HW2 Bonus

RANSAC PLANE ESTIMATION

1. Run RANSAC for 3D plane estimation using the 3D point cloud data from HW1. Discuss the parameters of your implementation.
2. Recolor the output inlier points green and render an image (from an arbitrary position)
3. Eliminate the inliers points attained from step 1 and repeat steps 1 and 2 (detect a different plane) twice.
4. Show your results for the three generated images, one of them should depict the "ground plane", If not, iterate until ones does.
5. Determine the parameters (n, d) of the "ground plane"

HOMOGRAPHY WARPING

6. Generate a single image from on arbitrary pose [R_a,t_a] using the pointcloud-to-image rendering code provided. This will be image A.
7. Determine a new camera pose [R_b,t_b] that would correspond to a "birds-eye-view" of the fish-fountain scene used for HW1.
8. Generate a single image from pose [R_b,t_b] using the pointcloud-to-image rendering code provided. This will be image B.
9. Using the plane-induced homography formula, warp image A to have the same "birds-eye" viewpoint as Image B (adapting your image warping code developed for HW1).
10. Compare images B and the warped Image A side by side

Hints:

- For RANSAC the minimal sample size is three and the plane parameters are the null space of those three 3D points in homogeneous coordinates
- The formula for the plane-induced homography can be found in Wikipedia at https://en.wikipedia.org/wiki/Homography_(computer_vision)
- It is typical for (n,d) and R,t to be defined w.r.t. to the "first" camera and for that camera to be at the origin. If your setup is different make sure to account for this.
- R_b is constrained mainly by the orientation of the ground plane normal, the optical axis of the camera should be parallel to said normal
- t_b is constrained mainly by FOV constraints (i.e. distance to the scene, focal length, and image resolution)