**Registration Benchmark utils.py Manual**

1. Program Overview

This script, utils.py, provides a collection of utility functions for processing and evaluation of 3D point cloud data. The functions mainly deal with loading and saving point cloud data, calculating statistical properties of point clouds, and visualizing registration results.

2. Function Descriptions

Main function:

**load\_point\_cloud**

This function loads a point cloud file and converts it into an Open3D point cloud object.

**calculate\_total\_points**

This function computes the total number of points in two point clouds.

**overlap\_percentage**

This function computes the overlap percentage between two point clouds.

**count\_ply\_files**

This function counts the number of .ply files in a specified directory.

**count\_pcd\_files**

This function counts the number of .pcd files in a specified directory.

**save\_array\_to\_txt**

This function saves a given array as a text file with the specified filename.

**save\_transformations**

This function saves the estimated and ground truth transformations to a text file.

**make\_open3d\_point\_cloud**

This function creates an Open3D point cloud object from a given set of xyz coordinates.

**draw\_registration\_result**

This function visualizes the result of point cloud registration by drawing the source and target point clouds with the estimated transformation applied.

3. Imports and Dependencies

This script leverages the Open3D library for handling point cloud objects, Numpy for array manipulations, and other Python standard libraries for file and directory handling.

import open3d as o3d

import os

import numpy as np

from pathlib import Path

import copy

import pandas as pd

import torch

from typing import List

4. Operation/Usage

The functions in this script are mainly used for loading, saving, and visualizing point cloud data, as well as performing calculations on point clouds.

5. Output and Interpretation

The utility functions in this script do not produce a single consistent type of output, as they perform a wide variety of tasks. For example, the **load\_point\_cloud** function returns an Open3D point cloud object, while the **overlap\_percentage** function returns a float representing the overlap percentage between two point clouds.

For functions that produce output files (e.g., **save\_array\_to\_txt**, **save\_transformations**), the output file will be written to the specified location in the file system. The user is expected to interpret the results based on the context in which these functions were used.