Algorithms

My algorithms should be similar to others. I looped over the pairs of images and extracted the keypoints and their descriptors. I utilized FLANN matching instead of BF to lessen computation time, though I am unsure of whether the search parameters are optimized for our current dataset. I then used the mask from findFundamentalMat to find the inliers and did the same for findHomography. To create the mosaic, I mapped the corners of image 1 to image 2 coordinates to find the bounding box and created two different images; one with warped image 1 in bounding box and one with image 2. Then I combined them together to create the final mosaic. To create the epipolar lines, I followed an OpenCV tutorial on constructing/graphing them and concatenated the two images to create the side by side image.

Decision Criteria

Threshold 1 (matches)
At first, I decided on setting a strict threshold but decided against it. I considered this part to be like the application process where the next threshold (an interview) would be the core of selecting pairs that pass. This allows scenes that have some relationship to each other, i.e. drink machines (Image 1) or trees (Image 2), to be able to be scanned through. However, this also increases computation time.

Threshold 2 (F inliers)
As mentioned before, this threshold is stricter considering it inherently calculates matching points that project onto each image with the Fundamental Matrix. This will filter out the majority of images because it is the final decision about whether two images depict the same scene. However, choosing this high of a threshold filters out some office image pairs which should technically pass but fail at the next stage. Images (3 & 4)

Threshold 3 (H inliers)
This threshold answers the question of if the two images can be accurately aligned. I chose this threshold because of the office image pairs. When I allowed them to pass, their images only correctly mapped the screen and did not account for the angle of the room. Their inlier percentage over F inliers was a little bit less than 65 so I took that as the basis. (Images 3 & 4)

Blending

The blending algorithm relies on the addWeighted function to combine images into the mosaic. Because of this, I had to cancel out the averaging over regions where the images do not overlap and overlapping region alone.

Results (overall)

Strengths: Strict thresholds, optimized matching (somewhat), utilization of optimized cv functions

Weaknesses: Weak first threshold, incorrect epipolar lines (Image 5), blending issues (intensity), small dataset, less control over processes (because of cv functions)

Image 1

Image 2

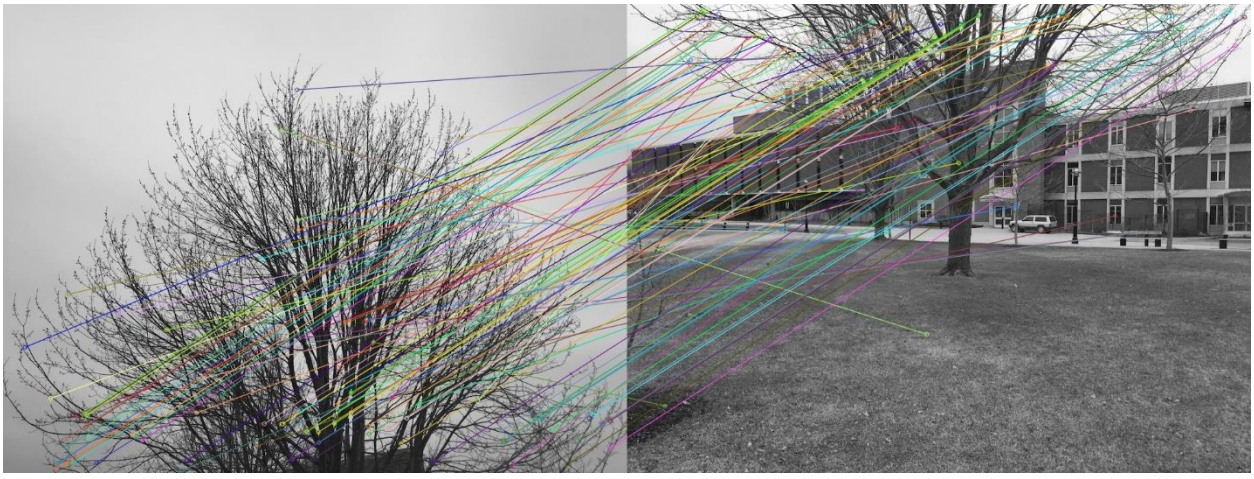

Image 3

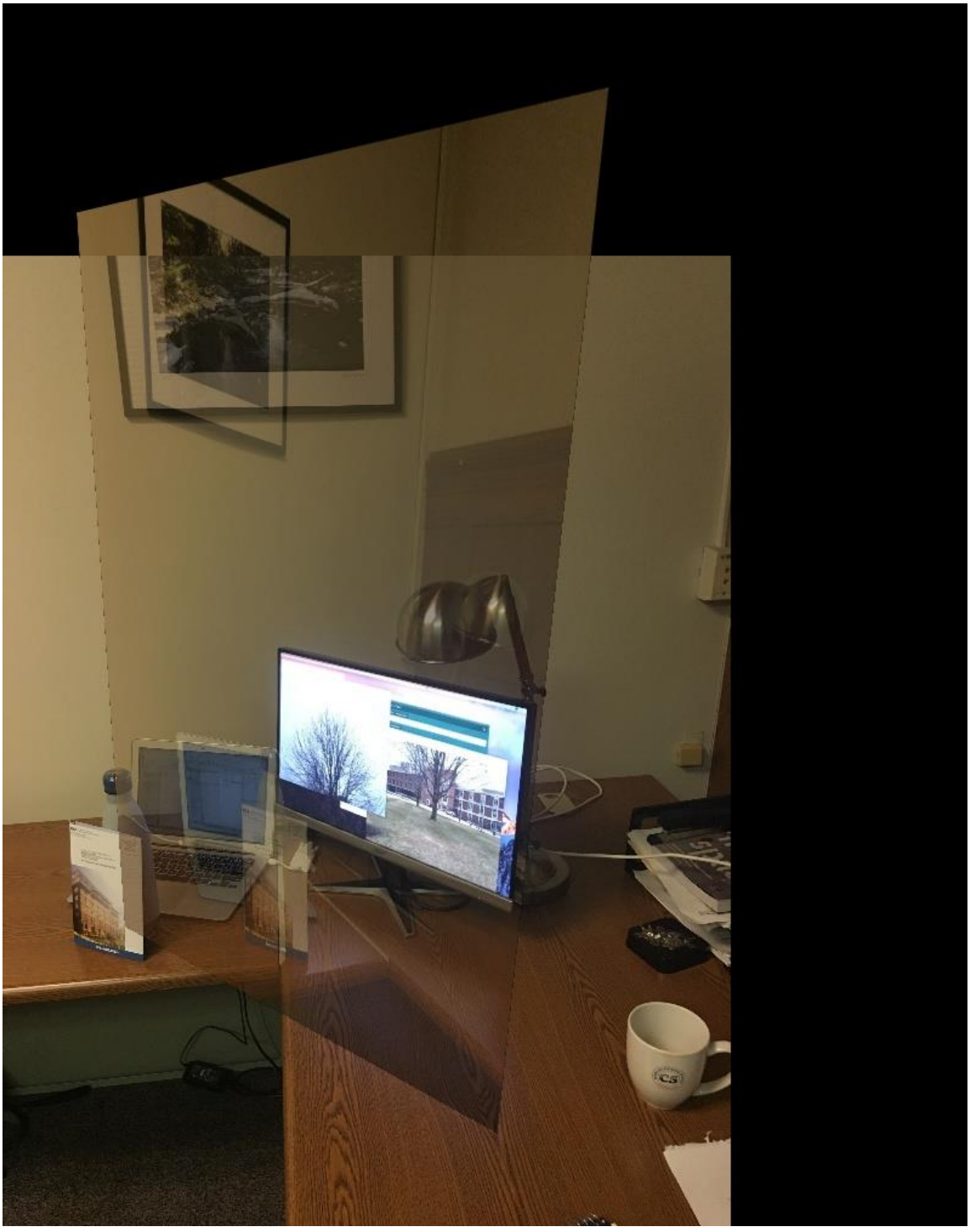

Image 4

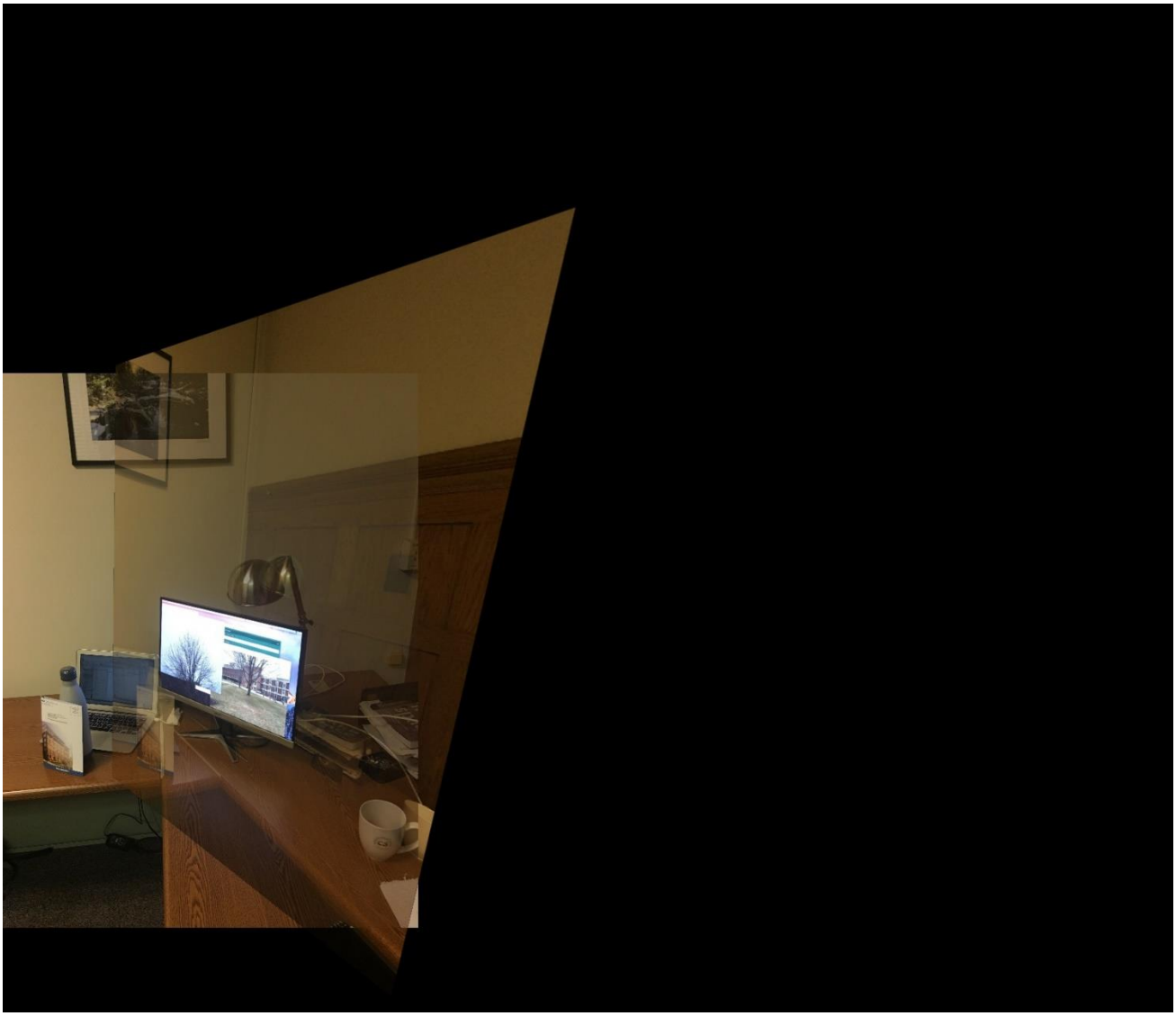

Image 5

Image Pairs	Matches	F Inliers	H Inliers	Decision
Drink Machine				
Image1: 3607 Image2: 4707	315 Fraction: 0.087 Fraction: 0.066	172 Over matches: 0.546		No. Few inliers, Different scenes
Image1: 3607 Image3: 3683	122 Fraction: 0.034 Fraction: 0.033			No. Few matches, Different scenes
Image2: 4707 Image3: 3683	368 Fraction: 0.078 Fraction: 0.01	224 Over matches: 0.609		No. Few inliers, Different scenes
Frear Park				
Image1: 668 Image2: 863	152 Fraction: 0.228 Fraction: 0.176	147 Over matches: 0.967	132 Over F: 0.898	Yes. Over 0.65 percent inliers.
Office				
IMG2536: 667 IMG2537: 610	257 Fraction: 0.385 Fraction: 0.421	222 Over matches: 0.864	168 Over F: 0.757	Yes. Over 0.65 percent inliers.
IMG2536: 667 IMG2538: 751	153 Fraction: 0.229 Fraction: 0.204	95 Over matches: 0.621		No. Few inliers, Different scenes
IMG2537: 610 IMG2538: 751	121 Fraction: 0.199 Fraction: 0.161	78 Over matches: 0.645		No. Few inliers, Different scenes
Tree mrc				
Image1: 6861 Image2: 7277	1613 Fraction: 0.235 Fraction: 0.222	1535 Over matches: 0.952	1377 Over F: 0.897	Yes. Over 0.65 percent inliers.
Image1: 6861 Image3: 5997	505 Fraction: 0.074 Fraction: 0.084	400 Over matches: 0.792		No. Few inliers, Different scenes
Image1: 6861 Image4: 5475	109 Fraction: 0.016 Fraction: 0.020			No. Different scenes
Image2: 7277 Image3: 5997	1289 Fraction: 0.177 Fraction: 0.215	1184 Over matches: 0.919	896 Over F: 0.757	Yes. Over 0.65 percent inliers.
Image2: 7277 Image4: 5475	311 Fraction: 0.043 Fraction: 0.057			No. Few matches, Different scenes
	734	613	406	Yes.

Image3: 5997 Image4: 5475	Fraction: 0.122 Fraction: 0.134	Over matches: 0.835	Over F: 0.662	Over 0.65 percent inliers.
VCC Entrance				
 Image1: 2337 Image2: 4457	964 Fraction: 0.412 Fraction: 0.216	881 Over matches: 0.914	454 Over F: 0.515	No. Less than 0.65 percent inliers.
 Image1: 2337 Image3: 491	125 Fraction: 0.053 Fraction: 0.255	34 Over matches: 0.272		No. Few inliers, Different scenes
 Image2: 4457 Image3: 491	202 Fraction: 0.045 Fraction: 0.411			No. Few matches, Different scenes.