

NTUST course: Computer Vision and Applications (CI5336701, 2024 Spring)

Final Project : Reconstruct 3D from stereoscopic side-by-side images

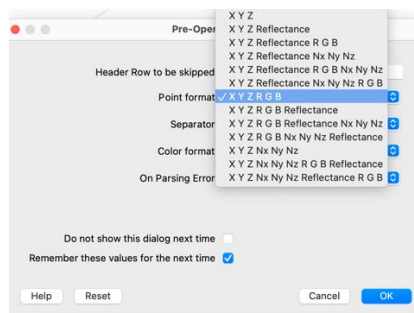
Date Due : 2024. Jun. 7th, PM11:59 (2.5 weeks)

Description :

1. Write a program for reconstructing 3D points from stereoscopic images, then, output all 3D points as one XYZ (with color) file. (choose your tools, ex. C++/C, python, openCV, orMatlab).
2. The intrinsic and extrinsic parameters of both images are given in CameraParameter.txt. In this project, you need to write a program for importing side-by-side image sequences, and analyzing images to create a color 3D .xyz file. In addition, please reject all outliers by verifying their re-projection error.

Where Fundamental matrix, and both intrinsic and extrinsic parameters were given.

3. In each frame, you need to split it into left and right images. Try to pick out the brightest pixel (recognize it according to the blue channel) for each row in Left and find out its corresponding point in Right, as well as inverse direction, by following the constrain of epipolar geometry. Finally calculate 3D by “direct triangulation” as mentioned in lecture. Store your data into X Y Z RGB in each line of a text file with .xyz extension (can be recognized by Meshlab, as the following figure).



4. Please write a short report (upto 2 pages in A4), and use Meshlab / CloudCompare software or other 3D viewer to verify your result.
5. Deliverable: There are three items you should provide:
 - 1) Source code (and execution file, if any) in python, C++/C, Matlab, with simple comments,
 - 2) An output 3D file in YourID.xyz (Color 3D point cloud),
 - 3) report document (2 pages at most).

Please zip all your files, then, upload to moodle2 (<http://moodle2.ntust.edu.tw>) by date due.

Note: this assignment will be 20% of final grade.

Hint:

1. Please refer to course slides.
2. One frame side-by-side image (resolution will be 720x1280 for Left and Right views)



3. The 3D model is roughly 200 mm in height, the size of reference checkerboard is 100x100 mm x mm, and STL (no color) file was provided to benchmark your result. The scenario looks like the following figure.



(blank below this line)