

A novel data fusion pipeline for point cloud registration

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Introduction

At the 2022 3DMC Conference, we proposed a data fusion pipeline applied to point clouds having large disparity of sizes and point densities. This application scenario is not frequently seen in the existing literature [1]. In this work we presented an updated version of this pipeline in which the geometrical comparison steps are technically simpler and less prone to misalignment between point clouds. In the version, we employed principal component analysis to detect the best location for registration, which accelerated the efficiency of selection and downgraded the complexity of computation.

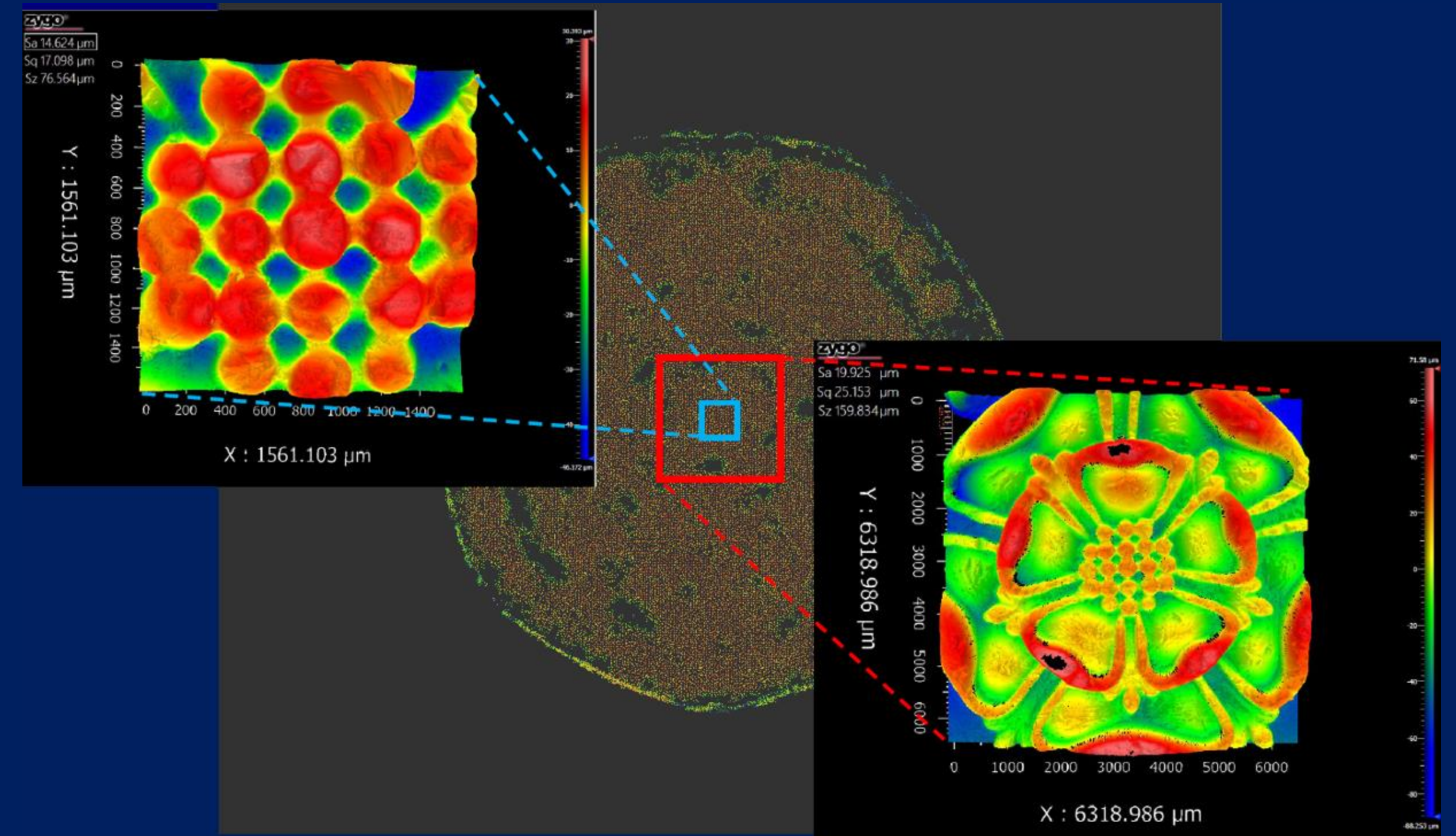
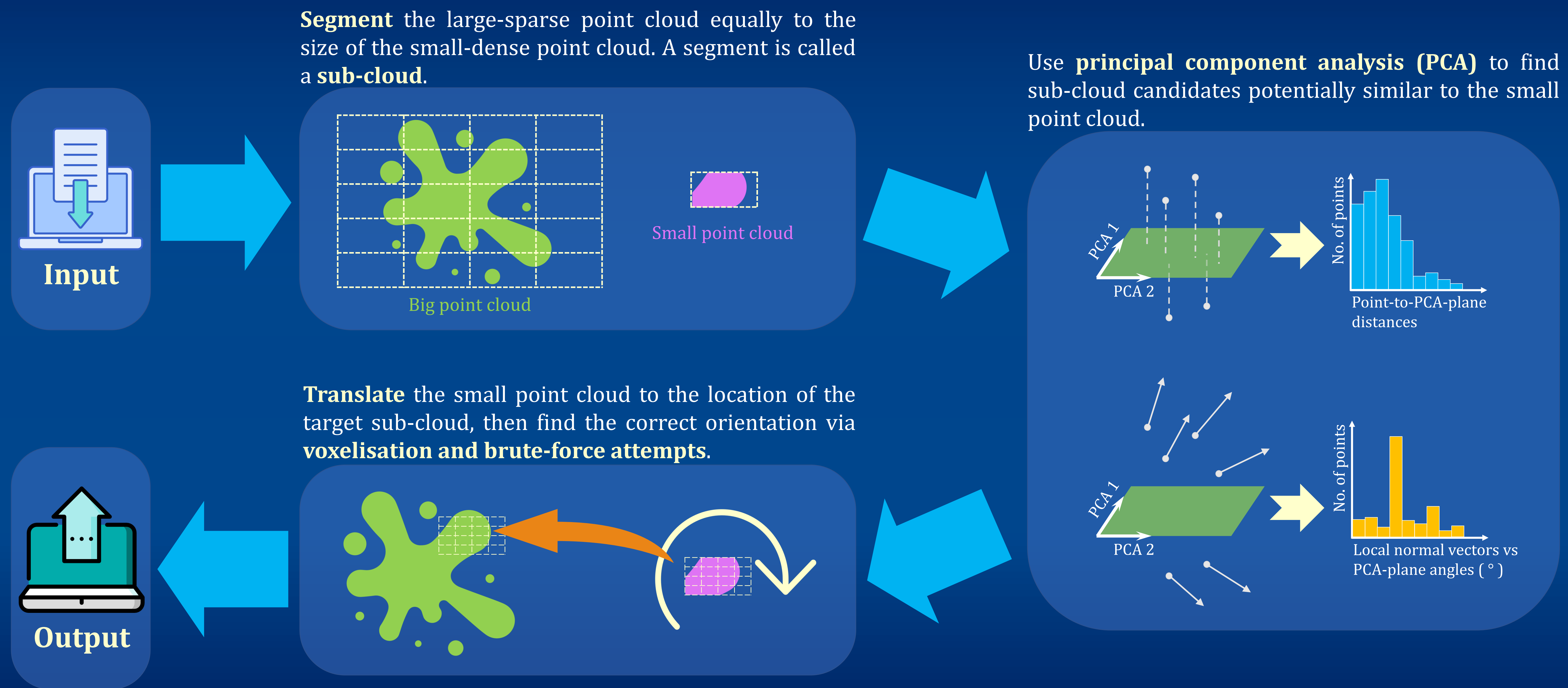


Figure 1 A typical application scenario of our pipeline: the surface texture point cloud of a 20p coin (images on the upper left and the lower right) will be registered within the 3D coordinate point cloud of the coin.

Algorithmic pipeline



Latest progress

Future work

✓ Have successfully tested on synthetic three-dimensional models with pseudo-realistic engineered surfaces.

- Investigate the configuration of parameters in the geometrical similarity comparison steps;
- Test the algorithmic pipeline with an engineered part such a 20p coin (figure 1) on a high-power computing device (figure 3);
- Explore potential application contexts in a wider scope.

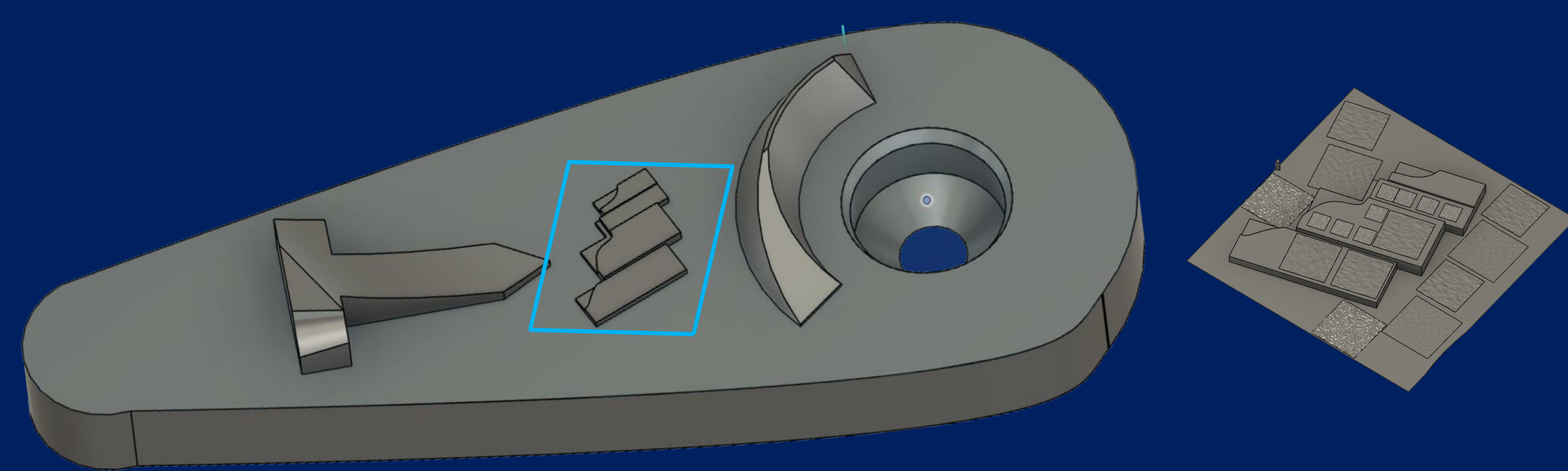


Figure 2 The CAD models used for generating synthetic point clouds. The location of the small model with pseudo-realistic engineered surface texture (right) is shown on the coordinate model (left) as the blue square.



Figure 3 The 64-core high-power computer in our laboratory, which will be used for more tests.

Acknowledgement

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Reference

[1] Zhang M Z, Catalucci S, Thompson A, Leach R, Piano S 2023 Applications of data fusion in optical coordinate metrology: A review *Int. J. Adv. Manuf. Technol.* **124**, 1341–56