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CS 4474
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Assignment 7 – Feature Detection

Code Implementation:

Before I started coding, I looked at the steps provided and researched what I would be doing at each step. SIFT quickly popped up a lot of documentation. So using this information, I built my first version of this code. It didn't work. But luckily in my research I came across ORB. Using the ORB documentation, I created my detectAndCompute() function. I tried creating detect and compute separately and as a single unit to see which one was more accurate with my images. I discovered that detect and compute as a single unit was the most accurate. I read up on hamming API and created a brute force matcher using the descriptors from the key points that had just found that used hamming and set the crossCheck to true. This function matched key points from image one to similar key points in image 2. I set matches to this brute force matcher and then sorted by distance. I then took a slice of my matches list from the first element to the tenth to get the ten best matches.

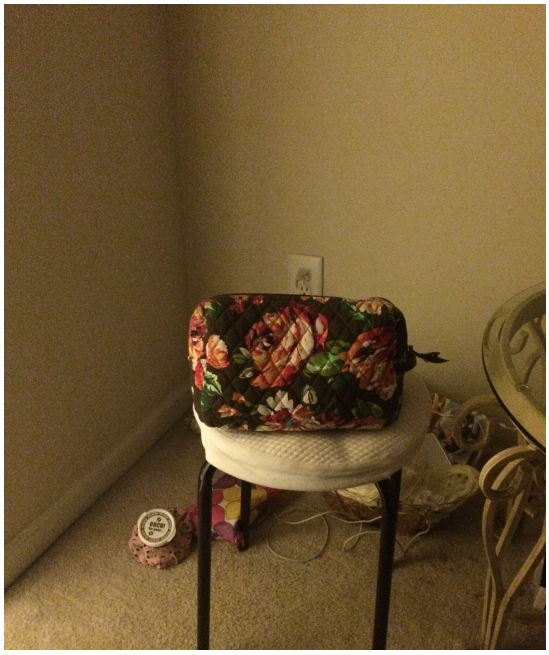
Picture Implementation:

I originally started off my trying to match the features of my roommate's teddy bear that I sat on my bed. I ran the images that I took through the test file and was frustrated to discover that the code has feature detected the background images instead of the teddy bear. I assumed that maybe the teddy bear didn't have distinct enough features, so I tried the same thing with my face. Again, the background matched up perfectly, but not my face. So I figured the background was too busy. So I set the teddy bear on a stool in front of a white wall. I propped the teddy bear up with my make-up bag and repeated the process. This time the code perfectly matched up the pattern on my makeup bag. This caused a light bulb to go off in my head. Maybe the bright pattern of my makeup bag was the key! So I repeated the

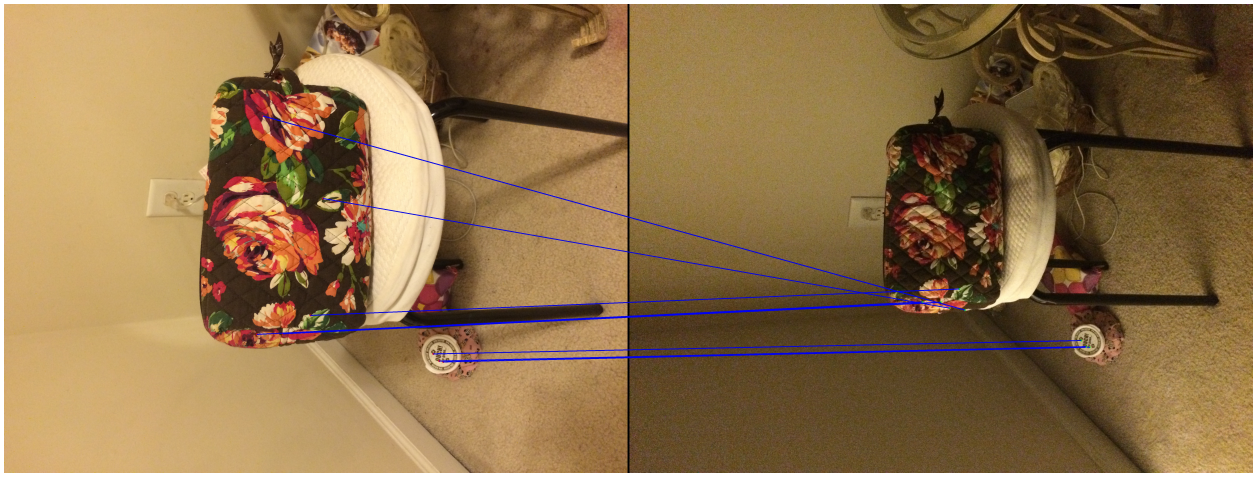
process again with my makeup bag. The implementation with the loud pattern of the makeup bag was much more accurate and many more of its features were detected than with previous attempts with different objects.

Lighting Photos:

image_1.jpg



lighting_2.jpg



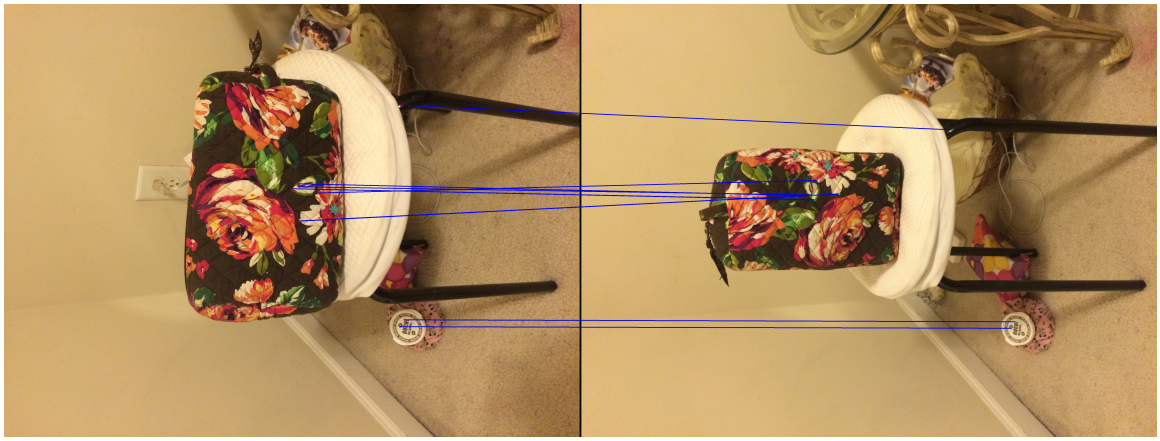
matches.jpg

1. My algorithem got 7/10 matches correct. This includes four matches on the bag and three matches on the ice pack on the floor. I think this is the least accurate of all of the attempts because of the lighting change and the positioning of the light. The lighting change can manipulate the colors on the bag, thus confusing the algorithm that relies on finding images that are extemely similar. If you look closely, one can see that the side of the bag closest to the light source has the most acurate matches.
2. I attemped each image multiple times with different objects. The bag had the most acurate matches. I believe this is do to the large contrasting pattern that has very dominat features.

Rotation Photos:

image_1.jpg

rotation_2.jpg



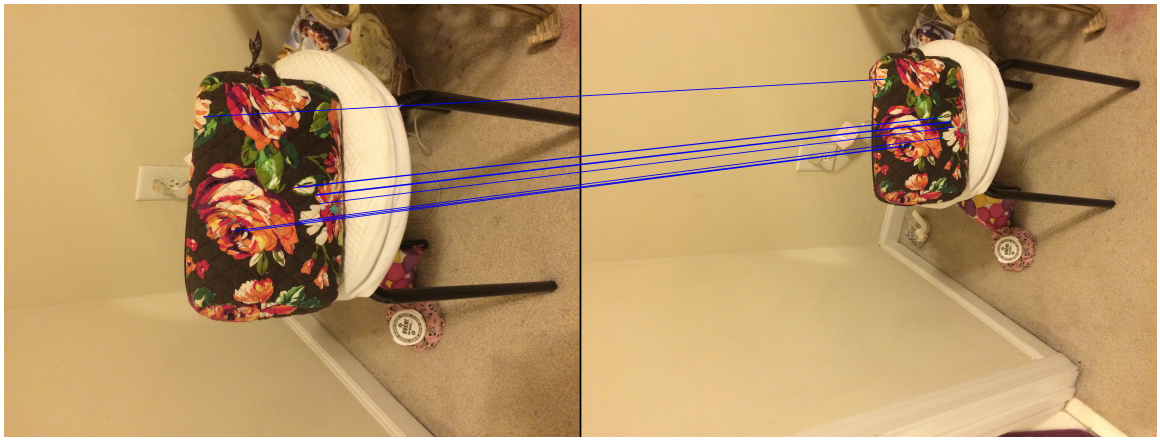
matched.jpg

1. This image got 10/10 features correct during the matching process. I was very carful to keep the lighting and the distance the same in each picture and only manipulate the orientation of the object itself. I believe that this is why the image was so successful.
2. This image was not successful on the first try. I had changed my position for the rotation image and this messed up the feature detection as the algorithm has more trouble pinpointing the features. I solved this by pulling the original image up on my computer, then lined the rotation image up distance and orientation wise with the image on the screen. I then set a marker on the floor for the previous images so I would know where to stand for the best images possible.

Sample Photos:

image_1.jpg

image_2.jpg



matches.jpg

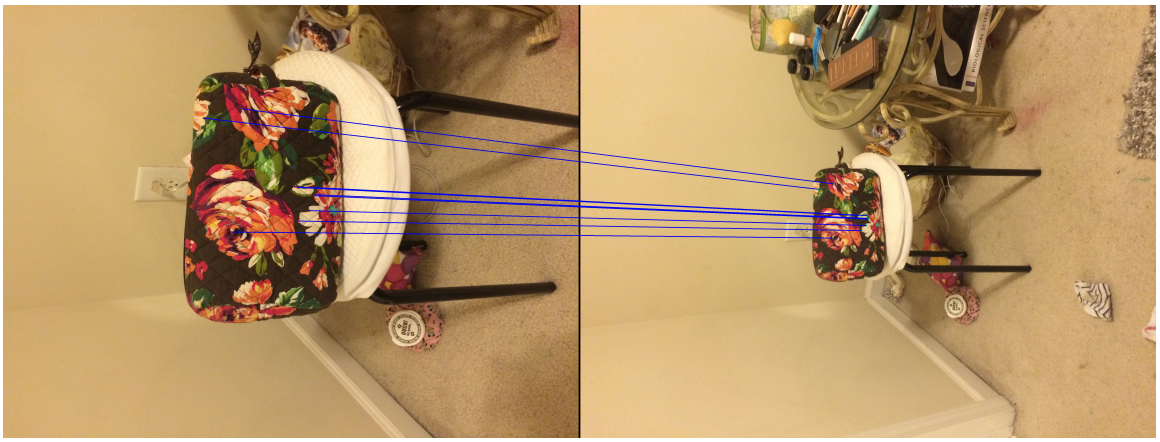
1. The algorithm got 10/10 feature matches for this set as well. I believe this is because I had the lighting the same and the object in the exact orientation. I simply slid to the left a bit from my marker and snapped this photo. Again, I tried my best to only manipulate one variable at a time.

2. Due to the addition of a picture marker in the previous set, I was able to take this picture in one try and get all the features lined up. I was honestly very pleasantly surprised.

Scale Photos:

image_1.jpg

scale_2.jpg



matches.jpg

1. Again, I got all 10 matches correctly! I kept the lighting and orientation the same and took three steps back from my marker to change the scale of my makeup bag. I was a little worried because with the scale image, there was more of the

background visible. I even had another makeup bag with a loud pattern visible. But I think since image _1 was very plain, the subject of the photo was the only thing with detectable features so it matched up well with scale_2.

2. This is another photo that I only had to do once. I got a lot of practice from the previous objects that I had photographed (that didn't work out) so by the time I was taking my last image I was very experienced.