NUS

National University
of Singapore

Faculty of Engineering

EE5731: Visual Computing
Assignment 1 Report: Panoramic Image Stitching

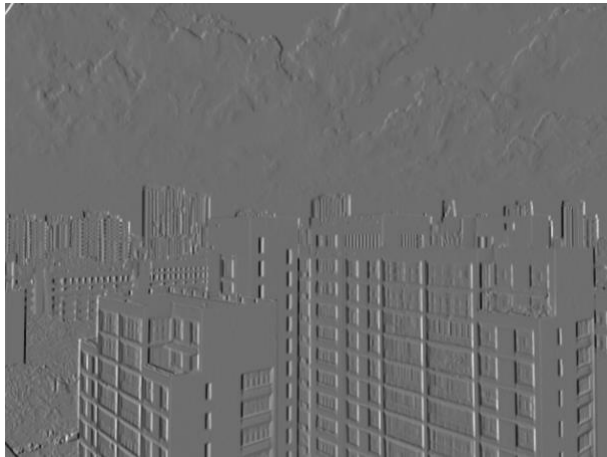for assignment deadline: October 1, 2019 at 5pm

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Part 1: 2D Convolution

Original Photo:

Sobel kernel [-1 0 1; -2 0 2; -1 0 1]:
Sobel kernel is used for edge detection.

Gaussian kernel [1 2 1; 2 4 2; 1 2 1]:

Gaussian kernel is used to make image blur.
As the size increases, the degree of blurriness increases.

Haar-like mask 1 [1 -1;-1 1]:
This mask is used to detect diagonal edges.
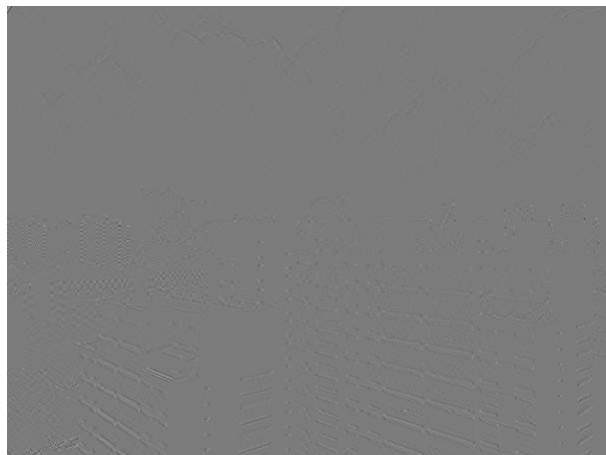
Haar-like mask 2 [-1 1 -1]:
This mask is used to contrast the intensity of the colour horizontally.

Haar-like mask 3 [-1; 1; -1]:
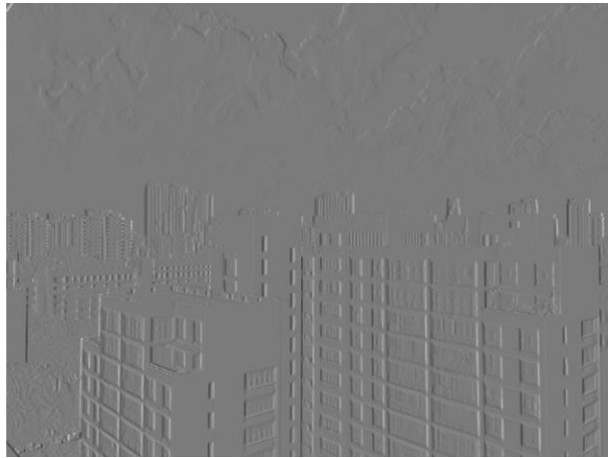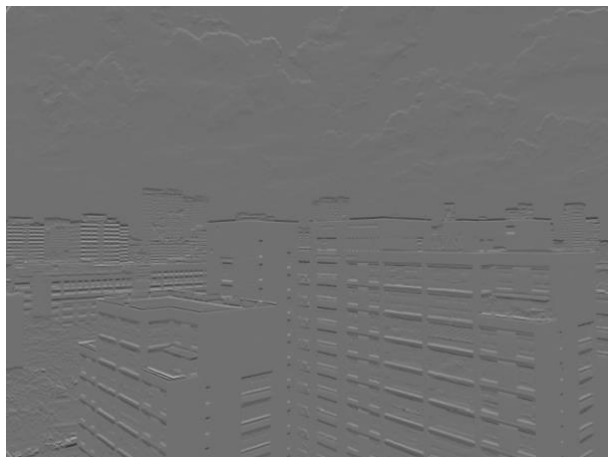This mask is used to contrast the intensity of the colour vertically.

Haar-like mask 4 [-1 1]:
This mask is used to detects horizontal edges.
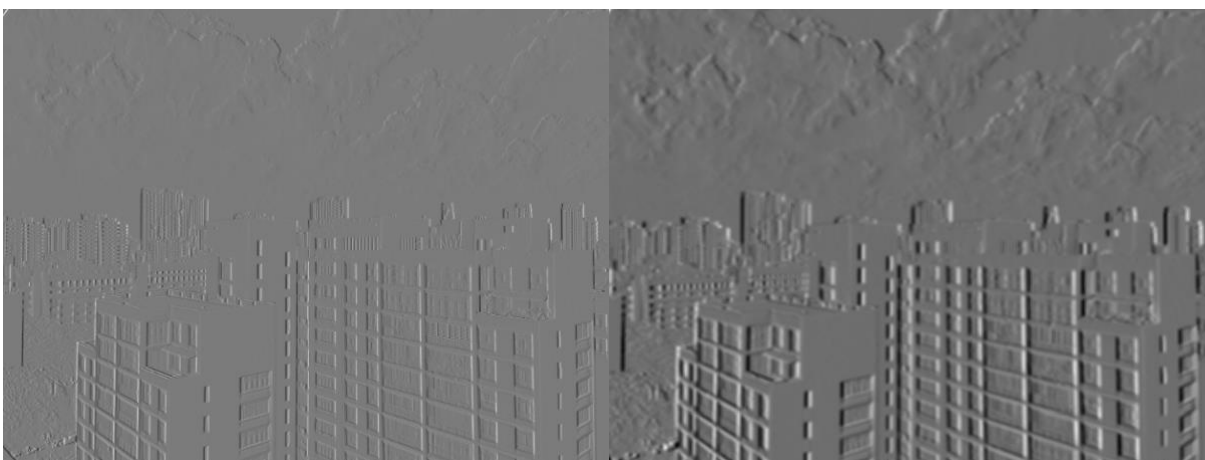

Haar-like mask 5 [-1; 1]:
This mask is used to detects vetical edges.

Comparison between Haar-like mask [-1 1] in size 1x2(left) and 4x8(right):

For all Haar-like masks, when mask size increases, it tends to ignore smaller features and detects larger features like edges.

Part 2: SIFT Features and Descriptors
As shown in the photo, all the circled points are detected as keypoints.

In the matlab code, the structure of Keypoint is as following:

Coordinates – Coordinates of the keypoint, in the order of y, x
Magnitude: magnitude of the feature
Direction: direction of the feature, as shown in the photo with blue line
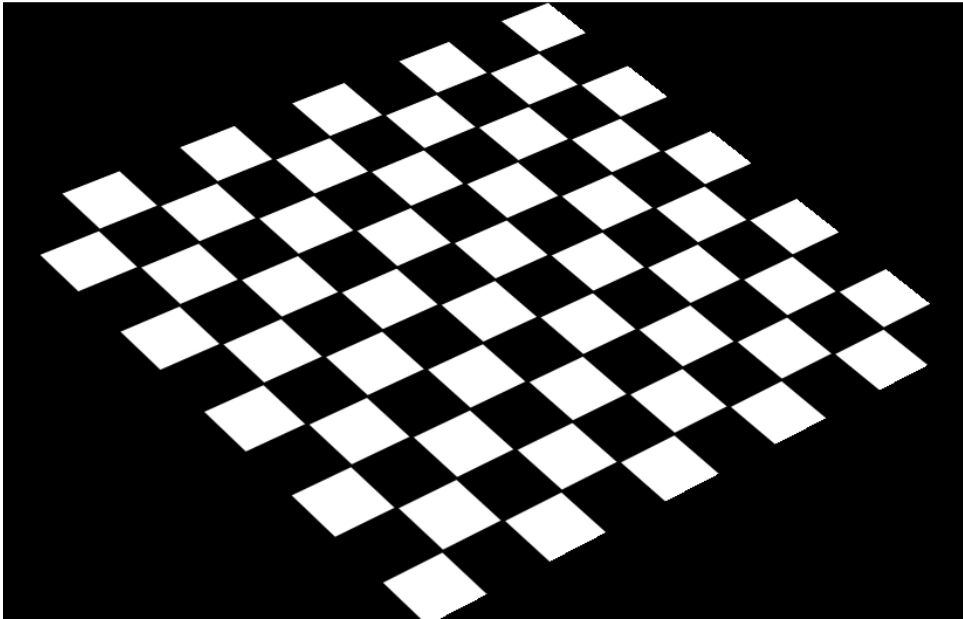Descriptor: the descriptor
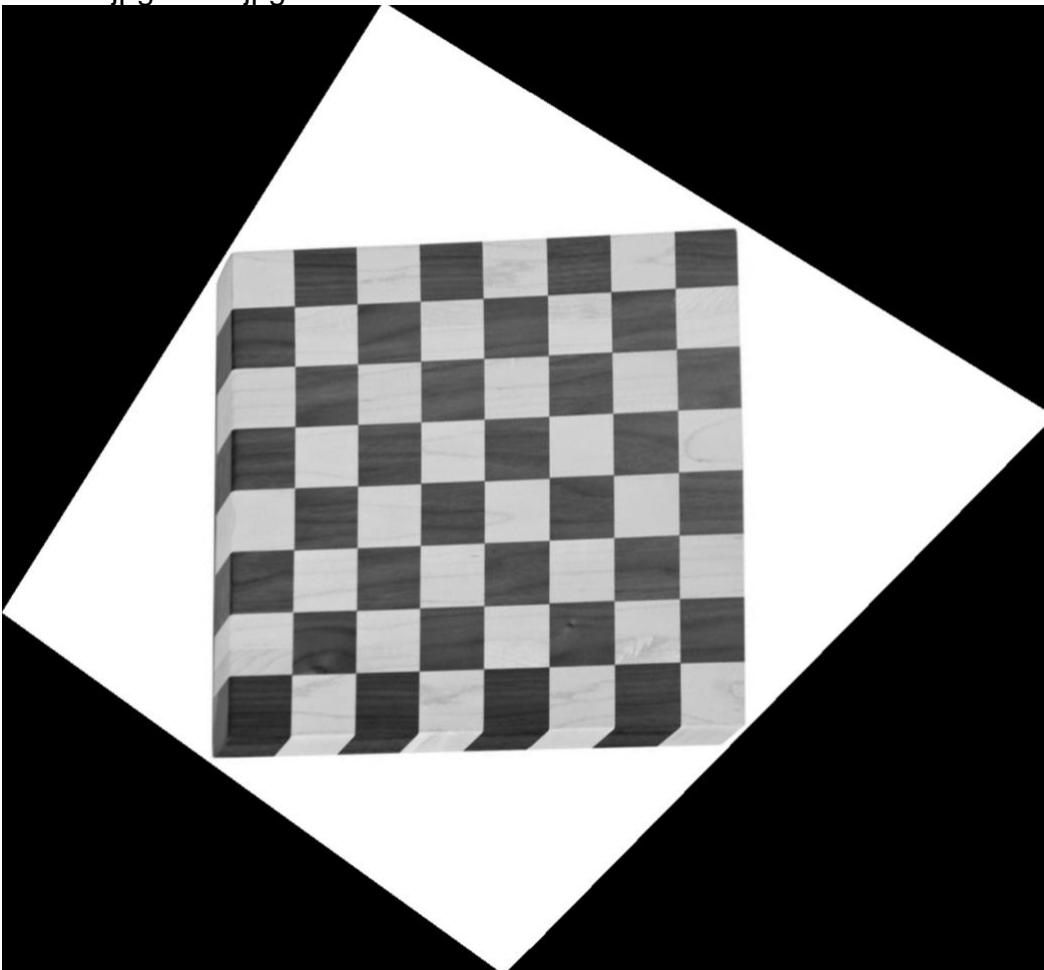Octave: Octatve in the context of SIFT
Scale: Scale in the context of SIFT

Part 3: Homography

Transform h1.jpg to h2.jpg:


Transform h2.jpg to h1.jpg:

Part 4: Manual Homography + Stitching

There is an effect of double edges in the overlapping regions between im01.jpg and im02.jpg, because the photos are actually taking from different angles, even after transformation, the images cannot be identical. The overlapping area is simple using average value of the two images.

Part 5: Part 5: Homography + RANSAC

Matched Points
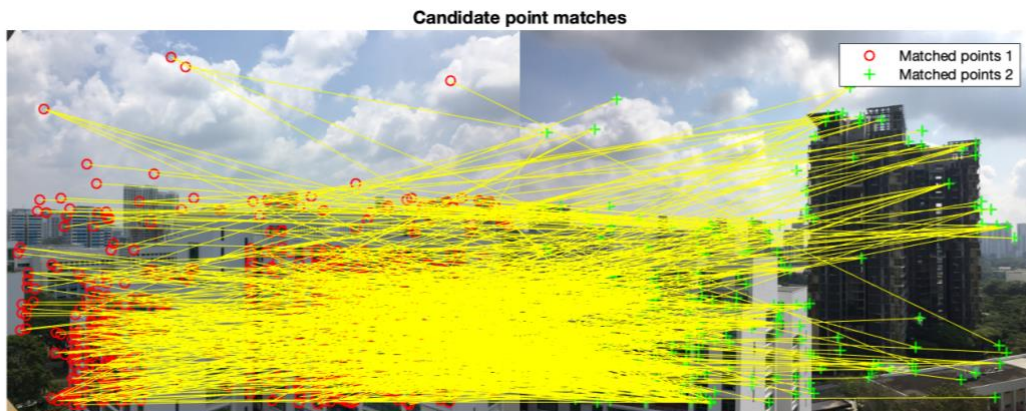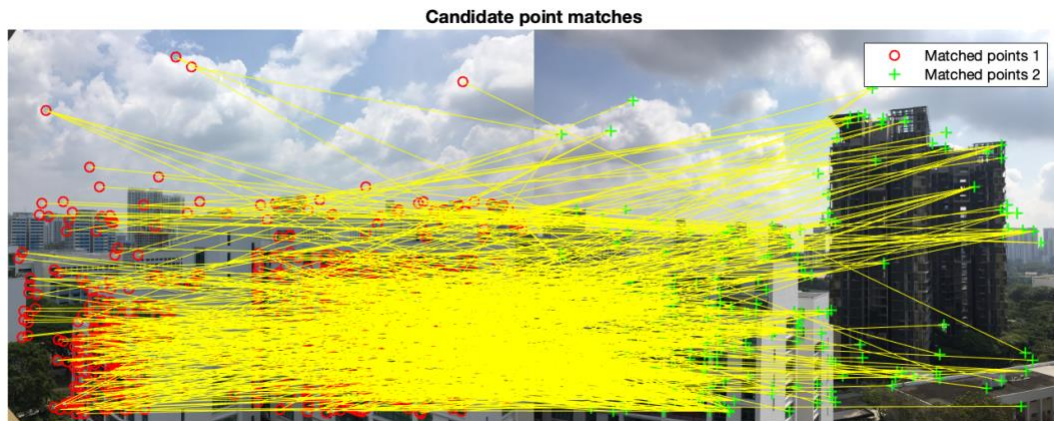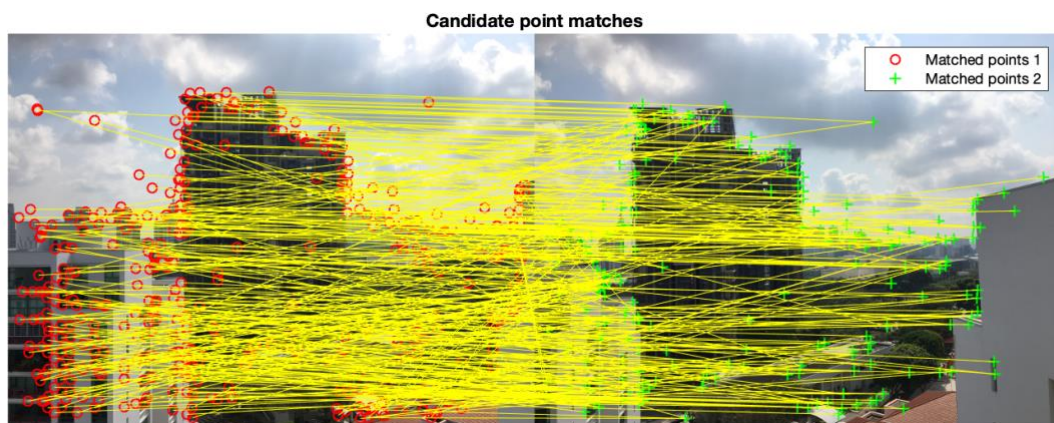

Inlier matches (67 inliers):
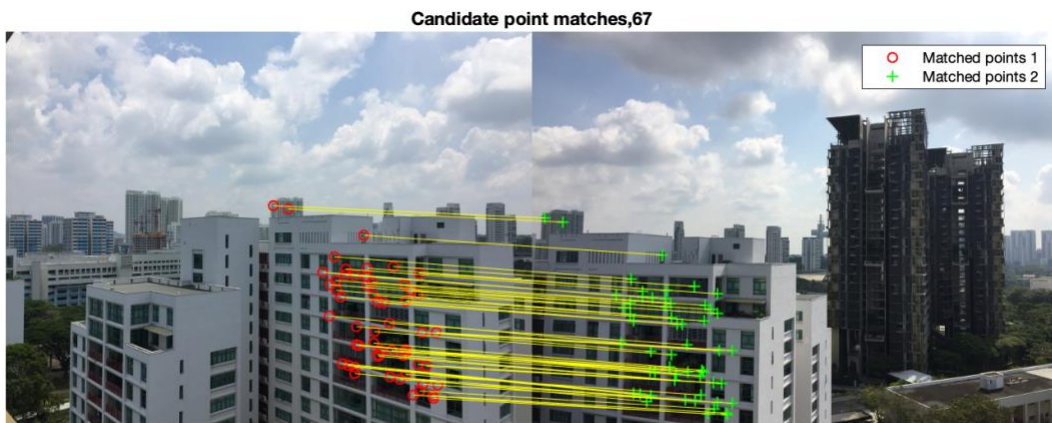
Stitched Image:

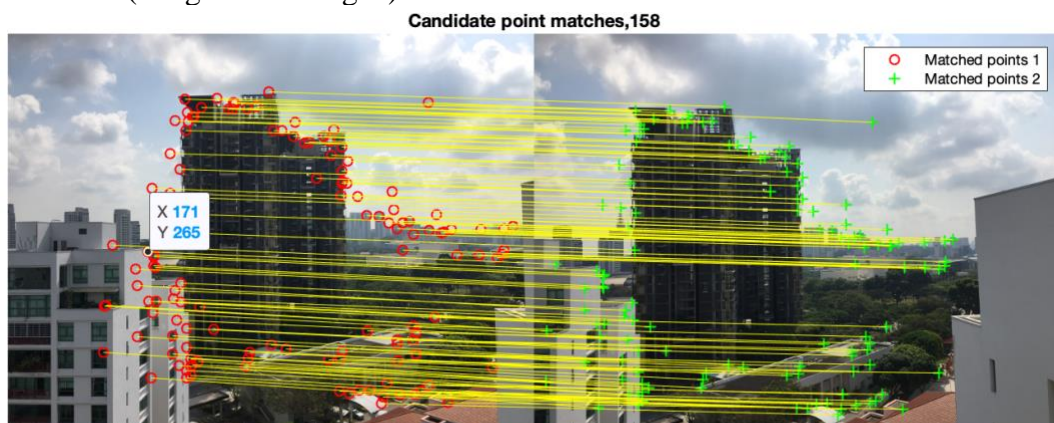# Part 6: Basic Panoramic Image

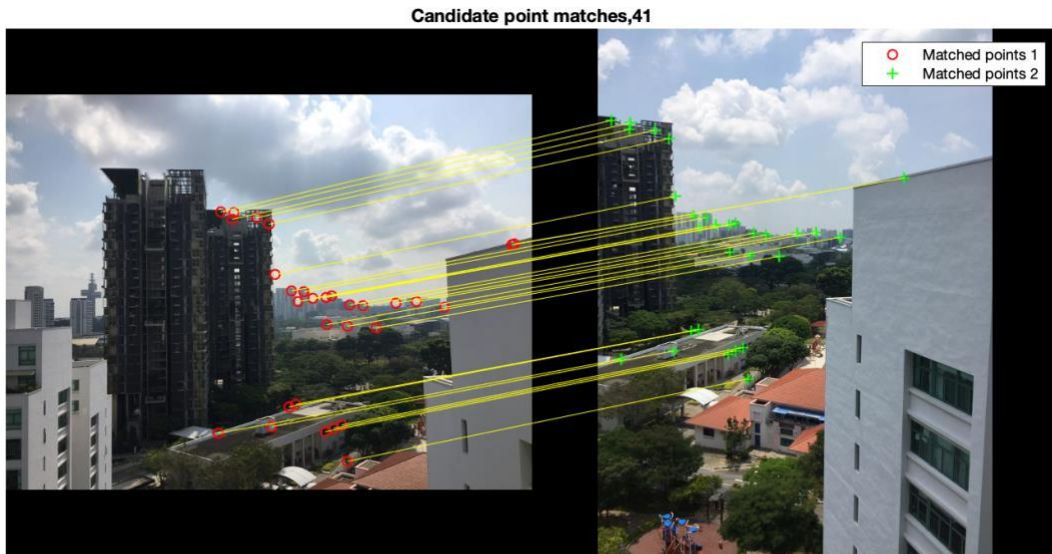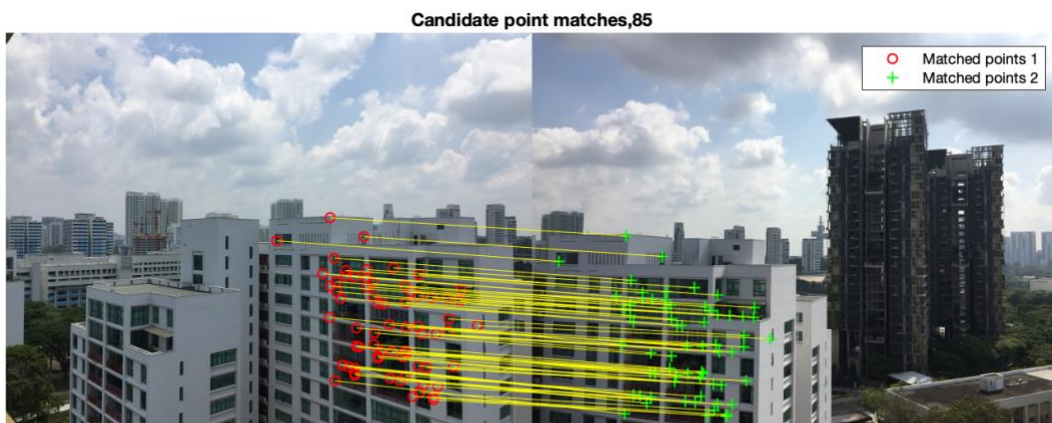Matched Points (image1 and image2):

Matched Points (image2 and image3):

Matched Points (image3 and image4):

Matched Points (image4 and image5):

Candidate point matches,41

Inlier matches (image1 and image2):

Candidate point matches,85
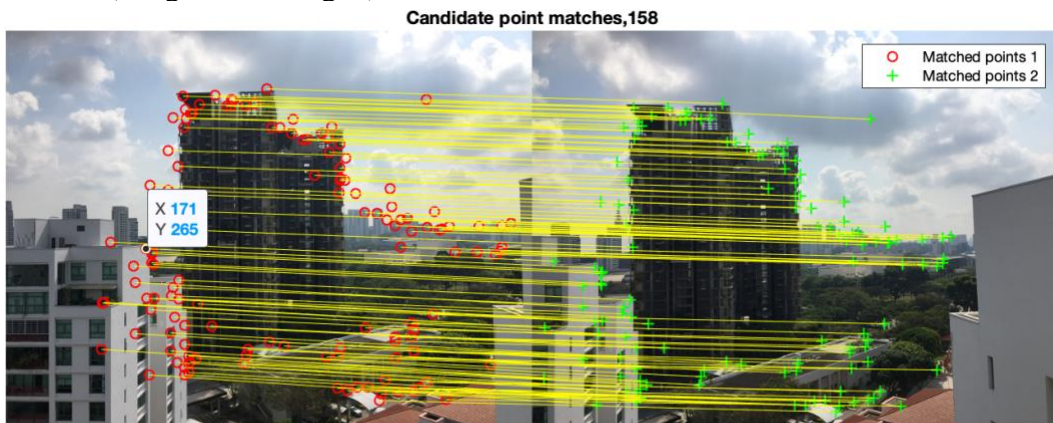
Inlier matches (image2 and image3):

Candidate point matches,188
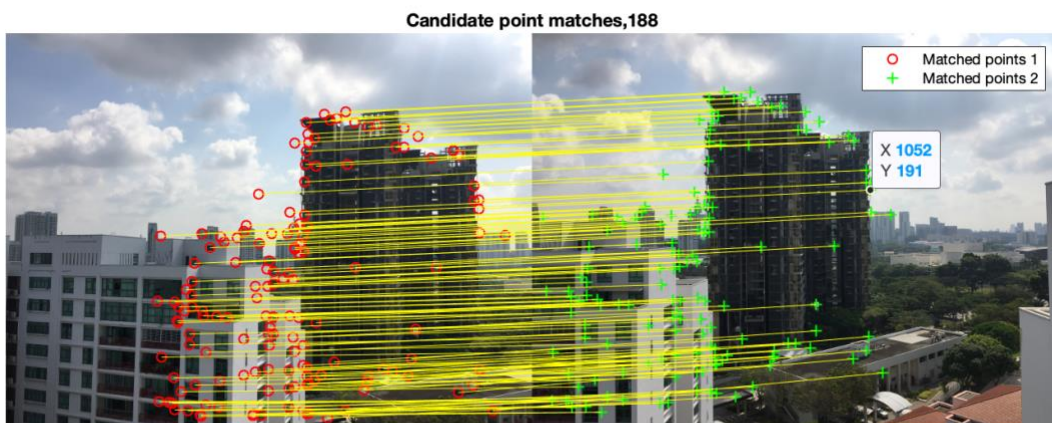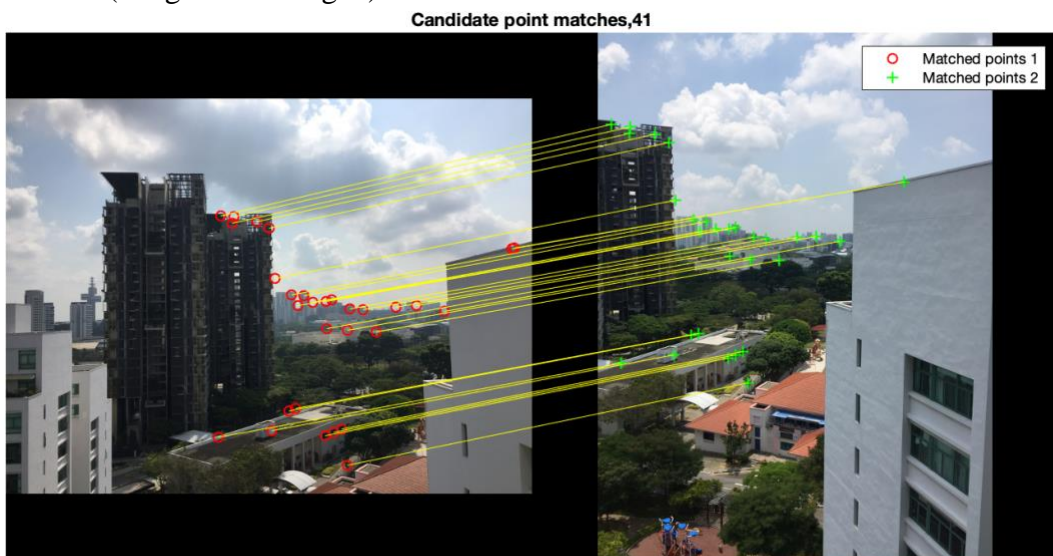
Inlier matches (image3 and image4):

Inlier matches (image4 and image5):

Final result: