

CSE 473/573 - Computer Vision and Image Processing

Project # 2

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Task 1: Background Stitching.

In this task we are given two images that have some overlapping background and some objects in the foreground. Our goal of the task is to stitch the images and removing the foreground using the difference between the two images.



Img1

img2

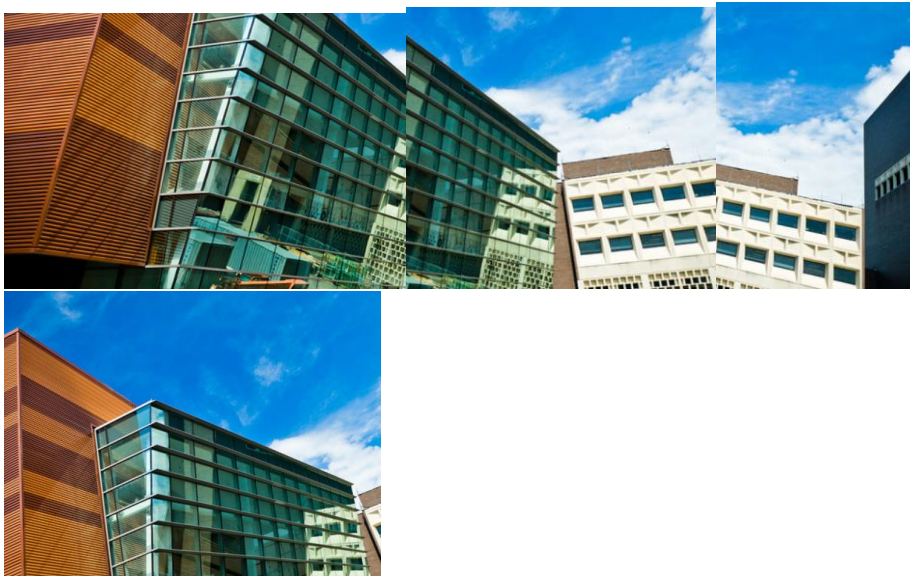
To Stitch the images

1. I need to find features of the individual images using SIFT feature detector.
2. To find the matches between the image descriptors I have used L2 norm. A match is considered, if the ratio of the matches is greater than 0.8.
3. The KeyPoints of the corresponding matches are extracted for both the images.
4. Passing these matched KeyPoints into findhomography function, I have obtained the homography matrix.
5. Using the homography matrix along with warp perspective function I warped the img1.
6. And I have placed img2 on top of the warped image.
7. Till now I was able to attach the two images but the foreground in one of the images remained in the attached image.
8. To remove that foreground, I used a patch technique. I selected a patch size of 2 and started checking the average of the patch size in both the images (warped image and img2). Patch matching is done across all over the image.

9. I had maintained a condition that if the difference between the average of patch of img2 and the average of the patch of warped image should be greater than zero. I replaced the patch of warped image by the patch of img2 when the condition is satisfied.
10. This gives up the warped image in which the foreground of the img2 is replaced with the pixels of warped image.
11. The final image is below.



Task 2: Image Panorama



In this task we are given a set of images that may or may not overlap with other images. We are given a task to find which images overlap and return an overlap matrix. And also, we need to stitch all the images into a single image and save the image.

To find the overlap matrix, I did the following steps.

1. I need to find features of the individual images using SIFT feature detector.
2. To find the matches between the image descriptors I have used L2 norm. A match is considered, if the ratio of the matches is greater than 0.8.
3. The count of these matches is maintained. And the ratio of matches with the total descriptors of each image is extracted and the max of the ratio is stored and if this is greater than 0.2 then the images are considered as overlapping.
4. Then the matrix element is updated to 1 if the images overlap.
5. After stitching all the images, the overlap matrix is returned

```
[[1 1 0 1]
 [1 1 1 1]
 [0 1 1 0]
 [1 1 0 1]]
```

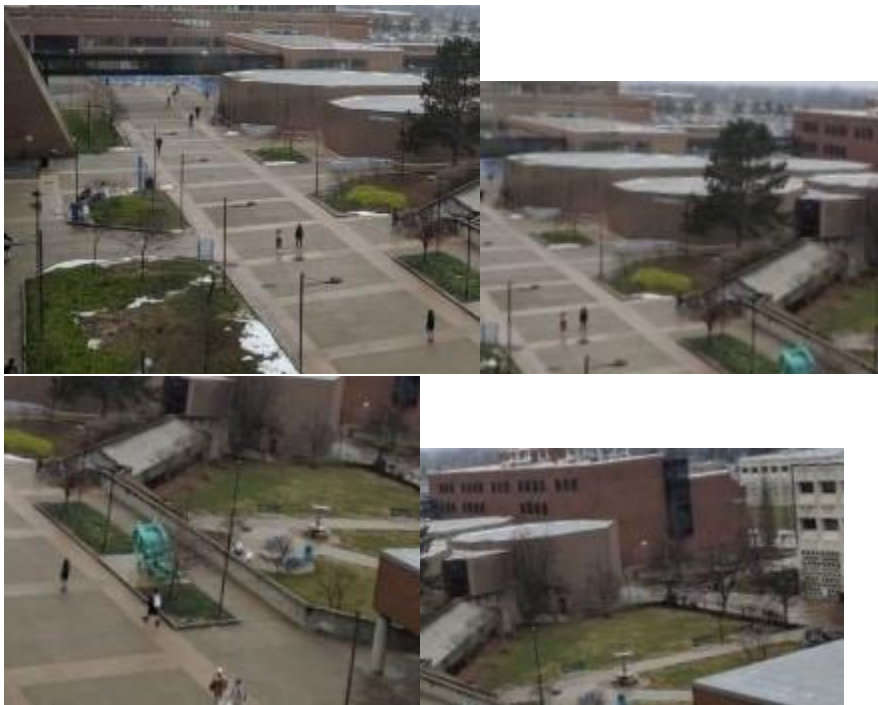
To stitch the images.

1. I created a function called `stitch_twoimgs` where we can stitch two images. This function is called till all the images are stitched together.
2. The function has the below flow of execution
3. I need to find features of the individual images using SIFT feature detector.
4. To find the matches between the image descriptors I have used L2 norm. A match is considered, if the ratio of the matches is greater than 0.8
5. The KeyPoints of the corresponding matches are extracted for both the images.
6. Passing these matched KeyPoints into `findhomography` function, I have obtained the homography matrix.
7. Using the homography matrix along with `warp perspective` function I warped the intermediate panorama image and the new image is added on top of the warped image. This process is repeated.
8. I have implemented a logic to find the starting points where to start the overriding the image.
9. The final output is as below.



Task 3: Bonus Point:

I have taken the following images to stitch into one image.



I have obtained the following image as output after stitching these images.

