

March 10, 2024

3D Computer Vision

Project - Stage 2: Structure-from-Motion from Unknown Correspondences

Submission Deadline: **March 18th 8am**

In this sheet, you will find the information regarding the data and evaluation that you will need for the second stage of your project. The data can be found in the accompanying folder. Below, you can find information about the content of the data, its format and how to do evaluation:

1 Data

In the accompanying folder, you can find two subfolders corresponding to two captured objects: a milk carton and a boot. The milk carton has corresponding ground truth, so you can use it to test and fine-tune your algorithm. The boot does not have ground-truth data and will be used by us to evaluate your solution. The contents of the folders and the corresponding formats are described below:

Images: The captured RGB images for the objects can be found in the *images* folder. Each object is observed from 51 views.

Camera Intrinsics: The camera intrinsics can be found in the *poses.json* or *gt_camera_parameters.json* files under the entry *intrinsics*. These are the same for all images.

Additionally for the milk carton object, you are given ground-truth camera poses and a gt reconstructed mesh, so that you can evaluate your algorithm:

Ground-truth Camera Extrinsics: The ground-truth camera poses can also be found in the *gt_camera_parameters.json* file under the entry *extrinsics*, which is an array. Each entry in the *extrinsics* array has the image name from the *images* folder as the key and the 4×4 matrix defining the camera pose from world to camera coordinates as value.

Ground-truth Mesh Reconstruction: We also provide the ground-truth reconstruction in the ply format, named *gt_points.ply*. This will be used by the given evaluation script to evaluate your algorithm.

2 Task

From the given RGB images and camera intrinsics, your task is to:

- Estimate the camera extrinsics corresponding to each RGB image.
- Get a point cloud reconstruction of the scene.

3 Evaluation

We provide the *eval.py* script to evaluate the estimated camera poses and the reconstructed point cloud for the milk carton object:

Estimated Camera Poses: The estimated camera parameters need to be saved in the *milk* folder under the filename *estimated_camera_parameters.json*. It should follow the same format as *gt_camera_parameters.json* (an array containing key-value pairs corresponding to each image under the *extrinsics* entry). Running the script will then give you the average rotation error and average translation error of your estimated poses.

Estimated Point Cloud Reconstruction: The estimated points to be saved in the *milk* folder under the filename *estimated_points.ply* in the ply format. The script then returns you the average reconstruction error using the chamfer distance.

4 Submission

The final submission for stage 2 should contain the following deliverables:

- Estimated camera poses for the boot object.
- Point cloud reconstruction for the boot object.

Please follow the format described in the evaluation section for both deliverables.

Best of Luck!