BBM415 Assignment 3
Generating Panorama Images

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1 – Introduction

Image stitching is the combination of images with overlapping sections to create a single panoramic or high-resolution image. Image stitching software may be purpose-designed, part of a photo editing suite or included in camera features.

Image stitching enables the combination of multiple shots to create a larger picture that is beyond the normal aspect ratio and resolution (super resolution) of the camera's individual shots. The technology enables positioning for dramatically wide shots without duplicated objects or distortion.

2 – Explanations

Q1 : Explain the each step of the algorithm. Why can SIFT features be used for? What is the purpose of the RANSAC algorithm? Why are they used for?

The process of image stiching for a panoramic image consists of the following steps:

1. **Load images from files and convert them to grayscale**
2. **Compute SIFT keypoints and descriptors for all image pairs**
3. **Find Top M matches of descriptors of all images**
4. **Detect a set of matching points that is present in both images (overlapping area)**
5. **Apply the RANSAC method to improve the matching process detection**
6. **Apply perspective transformation on one image using the other image as a reference frame**
7. **Stitch images together**

SIFT feature can helps us to locate the local features in an image, commonly known as the ‘keypoints‘ of the image. These keypoints are scale & rotation invariant that can be used for various computer vision applications, like image stiching to generate panoramic images.we can also use the keypoints generated using SIFT as features for the image during model training. The major advantage of SIFT features, over edge features or hog features, is that they are not affected by the size or orientation of the image. For example, if our image of the buildings along with its smaller size . The keypoints of the object in the first image are matched with the keypoints found in the second image. The same goes for two images when the object in the other image is slightly rotated it is useful for us. it is necessary to use the RANSAC algorithm to remove mismatched points from the descriptors generated by the SIFT algorithm.

Q2 : Can you use different methods to merge images? What are the advantages of the blending compared to other methods?

Yes, there are so many algorithm for merging images together such as **L-M (Levenberg-Marquardt) algorithm** is a nonlinear optimization algorithm that combines the Gauss-Newton method with the gradient descent method, making use of known measurement data to estimate the unknown parameters Second one is **Improved Stitching Method** In the image stitching process, as we know, the accuracy of image registration decides the quality of the panoramic image, and the affine transformation matrix is the final result, which is what we wanted by image registration. So it is important to obtain a precise transformation matrix. And The **Traditional Stitching Metho**d for stiching images. However, in traditional method, each time when an image stitching is completed, the dimension of reference image will continue to increase. The overlapping area between the new input image and the reference image accounts for smaller and smaller proportion comparing with the entire reference image area. Therefore, calculating SIFT feature points for the whole reference image will consume a lot of system resources and registration time.

Q3 : How can you improve the results?

image mosaic is a technique being used to stitch multiple images together to form a stitched image with higher resolution and large field of view.We can use iproved RANSAC algorithm to get a better result while stiching images fast and very effective way.We can change algorithm such as warpPrespective algorithm and get an better result in this way.Additionally, the improved stitching method dynamically selects the next input image based on the number of SIFT matching points. Compared with the traditional stitching process, the improved method increases the number of matching feature points and reduces SIFT feature detection area of the reference image.

Q4-Q5 : How can you improve the results?

You can see two diffrent images in next page first one is created with n=5 and second image is created with paramater n=2 and n=0 level we The image pyramid is a data structure designed to support efficient scaled convolution through reduced image representaion. It consists of a sequence of copies of an original image in which both sample density and resolution are decreased in regular steps. These reduced resolution levels of thepyramid are themselves obtained through ahighly efficient iterative algorithm.and it decreaase image quality you can see some shadow image enhencment points because while merging two images pyramids some points and edges must blured to enhance two images same level.Laplacian pyramid is an algorithm using Gaussian to blend the image while keeping the significant feature in the meantime. It downsizes the image into different levels (sizes) with Gaussian. Later, it expands the Gaussian in to the lower lever and subtracts from the image in that lever to acquire the Laplacian image. This Laplacian Pyramid is the true useful member of the image pyramid. Each layer of this pyramid is the band-pass image. We can now do some things to the specific frequency just like in the frequency domain. We also see that even after its frequencies are shown, the local features of the image are still there.

3 – Conculusion

There are so many algorithim and methods to sthiching images together we used and how we can apply image pyramids to our blending images effectively.According to image pyramids level our panoramic images resolution and wrapping intensity will change.