NTUST course: Computer Vision and Applications (CI5336701, 2022 Spring)

Final Project: Reconstruct 3D from stereoscopic images and colorize 3D point cloud

Date Due: 2022. Jun. 13th, PM11:55 (around three weeks)

Description:

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1. Write programs for reconstructing 3D points from two images, then, output a "Color" .xyz file. (choose your tools, ex. C++/C, python, openCV, Matlab).
2. The intrinsic and extrinsic parameters of both images are given in CalibrationData.txt. In this project, you need to write programs for importing both image sequences, and analyzing the both synchronized images. A fundamental matrix is given for assisting you to find the corresponding features in left and right images. Once corresponding features are determined, please calculate their 3D, then store them as a ID.xyz. Please reject all outliers by verifying their reprojection error.
3. An extra color texture file, called TextureImage.JPG, was taken at different device. You may need it to colorize your ID.xyz file. Please use one 3D tool, such as Meshlab, to retrieve 3D point coordinate and use image tool, such photoshop, to obtain 2D coordinate. Therefore, you can collect 2D-3D corresponding points to estimate the camera project matrix. Based on project matrix, try to project "Color" on the .xyz file. Then, save .xyz file again with color. A color .xyz file should be the format as
   [X Y Z R G B], in each line of a text file with .xyz extension.
4. Please write a short report (upto 3 pages, A4), and use Meshlab or other 3D viewer to verify your result.
5. Deliverable: There are three types of data you should provide:
   1) Source code in C++/C, python or Matlab, with simple comment. (single or two programs with following a and b function)
      a. To reconstruct 3D point in .xyz file.
      b. To colorize 3D point and export as a color .xyz file
   2) (Optional) Execution file (.exe), if you use c/c++ code, please build it into exe.
   3) Result of color 3D point data (stored as ID.xyz)
   4) PDF: description document (A4 within 3 pages).

Please zip all your files, then, upload on moodle2 (http://moodle2.ntust.edu.tw/) by due 6/13 PM11:55.

Evaluation rule: 1. 80 % correct 3D point. (if you reject outliers/noise, it will be better)
2. 20 % correct "Color" 3D point cloud

Note: This assignment will occupy 25% of final grade.

Hint: The 3D model is roughly 130 mm in height.

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