Camera Lab5 Report

Camera Calibration:

Camera Calibration Parameters:

Calibration results (with uncertainties):

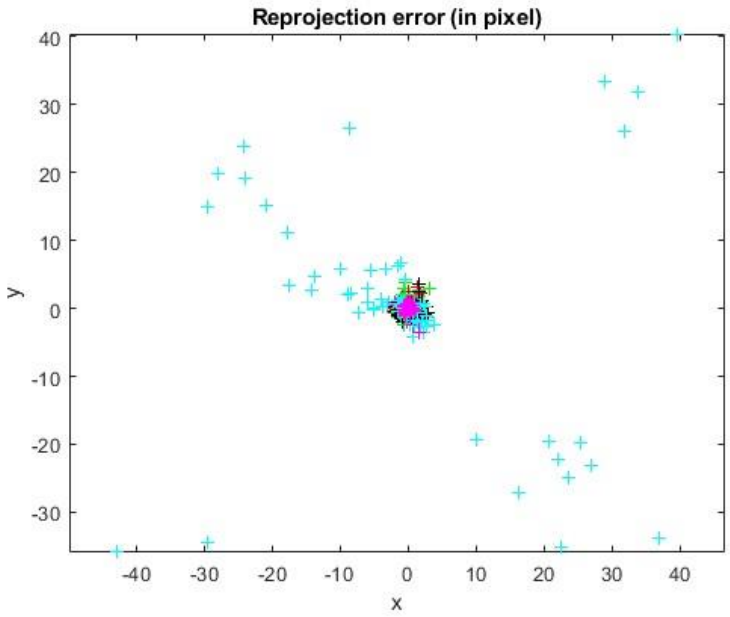
Focal Length: fc = [2907.90646 2912.33348] ± [213.10477 181.84577]
Principal point: cc = [1166.12036 2076.38695] ± [136.37465 248.97686]
Skew: alpha_c = [0.00000] ± [0.00000] => angle of pixel axes = 90.00000 ± 0.00000 degrees
Distortion: kc = [0.12765 -0.28480 0.00177 0.00001 0.00000] ± [0.17396 0.92608 0.02362 0.02152 0.00000]
Pixel error: err = [6.34348 6.05314]

Note: The numerical errors are approximately three times the standard deviations (for reference).

The image before and after the calibration:

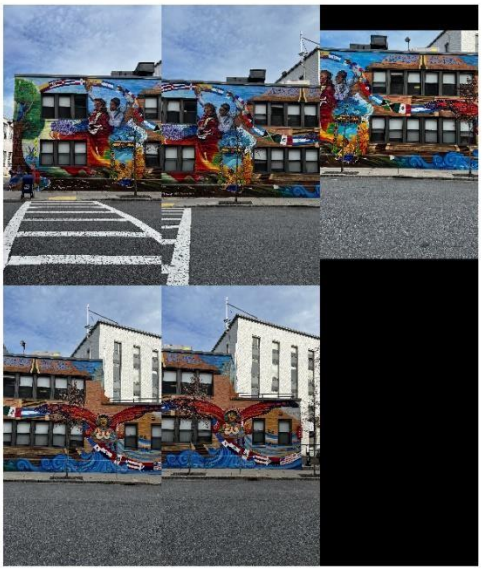
The image which is uncalibrated was uploaded into MATLAB. Using the parameters, the image is transformed by removing the distortions.

Reprojection Pixel Error:



Since we have observed very less distortion before and after calibration of the images, hence we have very less reprojection error.

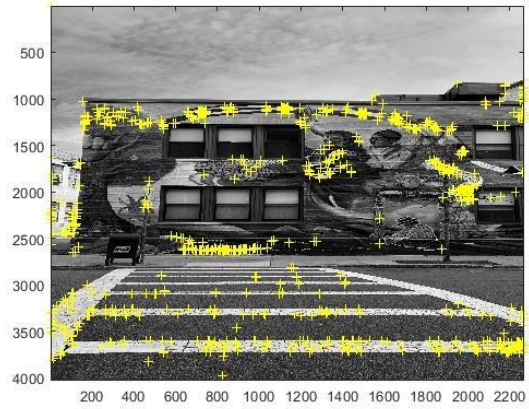
Data collection:

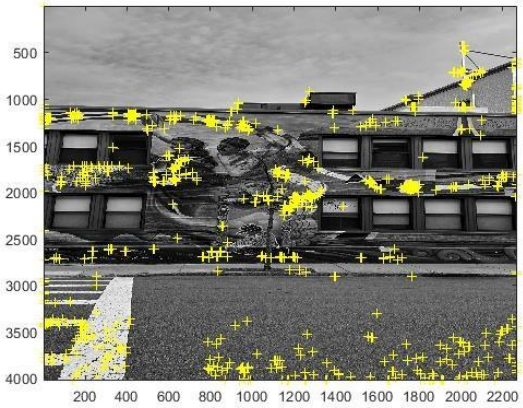


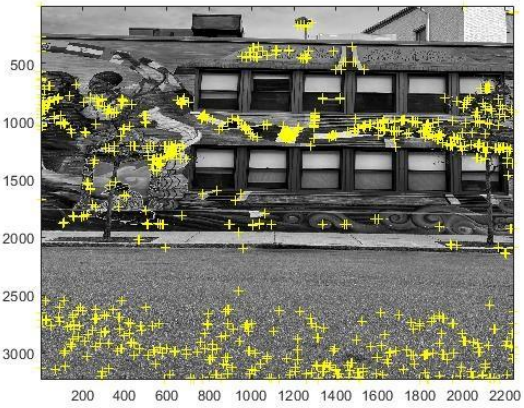
The sequential images were taken of the wall with approximately 50% and 15 % overlap between each

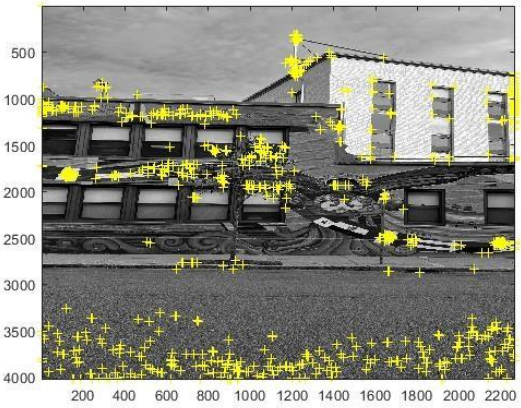
Harris feature detection:

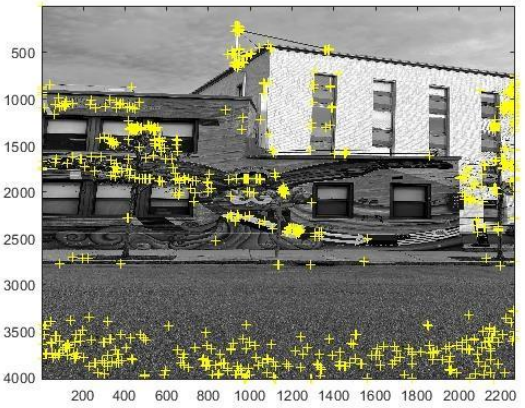
The Harris feature images are shown:











The above images are output of Harris corner detection features with parameter N = 500

Panoramic Image

The panoramic mosaic image is shown:

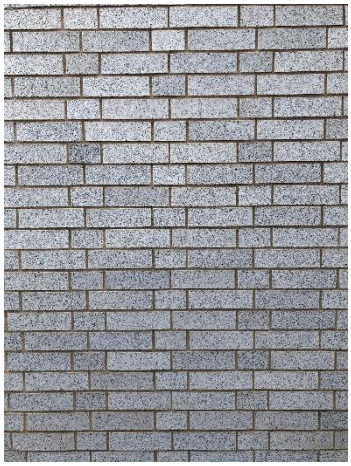
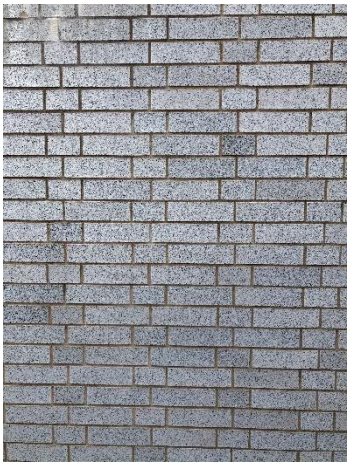
The Harris feature detection algorithm calling in MATLAB code:

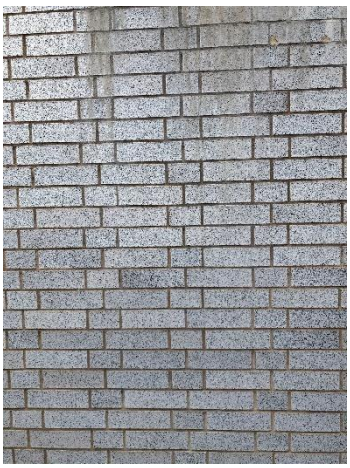
```
% Initialize features for I(1) grayImage = im2gray(I);
[y,x,m] = harris(grayImage,N,'tile',dispMatrix,'disp');%,'disp',1,; points=cornerPoints([x y]);
% points = detectSURFFeatures(grayImage);
[features, points] = extractFeatures(grayImage,points);
```

Mosaicking exercise with 50%+ overlap

The brick wall images are shown:





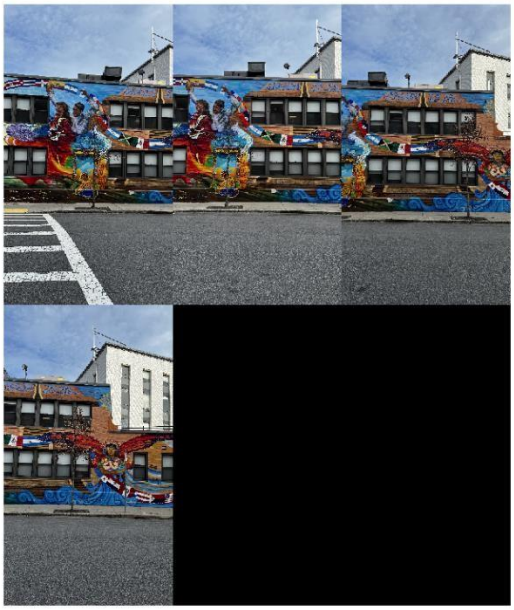
All image of the brick wall are almost similar to each other.

The result:

The output of the brick wall image panoramic is not good because features are repeating and similar to each other hence harris corner detector is not detecting many good features to match.

Overlap less than 15%

The input image with 15% overlap:



Panorama with 15% overlap:

1. ‘matchedPoints1 and matchedPoints2 do not have enough points. The number of points in each set must be at least 4.’ Hence add one more image and got the result with 4 images.
2. Because of the less overlap, harris corner script is unable to find the reasonable matching features when compared to more overlap situation. Hence, the output panorama image is bad.