Assignment

Problem Statement: *Playing with a scene point cloud*

A point cloud is a set of points in a 3D space which when visualised as a collective group appears to represent a scene or an object. Some examples of a point cloud are present here. A point cloud makes more sense when you visualise them in a dedicated viewer/renderer. You can try it yourself using meshlab or anything online/offline interface of your choice.

With the recent advent in 3D computer vision, notably focusing around areas like VR, AR and even 2D-to-3D modelling, there is a huge shift towards the knowledge base of appropriately transforming and playing with 3D representations themselves, one such representation being point clouds.

The task in this assignment involves doing a couple of transformations on the given ten point clouds. These tasks are listed below.

Feel free to write at sohil.shah@avataar.ai for any clarifications.

Tasks:

The assignment has two deliverables:

1. In the given point cloud, there is a shoe kept on the floor. The task is to detect the floor and re-orient the floor (and hence the entire point cloud) on the YZ plane with the centre of the floor lying on the origin i.e. the equation of the plane passing through the floor should be $y = 0$. For this, you can refer [1-4] and the appendix.
2. Since the 3D representation involved over here is a point cloud, the overall scene looks kind of pointy and perforated. Convert this point cloud to some other representation where the scene looks more continuous with a smooth surface.
3. Add a unit test case to check and verify your solution. For this, add some random transformations to an input point cloud and then pass it through your algorithm to test it.

Note: All tasks need to be achieved programmatically (using python).

Deliverables:

As part of the submission, provide a link of the github repository with the code and a readme file describing the execution of the code, the thought process and the visual results. Also analyse where your approach works well, where it fails, ideas on what would be done to fix it etc. and include this in your report.

References:

[1] Open3D
[2] PyMeshLab
[3] Trimesh

[4] [PyTorch3D](#)

Appendix:

```Python
import open3d as o3d
pcd =
o3d.io.read_point_cloud("shoe_pc.ply")
o3d.visualization.draw_geometries([pcd])
```