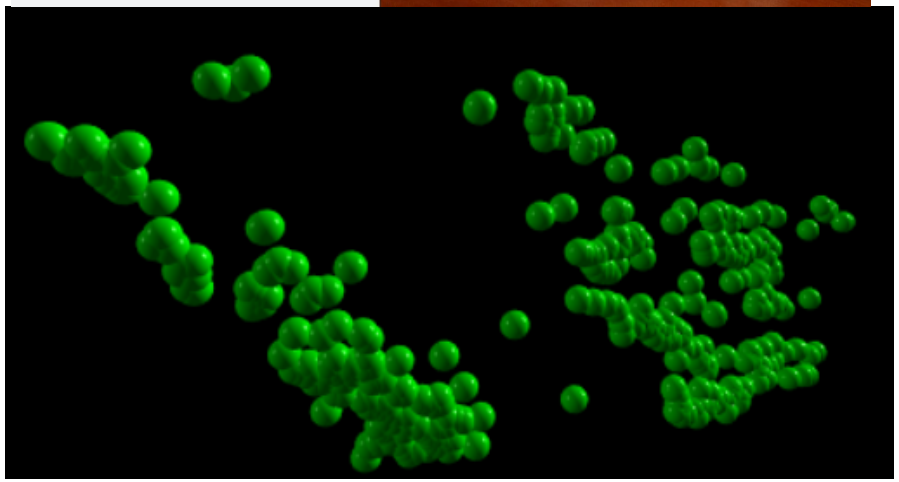


Final Project – 3d reconstruction from 2d images

Pictures of 2 Chinese figures, the features detected, and the 3d reconstruction. The checkerboard is used to align camera positions. This project kicked my butt. It took a month before I got any results.



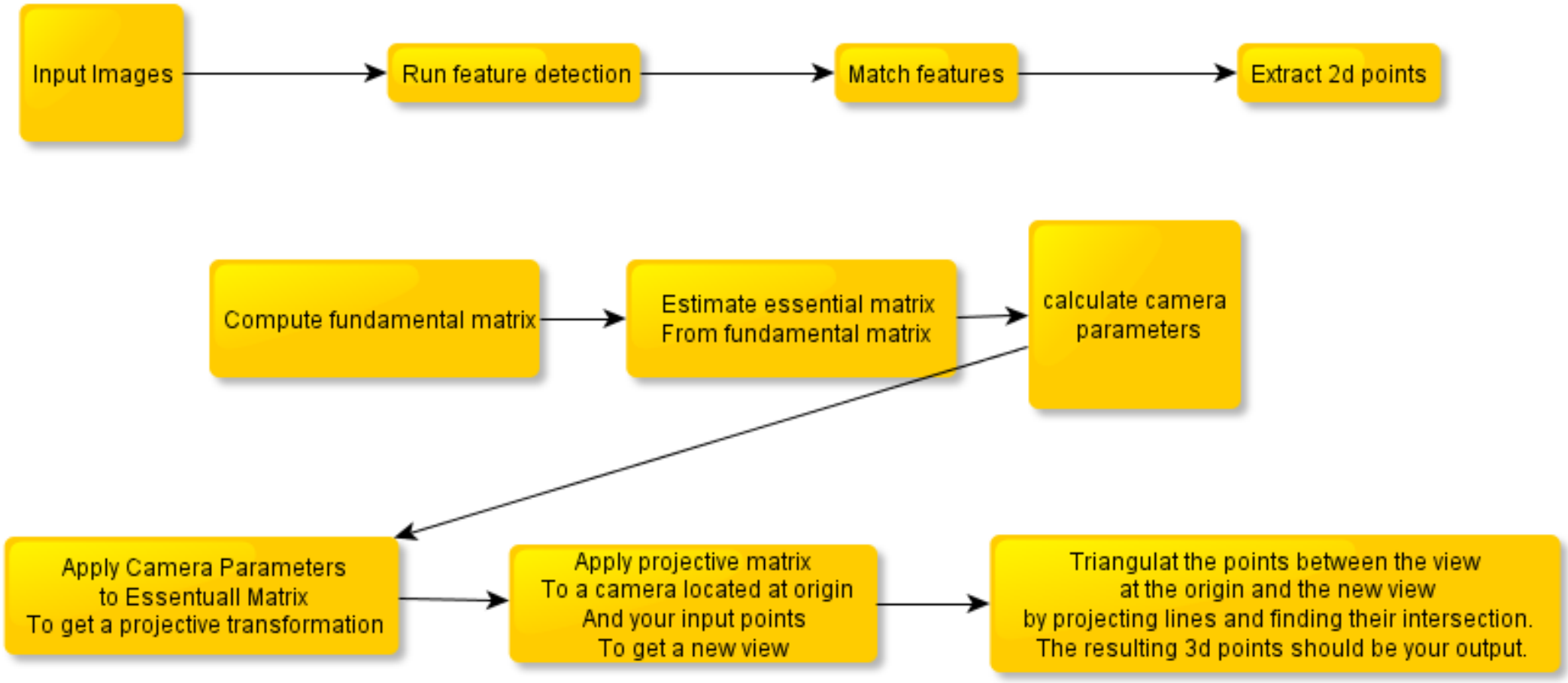
SIFT feature Matches



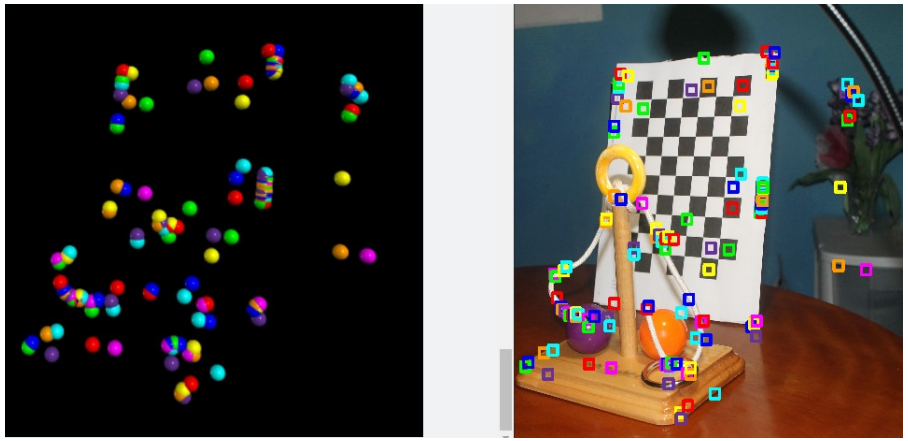
3D reconstruction

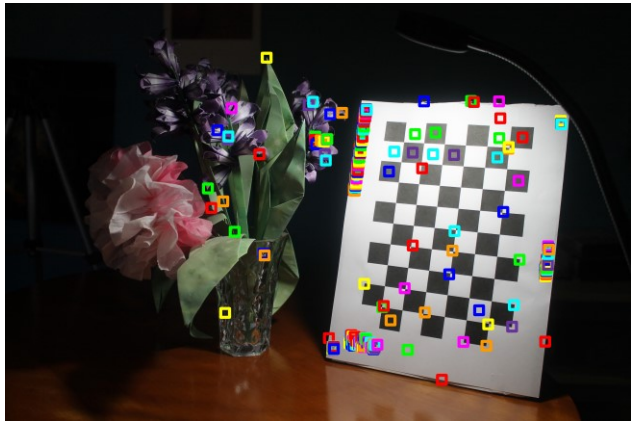
See the 3d video on my google drive at https://drive.google.com/open?id=1fYoofYLXI-8VvQ59FVRmZMRfpCNfnQ3c

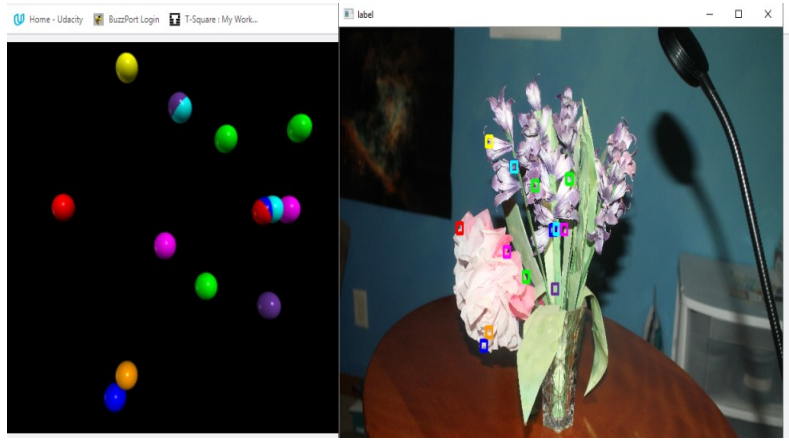
Final Project (2) - Project Pipeline



The fundamental matrix song: http://danielwedge.com/fmatrix/



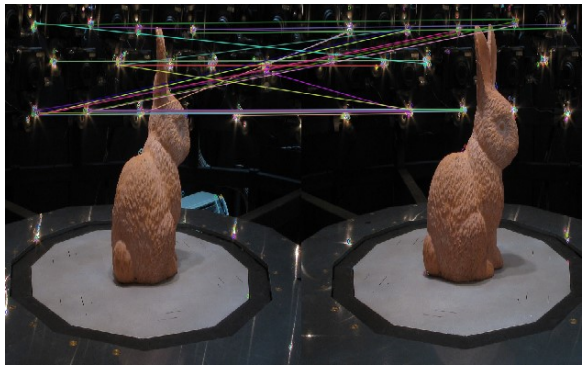




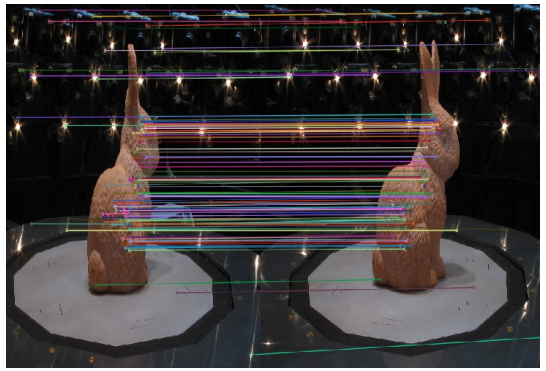
More matches found using SIFT feature detector

- Comparison of feature detectors

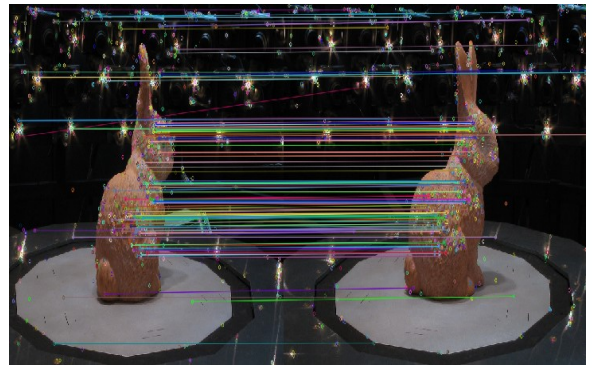
ORB



SIFT- brute force method

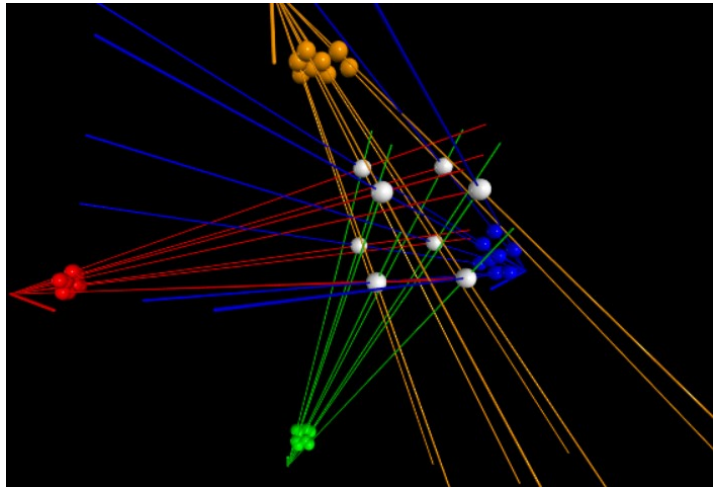


SIFT – KNN method
With Lowe ratio test

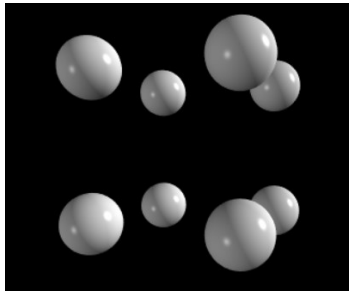


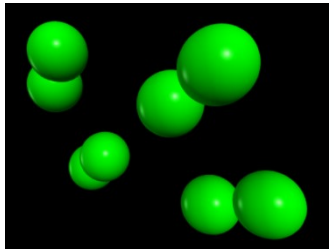
SIFT Flann – same as SIFT KNN
Except faster

Images created by compareMatchingMethods.py

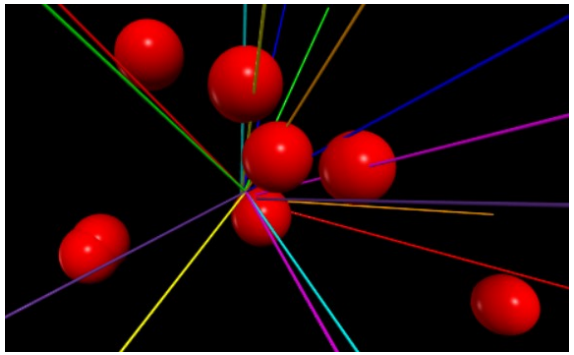


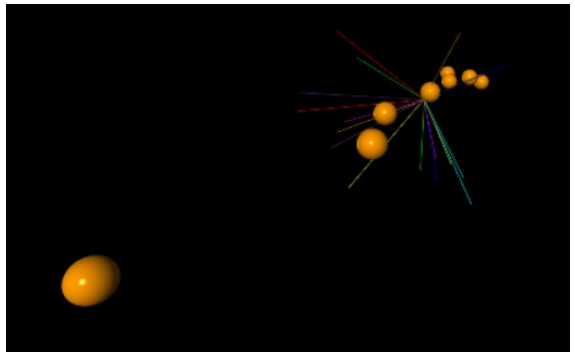
The ground truth of my toy data – a cube in 3d space

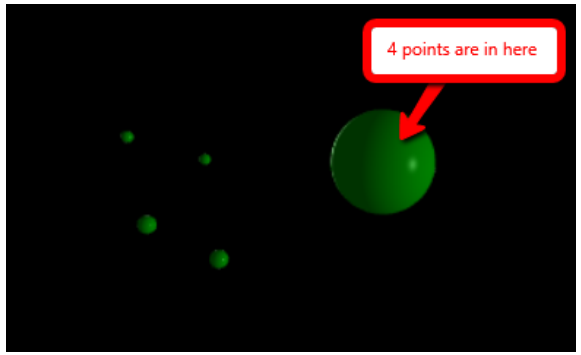


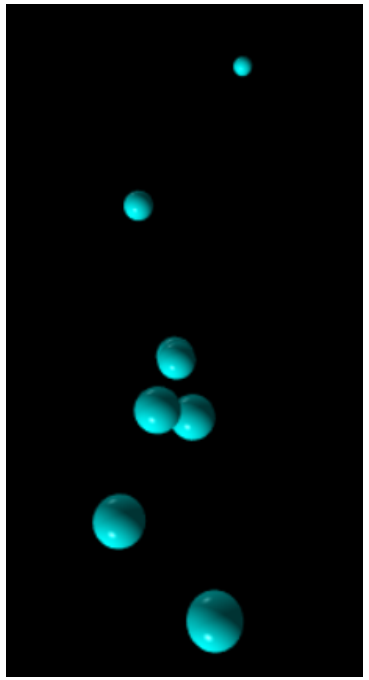


Early results - a flattened cube.

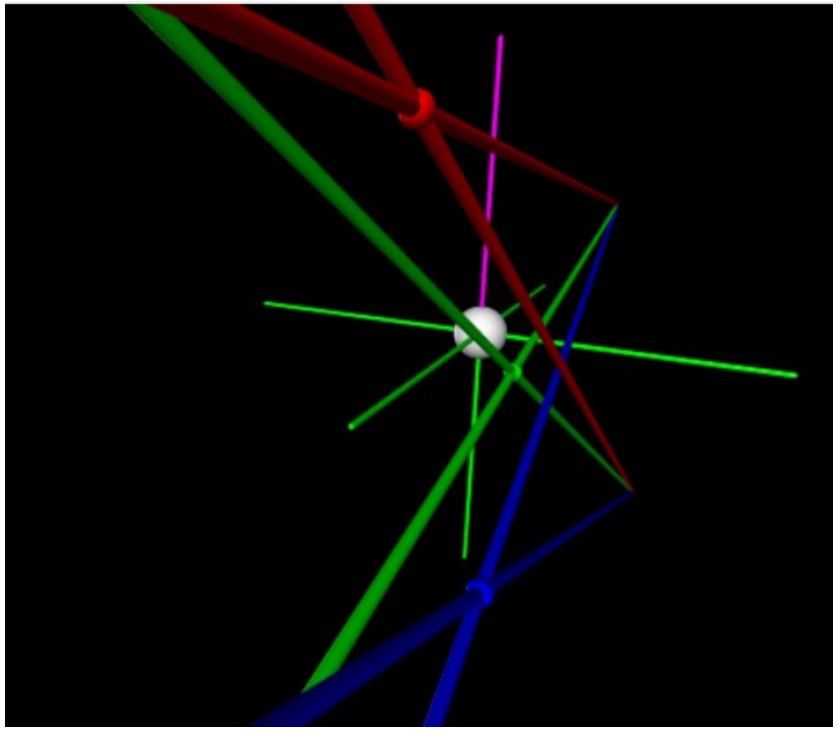


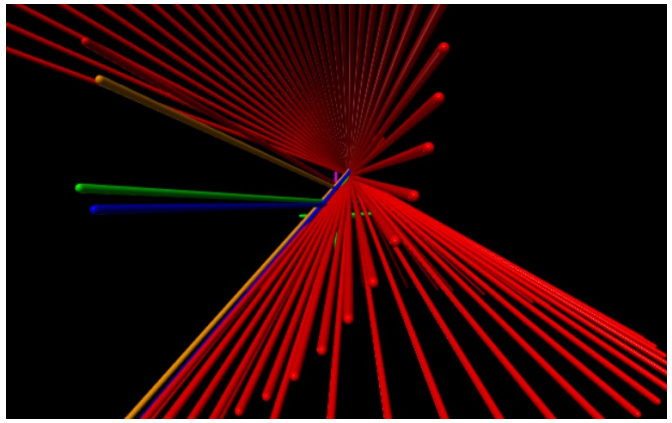


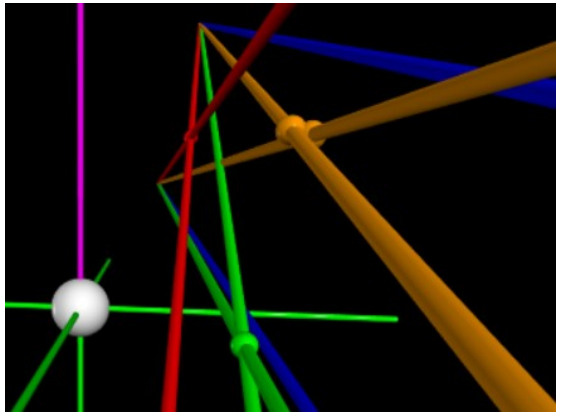


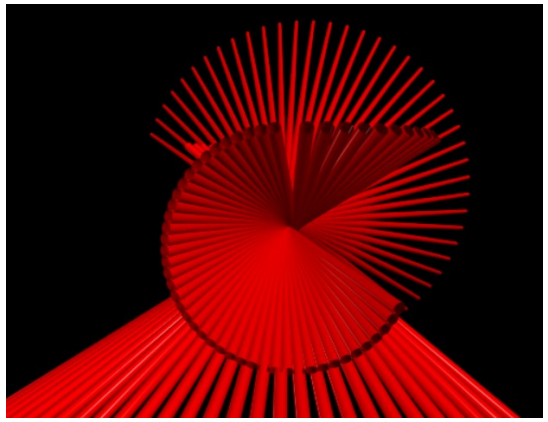


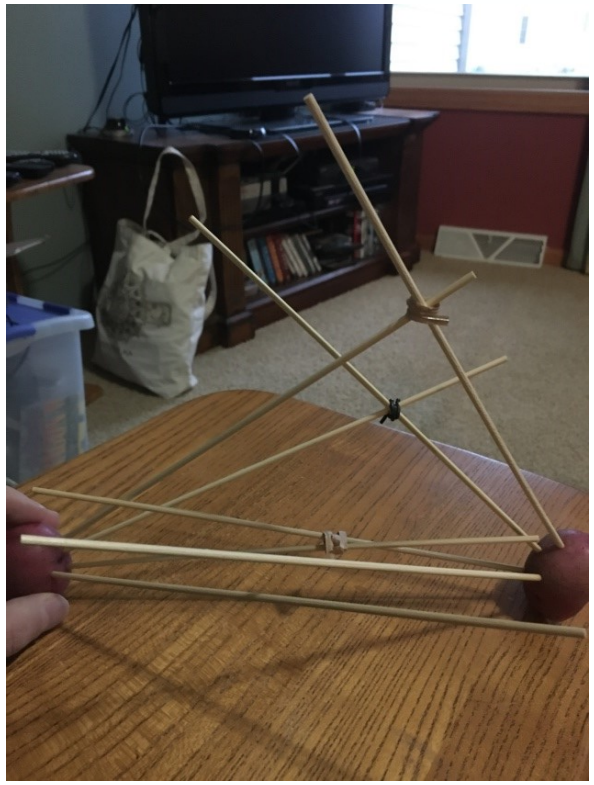
Failed attempts at triangulating points in space











Fun images and a model I built out of potatoes and skewers to try to solve the triangulation problem.