Computer Vision 2025
Workshop 2

Introduction

This week's workshop reinforces lecture material on feature detection and description, as well as matching and geometry. The workshop builds on the SIFT detector/descriptor discussed in detail in lectures and considers two descendants, SURF and ORB. Furthermore, we will look at how these can be used to create a image panorama.

Developing a solid understanding of all of this material will stand you in good stead for Assignment 2.

Feature detectors and descriptors

The SIFT feature detector and descriptor covered in last week's lecture is one of the most successful and widely used computer vision algorithms ever created.

Since its initial publication almost 20 years ago, many alternatives have been designed to tweak SIFT performance in certain situations, improve its efficiency, and so on. By looking at what they change about SIFT, and what they keep the same, we can get a better understanding of how each part of it works.

For this question, have a look at the **SURF** [1] and **ORB** [2] feature detector/descriptor methods. These are both described in the Matlab and OpenCV documentation and also online (for example Wikipedia). For each method, explain:

- what is its purpose - what is it trying to do better than previous methods?
- what is it doing that is new or different to previous methods? What parts of the overall detection and description process is it actually changing?

Image panoramas

A common application for image feature matching is to stitch overlapping images together to create a single panorama.

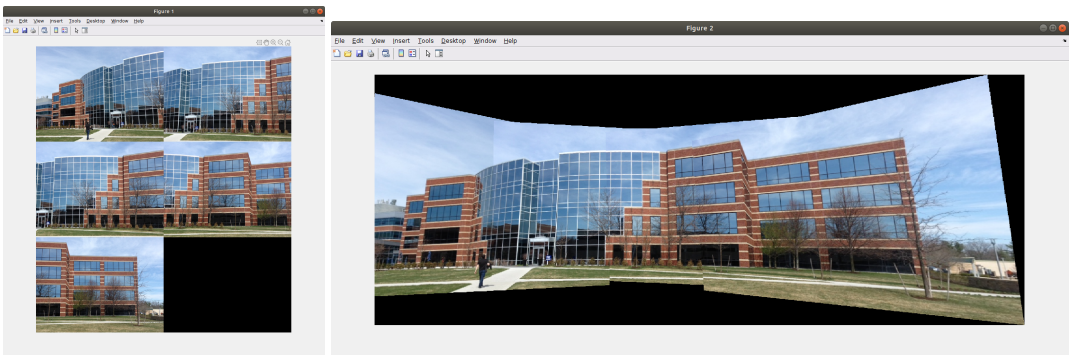

Figure 1: Image stitching in Matlab.

The steps involved in creating a panorama are described in Section 6.1.2 and Exercise 6.2 of the textbook. A Matlab tutorial using a similar procedure is here:

`https://au.mathworks.com/help/vision/examples/feature-based-panoramic-image-stitching.html`

A Python tutorial is available through the link or on MyUni:
`https://medium.com/data-science/image-panorama-stitching-with-opencv-2402bde6b46c`

Go through each step of the process to make sure you understand it, and try it out on some images of your own. What errors do you observe, and how might you avoid them?

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References

[1] H. Bay, A. Ess, T. Tuytelaars, L. Van Gool, *SURF: Speeded Up Robust Features*. Computer Vision and Image Understanding (CVIU), Vol. 110, No. 3, 2008

[2] E. Rublee, V. Rabaud, K. Konolige, G. Bradski, *ORB: An efficient alternative to SIFT or SURF*. Int. Conf. Computer Vision, 2011.