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3D Computer Vision

Assignment 1: COLMAP

Submission Deadline: Feb 9th

In this assignment, you will be working on estimating camera poses, which includes both intrinsic and extrinsic matrices, utilizing the most popular tool COLMAP [1]. **It is important to note that the provided codebase is tested exclusively on the Linux.**

Privacy Note: Please note that you are not allowed to publish the solutions to any of the exercises publicly.

***** Please Note: In the virtual machine, we have prepared a conda environment named "colmap" for you. Please activate it with `conda activate colmap` . *****

Optional: Installing COLMAP

The following steps are only if you are **not** using the virtual machine.

1. You can install COLMAP by following this link: https://colmap.github.io/install.html. Read the instructions carefully and proceed accordingly.
2. You can verify the installation by executing the command `colmap -h` in the terminal or command shell, depending on your operating system. If you observe a list of available commands, the installation process has been successfully completed. Alternatively, you can also validate the installation by launching the COLMAP graphical user interface (GUI). For the purposes of this assignment, we will be utilizing the COLAMP CLI.
3. Install the necessary packages needed for this assignment as given in the requirements.txt Activate conda environment of your choice and run `pip install -r requirements.txt`.

Prerequisite: Getting started with COLMAP

You can find the documentation for COLMAP here.

1. Please understand the following:
   - The folder structure followed by COLMAP
   - Output contents and format of the files from COLMAP
   - What is the sparse and dense reconstruction

Part 1: Estimating Poses

We provided a set of 49 images captured from multiple viewing directions. The images are part of the multi-view stereo image dataset called DTU [2] and are placed inside `images` folder. Additionally, an empty folder called `workspace` is given. The task is to estimate the intrinsics and extrinsics of the cameras using the colmap CLI.

1. Q1 [10 Points]: Complete `reconstruct.py` to estimate intrinsics and extrinsics from multiview images. We suggest to stick with automatic reconstruction. Please refer to the COLMAP docs for more details. Visualize your result with the `visualize.py` script.

Please note that the dense reconstruction will only be generated if you have a GPU, otherwise only a sparse reconstruction will be available.

Best of Luck!

References

[1] J. L. Schönberger and J.-M. Frahm, "Structure-from-motion revisited," in *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016.

[2] H. Aanæs, R. R. Jensen, G. Vogiatzis, E. Tola, and A. B. Dahl, "Large-scale data for multiple-view stereopsis," *International Journal of Computer Vision*, pp. 1–16, 2016.