**Registration Benchmark main.py Manual**

1. Program Overview

The `main.py` script serves as the core entry point for running point cloud registration experiments. The script supports various registration algorithms, applies them on a multitude of datasets, preprocesses point clouds, and presents the results in a user-friendly manner. Ultimately, saving and graphing the results.

2. Function Descriptions

Main function:

The main function of the script is to conduct point cloud registration experiments. The script uses command-line arguments to specify parameters for the experiments. The details of the command-line arguments are listed in the ‘Parameters’ subsection below.

Parameters:

The script provides several command-line arguments for managing the experiment parameters. Here are the details of what each argument does:

* `--datasets`: Specifies dataset names for the experiments. Acceptable values include 'eth', 'sun3d', 'both', 'all', or a custom list. Default is 'sun3d'.
* `--algorithms`: Indicates the algorithms for the experiments. Default includes RANSAC, ICP, FGR, point\_to\_plane\_ICP, and FMR.
* `--voxelsize`: Determines the voxel size for downsampling. Default is 0.02.
* `--overlap`: Sets the minimum percentage overlap in testing as a decimal. Default is 0.5.
* `--range\_t`: Sets the maximum range of transformation for each axis in meters. Default is 0.5.
* `--range\_r`: Sets the maximum range of rotation in degrees. Default is 60.
* `--rte-thresholds`: Provides a list of Relative Translational Error (RTE) thresholds. Default values are 0.6, 0.8, and 1.0.
* `--rre-thresholds`: Provides a list of Relative Rotational Error (RRE) thresholds. Default values are 10, 15, and 20 degrees.
* `-outfile` or `-o` or `--results-file`: Specifies the filename to store the results summary. Default filename is 'results\_summary.csv'.

3. Imports and Dependencies

To ensure the correct functioning of the `main.py` script, the following libraries are required:

- argparse: Used for parsing command-line options and arguments.

- sys: Used for interacting with the Python interpreter.

- Custom modules: `registration\_algs`, `run\_experiments`, `properties`, `data\_processing`, `FMR`, and `results\_visualize`.

4. Operation/Usage

To run the `main.py` script, use the following command-line syntax:

To use the **main.py** script, run the following command in your terminal, replacing the placeholders with appropriate values:

python main.py --datasets [your\_datasets] --algorithms [your\_algorithms] --voxelsize [your\_voxelsize] --overlap [your\_overlap] --range\_t [your\_range\_t] --range\_r [your\_range\_r] --rte-thresholds [your\_rte\_thresholds] --rre-thresholds [your\_rre\_thresholds] -o [your\_results\_filename]

A typical usage example (using some defaults) would be :

python main.py --datasets 'eth' --algorithms 'ICP' -o 'my\_results.csv'

5. Output and Interpretation

The program displays the message: "Analyzing experiment results..." upon completion of experiments. The results are displayed and saved to the specified file. Heatmaps of the results are also generated and displayed.