Computer Vision
Spring-2021
Assignment-2
Posted on: 07/02/2021
Due on: 23:59hrs, 21/02/2021

Guidelines

1. Follow the specified repository structure. `src` folder will contain the Jupyter notebooks used for the assignment. `images` folder will contain any images used for the questions.
2. Commit your work regularly to avoid losing progress. Make sure you run your Jupyter notebook before committing, to save all outputs.
3. The report should contain description of the problem, algorithms and results. It should be written in markdown, in the notebook itself.
4. Make sure that the assignment that you submit is your own work. **Any breach of this rule could result in serious actions including an F grade in the course**.
5. The experiments and report writing takes time. Start your work early and do not wait till the deadline.
6. You are not allowed to use inbuilt functions that directly solve the tasks assigned. Confirm with TAs regarding whether some function can be used, when in doubt.

Questions

1. **Image Mosaicing**
    1. Use any feature detector and descriptor (e.g. SIFT) to find matches between two partially overlapping images. You can use inbuilt functions for this.
    2. Estimate the homography matrix between the two images robustly.
    3. Transform one of the images to the other's reference frame using the homography matrix.
    4. Stitch the two images together.
    5. Repeat this for multiple images to produce a singly mosaic/panorama.
    6. Demonstrate the results on different scenes from the given data.
    7. Additionally, capture a set of overlapping images of a scene with your camera and report the results on the same.
    8. **BONUS**: Think of an algorithm which can stitch images given in any order without human intervention. Modify your existing code accordingly.

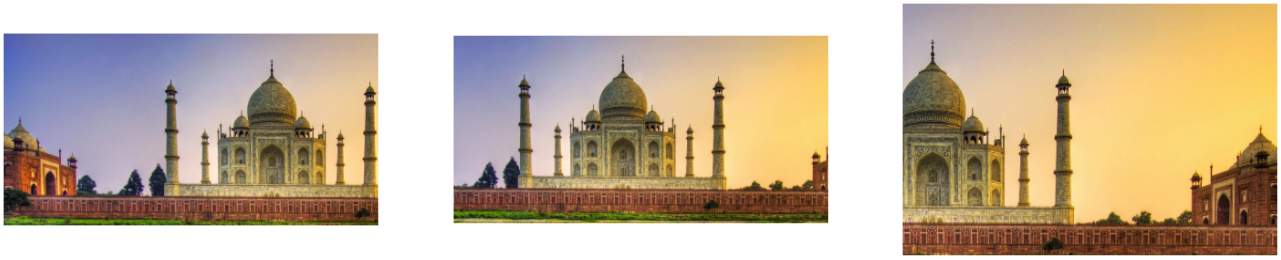

Figure 1: Overlapping Images of a Scene

Figure 2: Final Stitched Image

2. **Stereo Correspondences**

    1. You are given two images of the same scene, taken from different view points. Perform Intensity window-based correlation on the given pair of images.
    2. Recall that for a point in one image, its corresponding point in the other image is found along its epipolar line. Select few points in the first image and then plot their corresponding epipolar lines on the second. Repeat the same for the second image.
    3. Rectify the pair of images and on these new images, find the correspondences using greedy matching.
    4. Compare the Brute force and Greedy based solution for the stereo correspondence problem.
    5. **BONUS:** Perform dense SIFT-based matching on the given pair of Images and give the comparison with that of Intensity window-based correlation.
    6. Refer Chapter 9 and 11 of "Multiple View Geometry in Computer Vision" by Richard Hartley and Andrew Zisserman (2nd Edition), uploaded on moodle. Section 9.2 describes how we can find epipolar lines using the fundamental matrix.

Instructions

- Write modular code, with comments clearly outlining the function of each module.
- The code must be robust and scalable i.e, it should work for any number of images of any size and generate a reasonable output.
- There are some sample images included in the assignment, these images are NOT the exhaustive test set. Your code may be tested on a different set.
- **Submit a jupyter notebook with the code and results, and explain it wherever necessary.** Make sure you run the code before committing.