

A novel method for point cloud-to-point cloud registration

By Zhongyi Michael Zhang*, Adam Thompson, Sofia Catalucci, Samanta Piano

*zhongyi.zhang@nottingham.ac.uk

Introduction

Existing solutions for point cloud-to-point cloud registration can be subdivided into Gaussian process (GP), weighted least square (WLS) and machine learning algorithms (Zhang M Z et al. Applications of data fusion in optical coordinate metrology: A review *Int. J. Adv. Manuf. Technol.* Under review).

- ❖ Limitations: only applicable to point clouds having similar sizes, densities and being pre-aligned to a specific orientation.
- ❖ We propose a new algorithmic pipeline for registering two point clouds whose dimensions are different and whose initial poses are arbitrary.

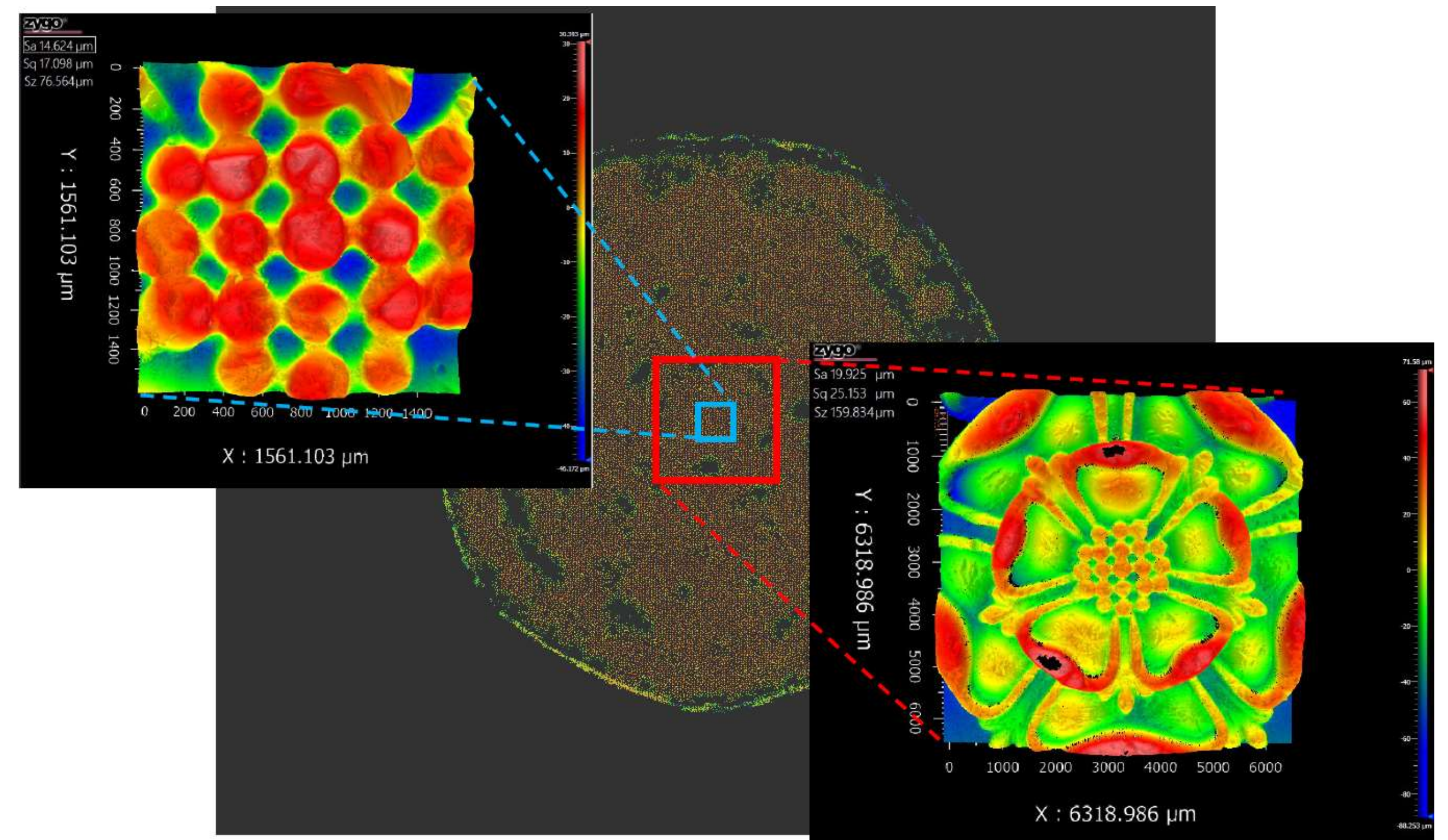
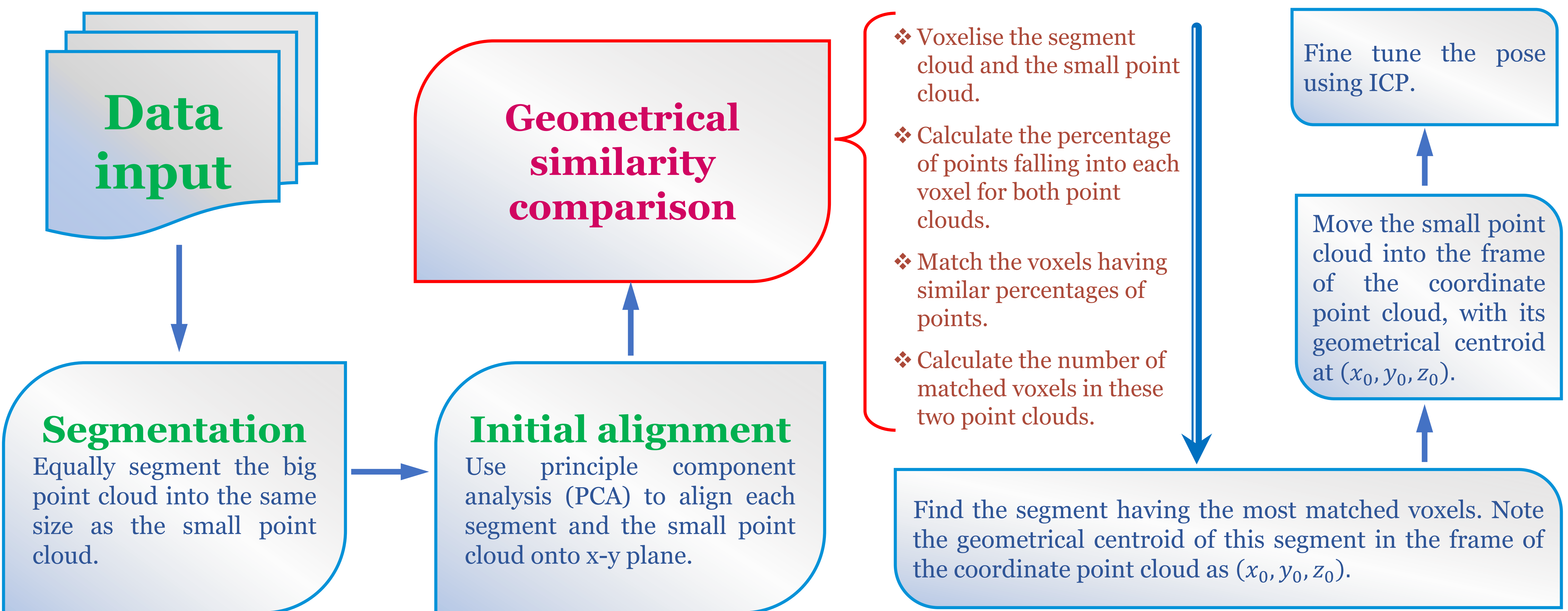


Figure 1 A typical application scenario of our pipeline. The surface texture point cloud of a 20p coin (two front images) will be registered in the 3D coordinate point cloud of the coin (background image).

Algorithmic pipeline



Latest progress

- Alignment of two point clouds onto x-y plane using PCA.
- Detection of similar features using the geometrical similarity comparison algorithm.
- Registration of simulated point clouds based on similarity matching.

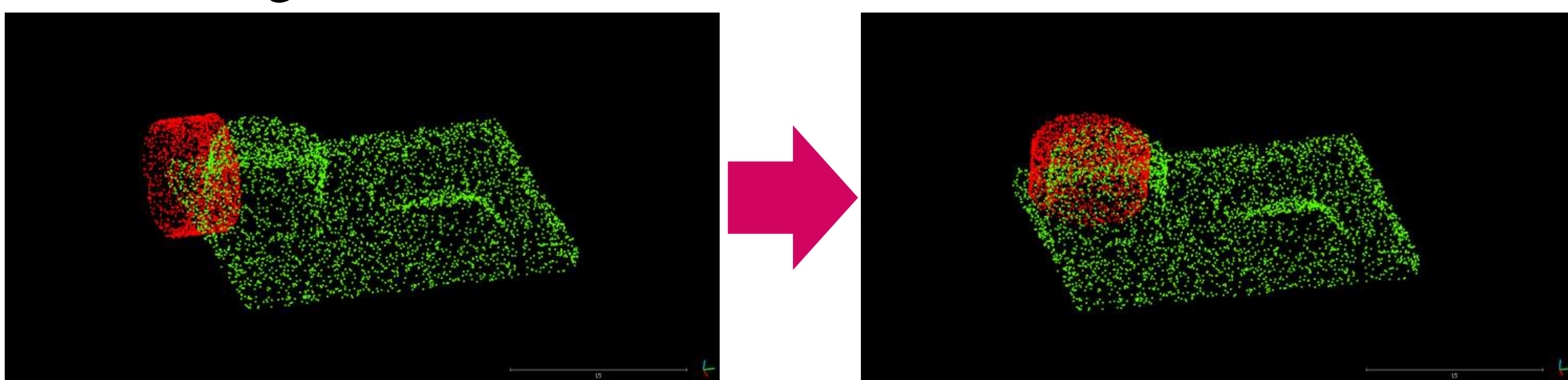


Figure 2 Preliminary result of registration of simulated point clouds (left: before; right: after). A small point cloud (red) is registered to a large one (green).

Future work

- Increase the speed of the pipeline using high-performance hardware.
- Design new test cases showing more complex geometrical variations, used to carry on further tests.

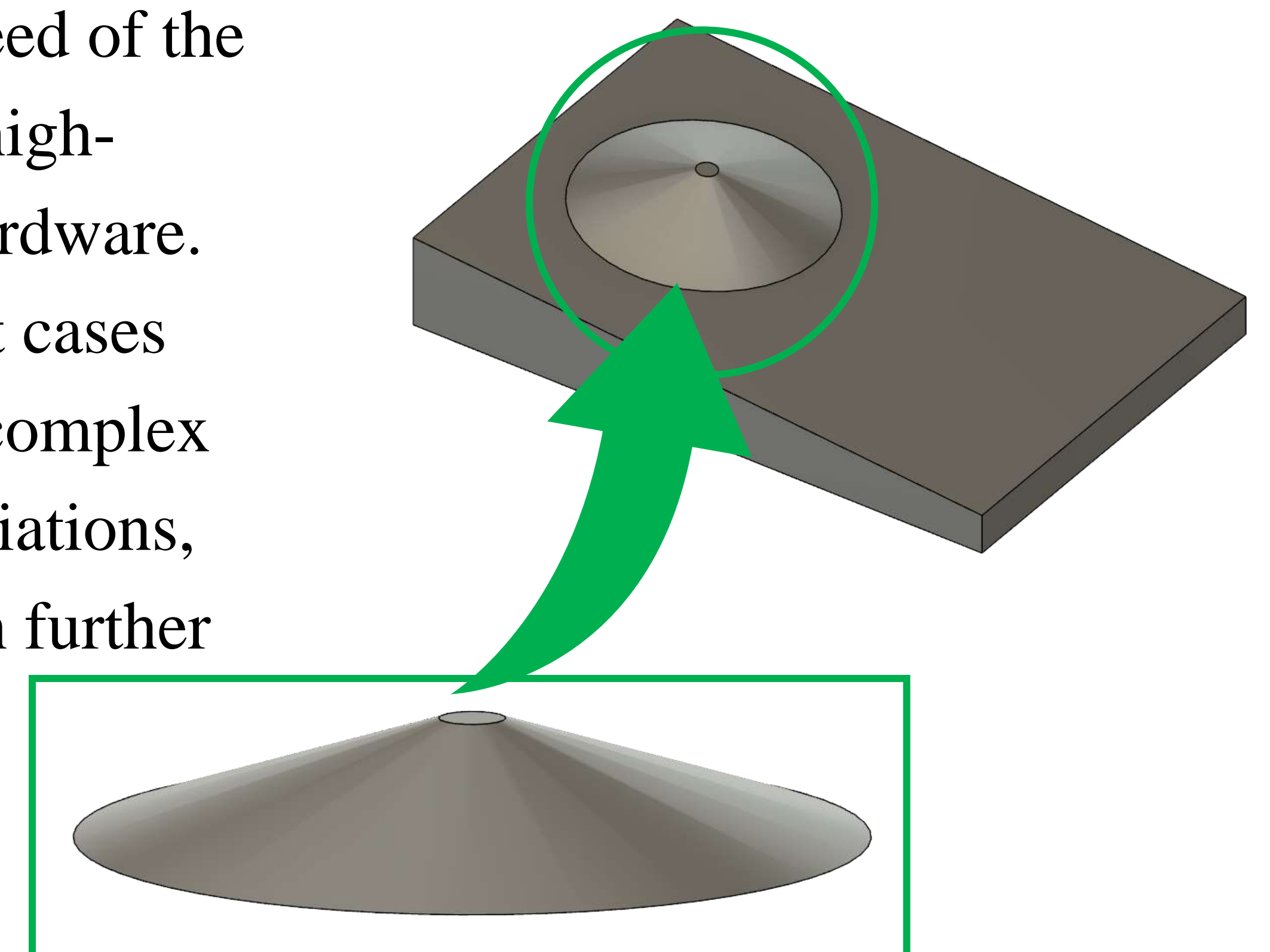


Figure 3 An example of new 3D models for generating further test point clouds.