PRIYA KUMARI
S6043321

Image Analysis Assignment
Orthophoto generation and Image matching

Introduction

Orthophoto – It is a process through which an image or photograph is orthorectified such that any geometric or radiometric problems are corrected i.e correction in scale, map projection, relief or tilt in the image.

An orthophoto is the accurate representation of the topography.

It can be used in the form of map or image and contain more information than a normal map & cheaply available along with the metric information

Image matching

It is the method in which the homologous pairs of points of two geometrically corrected images are brought into an agreement to achieve the same physical region of the area being imaged

It is done if there is any loss in data or error in the image (like shadow or dark area)

PROCEDURE

1. The loading of the data and converting it into a grey scale to obtain the single value by each and every pixel of the image
2. Detect distinct feature points in both the orthophotos. By using Harris Corner Detectors i.e corner points are determined whose neighboring features are too dominant then extract the neighborhood feature by using extract features function
3. Using matchfeature()Function compute the distance between the points in the 2 different images.
4. Choosing conjugate features simply based on descriptor difference will result in some wrong matches.
5. To remove the outliers RANSAC algorithm is applied to remove all the outlier from the image
6. *imwarp* function is used for estimation of the transformation of the image to wrap the image over another.
7. *imfuse* function is used to do image stitching is done to blend/intermixing the overlapping of the images,
8. We get the mosaic image as output.

OUTPUTS

PRIYA KUMARI
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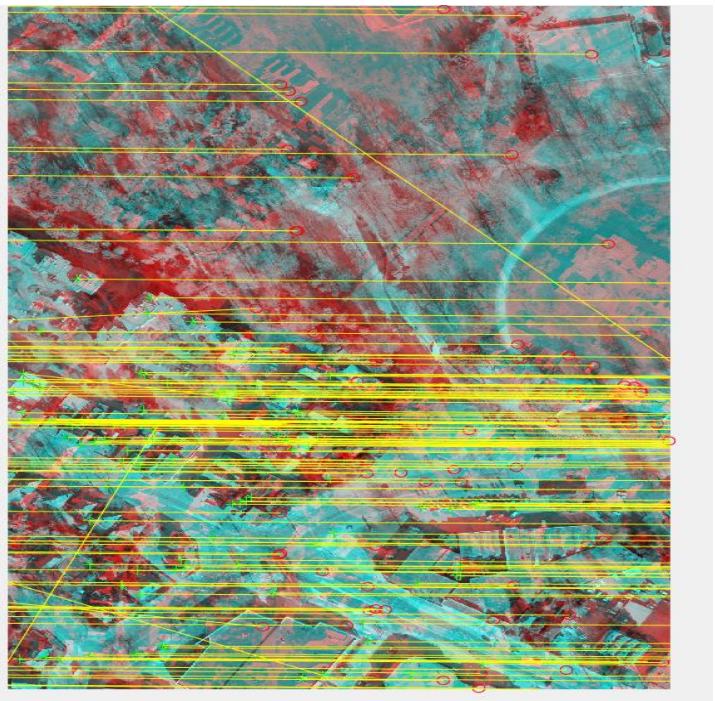


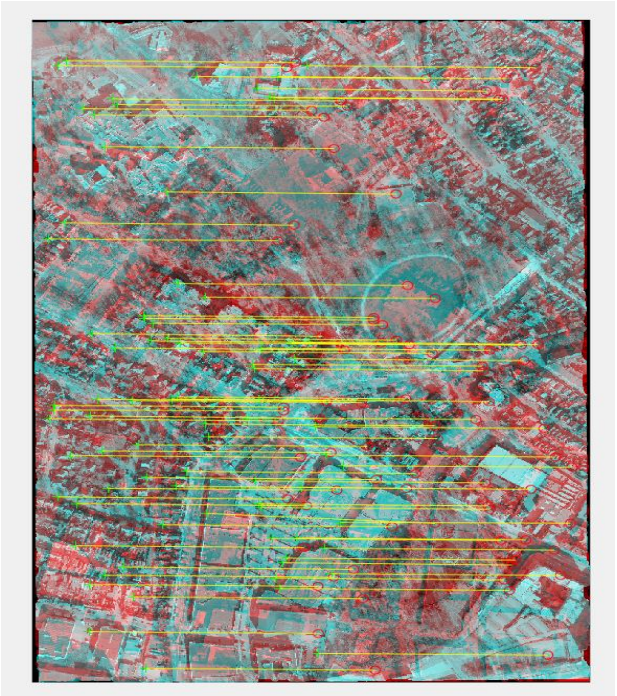
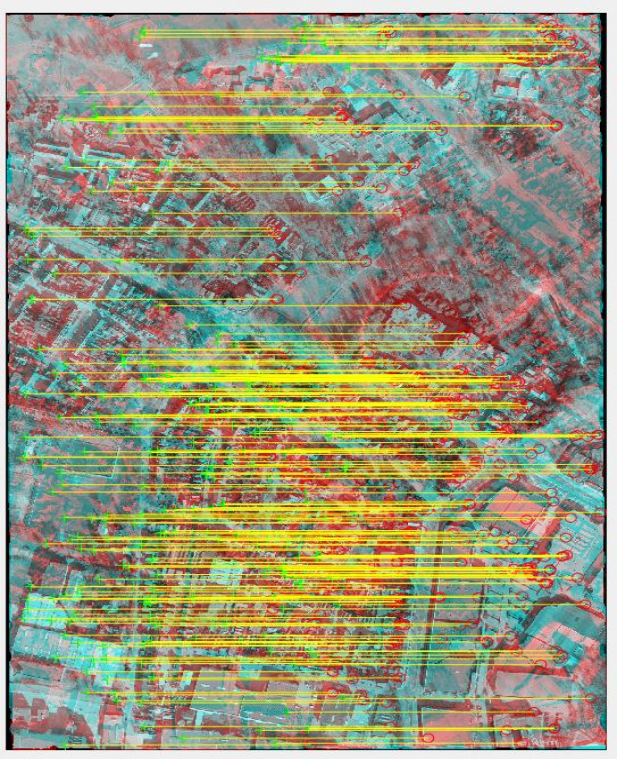


Figure 1(0.2m,high resolution)& Figure 2(1m,low resolution)Matching both the images based on descriptor values



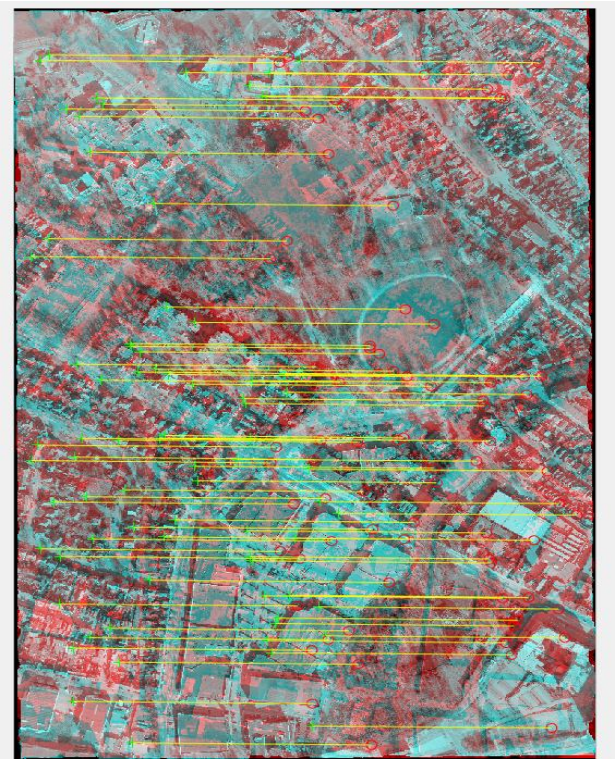


Figure 1(0.2m,high resolution)& Figure 2(1m,low resolution)Matching both the images based on descriptor values after RANSAC algorithm

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Figure 1(0.2m,high resolution)& Figure 2(1m,low resolution) fused images final output

Codes

```
% Read the stereo images.
image1 = imread('ortho256744_472087_35_1m.tif');
image2 = imread('ortho257045_472088_35_1m.tif');

I1 = rgb2gray(imread('ortho256744_472087_35_1m.tif'));
I2 = rgb2gray(imread('ortho257045_472088_35_1m.tif'));
% Find the corners.
points1 = detectHarrisFeatures(I1);
points2 = detectHarrisFeatures(I2);
% Extract the neighborhood features.
[features1,valid_points1] = extractFeatures(I1,points1);
[features2,valid_points2] = extractFeatures(I2,points2);
% Match the features.
indexPairs = matchFeatures(features1,features2);
% Retrieve the locations of the corresponding points for each image.
matchedPoints1 = valid_points1(indexPairs(:,1),:);
matchedPoints2 = valid_points2(indexPairs(:,2),:);
figure; showMatchedFeatures(I1,I2,matchedPoints1,matchedPoints2);

[tform, inlierIm2, inlierIm1] = estimateGeometricTransform(matchedPoints2, matchedPoints1, 'similarity');

figure; showMatchedFeatures(I1,I2,inlierIm1,inlierIm2);

out = imref2d(2*size(I2));
warped = imwarp(I2, tform, 'outputview', out);
fused = imfuse(I1, warped);
figure;
imshow(fused);
```

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RESULT

orthophoto

1. The orthophoto obtained in the 0.2m resolution is better than in 1m resolution, the wrong points are completely visible in higher resolution as compared to a lower resolution.
2. The orthophoto is noisy as it is very hard to differentiate between some buildings and rooftop the image still has more distortion near the edge than in the center as we can clearly see the relief displacement of the buildings after orthorectification.
3. We achieved better accuracy in the bilinear method than that of the cubic method.
4. Image stitching is done to blend the area of overlapping and improve the quality of the image

Image matching

1. The image is converted into greyscale to resolve the difference in brightness value in all the pixel
2. Harris corner detection algorithm was used to determine the corner points are determined whose neighboring features are too dominant.
3. After applying the RANSAC algorithm to remove the outliers and get the least error in matching which might cause an error which is not correctly visible in lower resolution but dominant in higher resolution.
4. In 1m resolution 80matched points &0.2m have 343 matched points.

Limitations

1. Harris corner detector fails when there is a variation in scale, geometry, radiometry.
2. Mosaic photos are sensitive to radiometric properties as there is a problem in brightness all over the image.
3. Outliers were visible only in high resolution not in low resolution.
4. RANSAC can work for one dataset model, not for more than one model & the time taken to compute the outliers are not defined

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