NTUST course: Computer Vision and Applications (CI5336701, 2017 Spring)

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

Date Due：2017. Mar. 24th PM11:59。 (~2 weeks)

Description：

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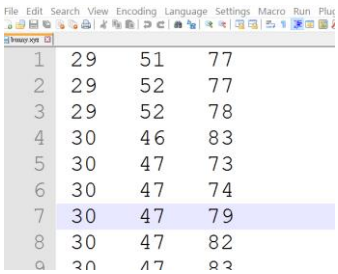
1-1. Writing programs for reading BMP images, then generating XYZ files for illustrating 3D voxel models. (choose your tools, ex. C++/C, openCV, Matlab).
請撰寫程式讀取圖檔，然後產生.xyz 檔(可用 Matlab, C/C++或其他 API)。

1-2. There are four data sets, says “Eagle”, “Bunny”, “Teapot”, and “Venus”. Each set has 8 silhouette images. In the 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, 001.bmp, 002.bmp, 003.bmp et. al. have the extrinsic parameters shown in “camera parameter.txt”.
共四組資料，每組 8 張照片。每張照片內部參數都一樣，而外部參數根據編號。可在 camera parmeter.txt 中找到對應的。

1-3. The workspace in world coordinate is around (-50,-50,-10) to (50,50,90). 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 in 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).
預設 voxel 大小為 1x1x1，並且分佈在(-50,-50,-10)~(50,50,90)的空間中。所以大約有 100 萬個 voxel 需投射到每一個影像上。(假如，某一個 voxel 投射到其中一張影像的 background 區域，則該 voxel 就不需要存下來。殘留下來的 voxel 即是最後的外觀。

1-4. Please save the voxel file as a .xyz file. 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.
請將 voxel 儲存成.xyz 檔案。檔案為文字格式，每一行代表一個(x,y,z)座標，在此我們當作 voxel。老師有提供一個簡易觀看 voxel 程式可供利用，或可使用 meshlab 軟體觀看。




1-5. There are three types of data you should provide: 1) Source code in C++/C or Matlab, with simple comment. 2) Execution file (.exe or .m) for at least one of these four examples. 3)

four .xyz files. Please zip all your files, then, upload on blackboard (http://moodle.ntust.edu.tw/) by due Mar. 24.

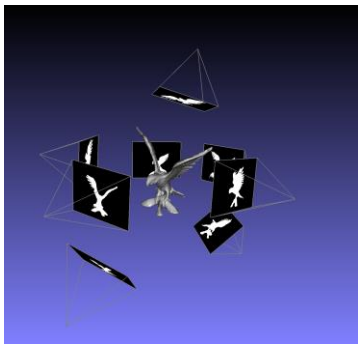
請繳交 3 種檔案 1)程式原始檔，並在內文加簡易註解，2) 執行檔，該執行檔可執行老師提供的其中一組範例 3)四個.xyz 檔。請將所檔案壓縮，並在期限內 3/24 午夜之前上傳到 moodle (http://moodle.ntust.edu.tw/)。

Hint:

若撰寫該作業有遭遇重大困難，請尋求助教協助。參考結果如下附圖。

1. If you have difficulty on this assignment, please contact with TA, 劉宇倫 (d10322501@mail.ntust.edu.tw).

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



Reconstruction results for your reference:

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