NTUST course: Computer Vision and Applications (CI5336701, 2021 Spring)

Homework#1：Using shape from silhouette method for 3D reconstruction

Date Due：2021. Mar. 29, PM11:55。 (~2 weeks)

Description：

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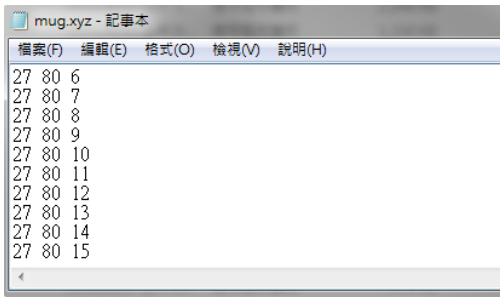
1. Writing programs for reading BMP images, then generating XYZ files for illustrating 3D voxel models. (choose your tools, ex. C++/C, python, Matlab).
2. There are four data sets, says “Bird”, “Last”, “Teapot”, and “Monkey”. Each set has 11 silhouette images. In a image, “white” pixels indicate “foreground”, and “black” pixels mean “background”. All images are taken with the same intrinsic parameter, and their extrinsic parameters are corresponding to the number in the TXT file. For example, 01.bmp, 02.bmp, 03.bmp et. al. have the extrinsic parameters shown in “camera parameter.txt”.
3. The initial workspace in world coordinate is around (-50,-50,0) to (50,50,100). The voxel is a cube with 1 x 1 x 1 in dimensions. So, there are 1.0 million candidate voxels should be processed. Please project all voxels onto each silhouette image, and check their existence. (hint: if a voxel is projected on the background of one image of them, it should be removed. The remained voxels indicate the final shape).
4. Please save the voxel file as a “.xyz” file, which is a 3D file-format to store vertices in each line. It’s simple txt file format for storing (x, y, z) data in every row (as following figure, for example). The professor provides a simple viewer tool for visualizing this kind of data, and you can view files by “meshlab” software as well.

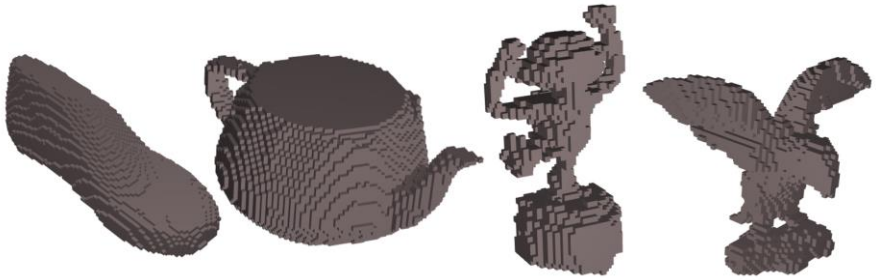


5. There are three types of data you should provide: 1) Source code in C++/C, Matlab, python, with simple comment. 2) Execution file (.exe, .m, .py) for at least one of these examples. Please make sure your program is executable in not only your computer but other guys’, 3) four .xyz files. Please zip all your files, then, upload to Moodle by date due.

Hint:

1. The snapshot of camera configuration and all ground truths of this assignment:

2. Reference result as following



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