AIN433 Introduction to Computer Vision Lab. Assignment-3

Alperen Ozcelik
21992995
Department of Artificial Intelligence Engineering
Hacettepe University
Ankara, Turkey
b21992995@cs.hacettepe.edu.tr

Overview

Our goals in this assignment is merge sub-images provided by using keypoint description methods and obtain a final panorama image that including all scenes in the sub-images.

1 Feature Extraction and Feature Matching

First of all, as usual, I read the file in the dataset that I chose, which contains sub images, and put all the images in this file into an array.

Later in this section, I used the SIFT method for feature extraction. I found and mapped the keypoints in these two images with the help of the euclidean distance after the SIFT method.

And I did this inside my extract and match features function. It is enough to give only two images to be matched as parameters.

2 Finding Homography

Homography is a transformation that describes the relationship between any two images of the same plane in space. It is an isomorphism of projective spaces, and have been used to explain the difference in appearance of two planes observed from different points of view. Homographies can be represented as a 3 x 3 matrix which can be multiplied with any point in the original image to describe where that point lies in the transformed image.

We need at least 4 correspondeces between the two images. So we use feature ectraction and matching parts because of this.

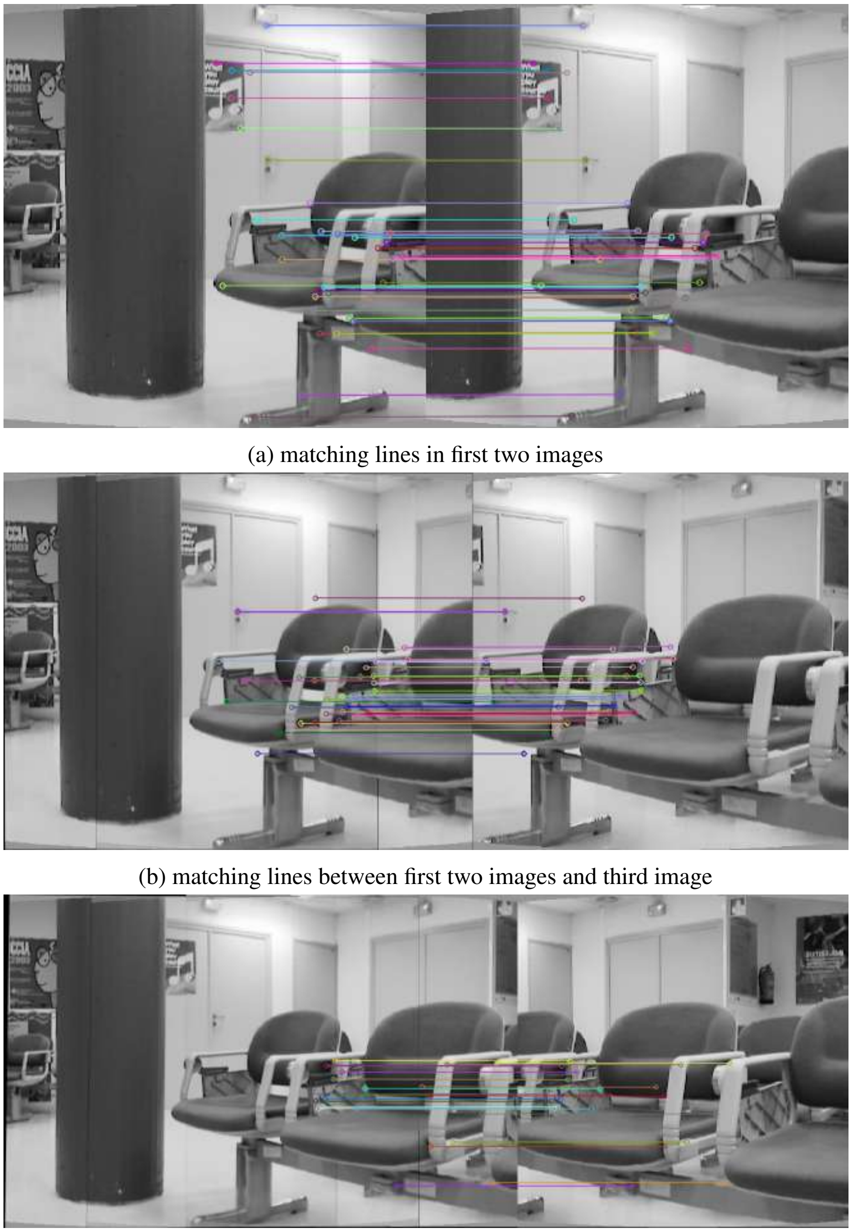
2.1 RANSAC Method

In SIFT, we first generate keypoints and the feature vector for each keypoint. For each keypoints, we look for a good match. The set of good matches forms a set of possible inliers. Then, I applied RANSAC method.

I randomly pick four good matches, compute a homography from these four, and test how good this homography is by checking how many of the good matches are consistent with the homography. Good matches that are consistent with the homography are called inliers. I count the number of outliers for this homography. Then, I do this iteration 1000 times in my code. Each iteration derives a homography and counts the number of outliers associated with it.

2.2 Feature Point Matching Lines Examples

I show first three feature point matching lines in three different dataset.

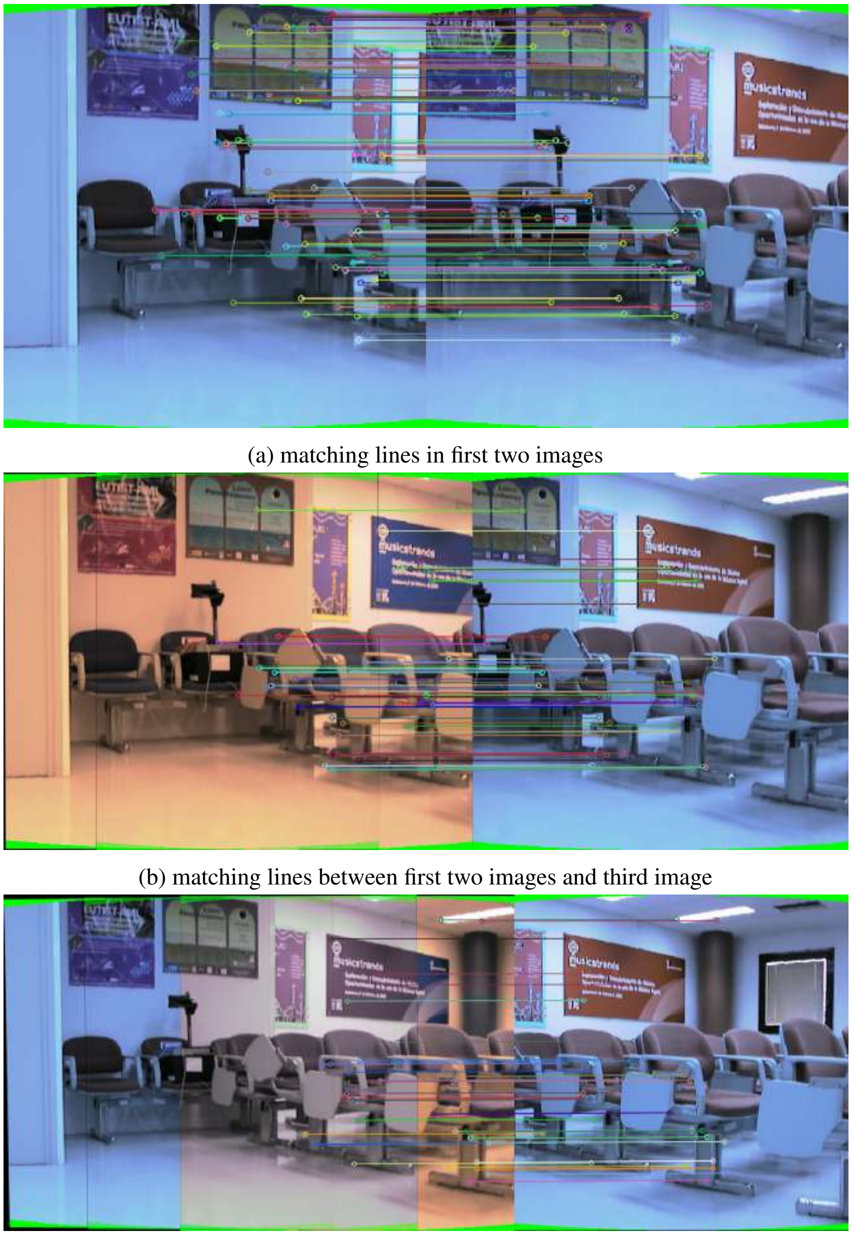


(a) matching lines in first two images

(b) matching lines between first two images and third image

(c) matching lines between first three images and fourth image

Figure 1: My outputs in first dataset

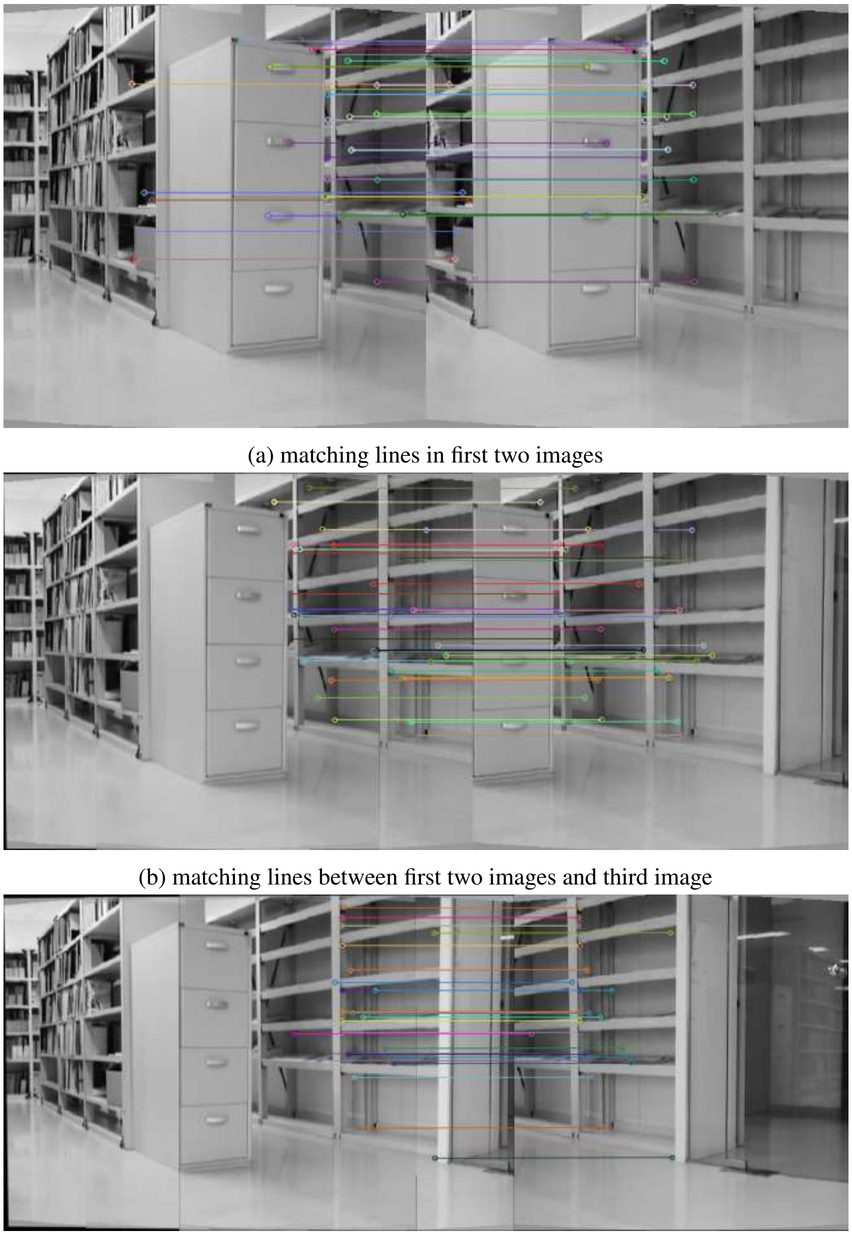


(a) matching lines in first two images

(b) matching lines between first two images and third image

(c) matching lines between first three images and fourth image

Figure 2: My outputs in second dataset



(a) matching lines in first two images

(b) matching lines between first two images and third image

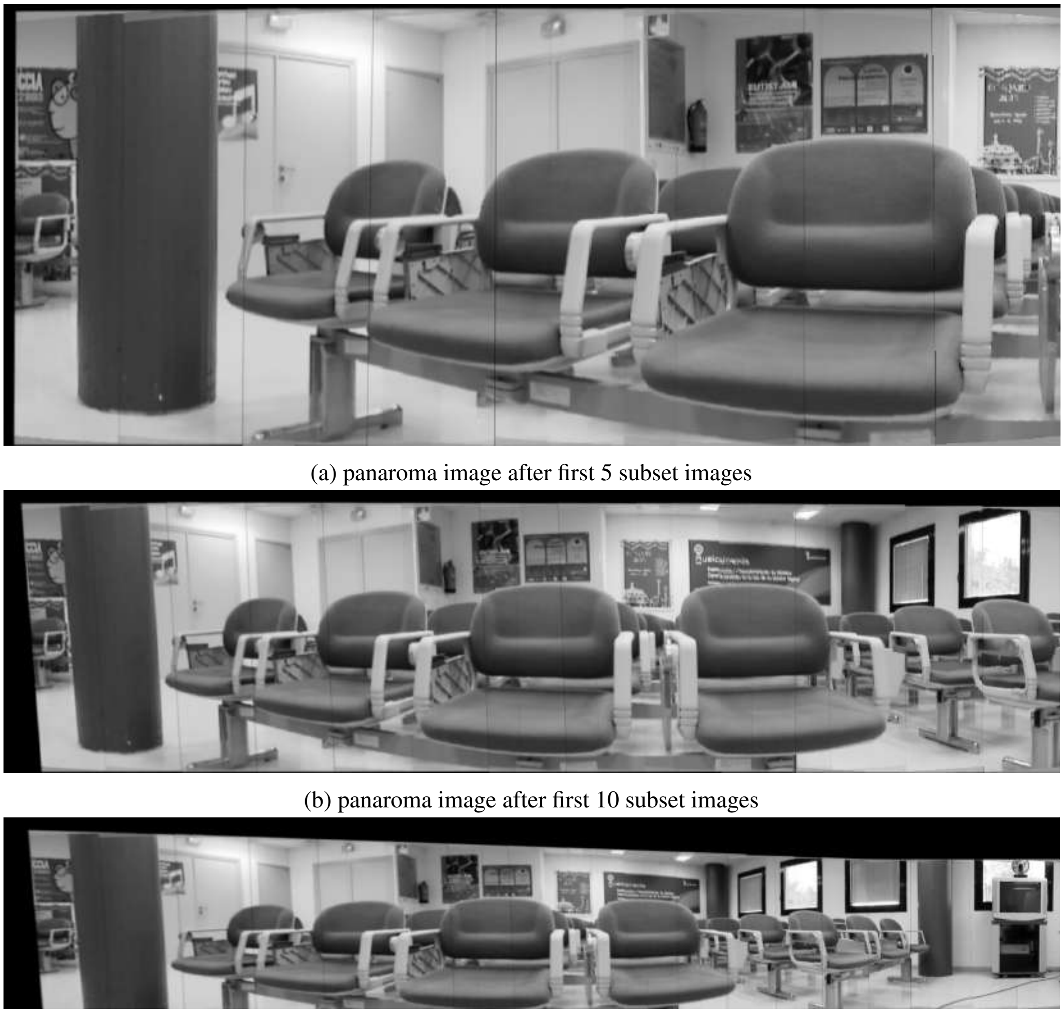
(c) matching lines between first three images and fourth image

Figure 3: My outputs in third dataset

3 Merging by Transformation

At this stage, we need to combine the 2 images that we have mapped the kekypoints and obtained the homography matrix by applying the ransac method. I wrote a function called stitching for this.

In it we need to put 2 images and homography matrices that need to be combined as parameters. I also applied some small wrapping-style operations to make the output come out more smoothly, and I returned the panoramic image at every stage.

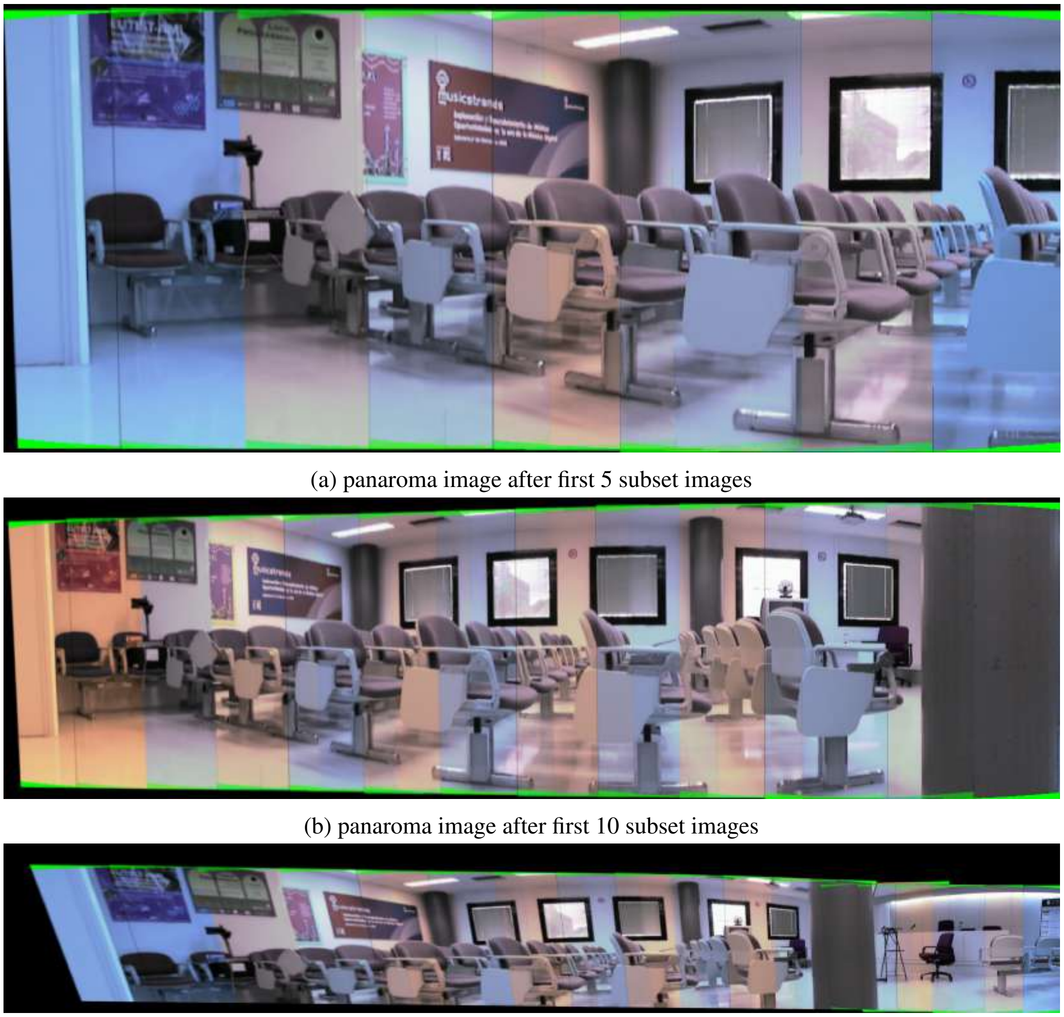


(a) panaroma image after first 5 subset images

(b) panaroma image after first 10 subset images

(c) My panaroma image output

Figure 4: My outputs in first dataset

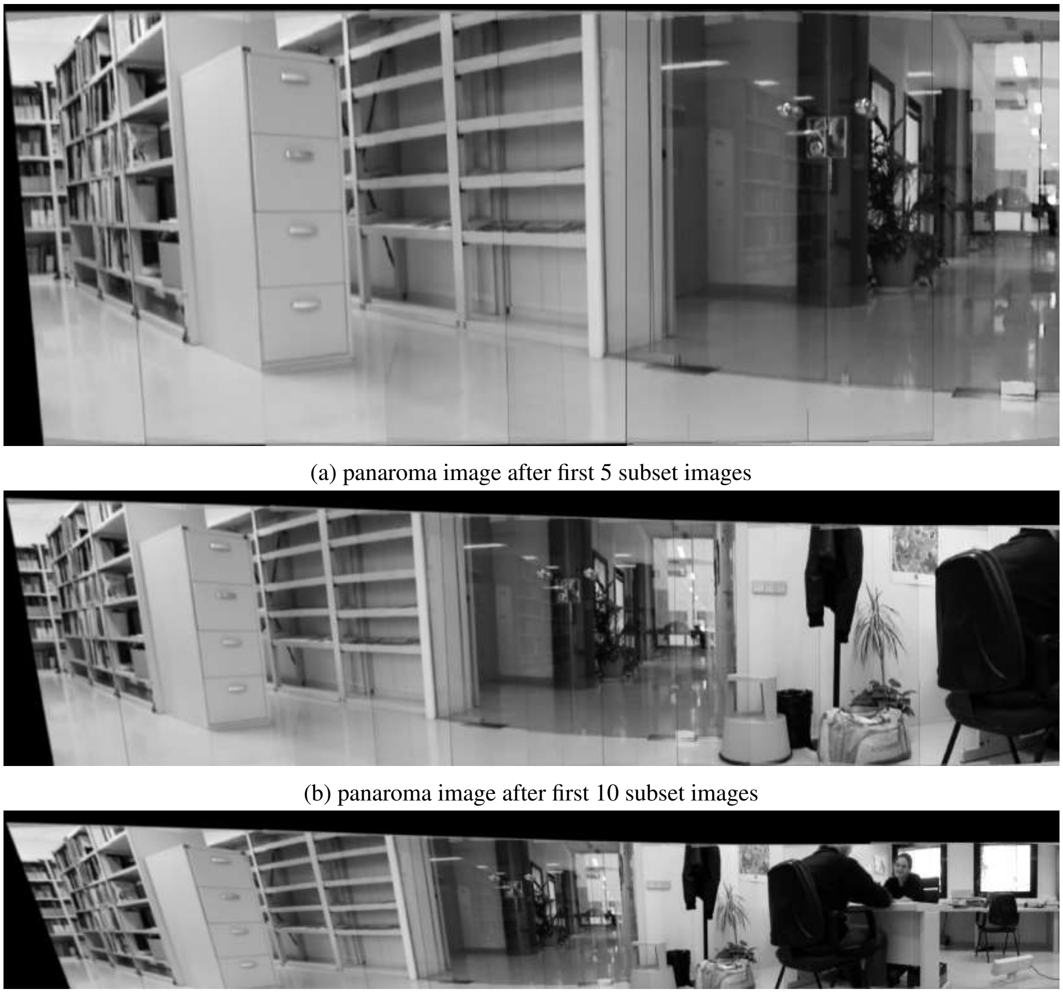


(a) panaroma image after first 5 subset images

(b) panaroma image after first 10 subset images

(c) My panaroma image output

Figure 5: My outputs in second dataset



(a) panaroma image after first 5 subset images

(b) panaroma image after first 10 subset images

(c) My panaroma image output

Figure 6: My outputs in third dataset

References

[1] https://dergipark.org.tr/tr/download/article-file/1198997

[2] https://medium.com/all-things-about-robotics-and-computer-vision/homography-and-how-to-calculate-it-8abf3a13ddc5

[3] http://www.iiia.csic.es/ aramisa/datasets/iiiapanos.html

[3] AIN431 Lecture Notes