HW #4

Due November 7th, 2024

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1. In this part we will continue looking at image registration but in a 3D world. Instead of computing homographies we will compute fundamental matrices between images while using the Buddha dataset (link provided in the resources section). The common points can then be projected into the 3D world and we can build a sparse reconstruction.
2. You will then take the 3D points and camera positions and do bundle adjustment, using your favorite tool (~~Opencv, Ceres, SciPy~~, GTSAM ~~or g2opy~~) to get a better result.

There are a number of tools that can accomplish this task, though of course we are going to write our own!

If you look at the Princeton SfMedu slides there is a progression of the functions we need to write.

Halfway through (Oct 27), I will also provide a solution that you can grab some functions from as needed while referencing the fact very explicitly in your code!

SFMedu2 is the matlab source code from Princeton

https://github.com/jianxiongxiao/SFMedu

Colmap is an open source tool that works well on this problem

https://colmap.github.io/

OpenSFM is also very nice

https://github.com/mapillary/OpenSfM

On the commercial side, Metashape does a good job as well

https://www.agisoft.com/

While we are interested in the sparse reconstruction, these tools typically also provide a means to do a dense reconstruction. You should download at least Colmap and OpenSFM to familiarize yourself with how they work.