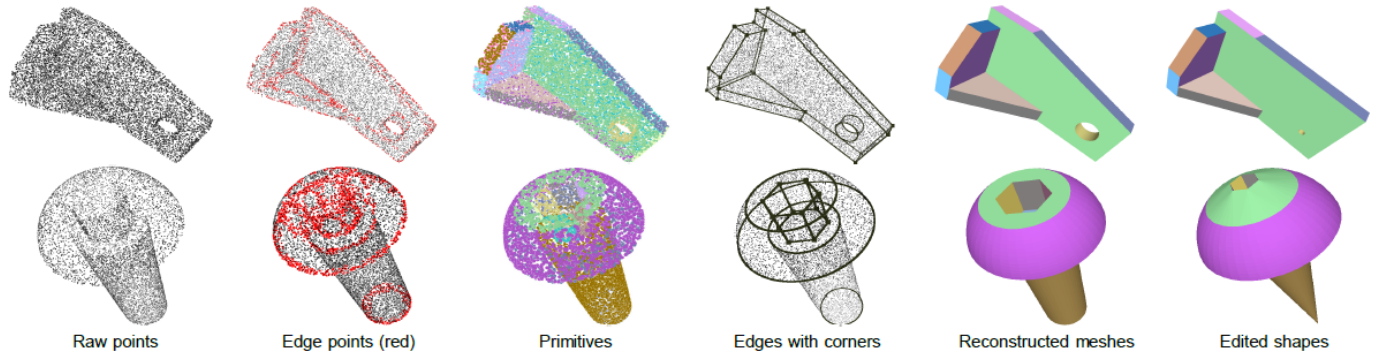# Learning Parametric Primitive Segmentation on 3D point clouds

University of ZurichUZH

| Raw points | Edge points (red) | Primitives | Edges with corners | Reconstructed meshes | Edited shapes |

Project Description

Parametric primitive segmentation is a technique used to decompose 3D point clouds into simpler geometric shapes (primitives) such as planes, spheres, cylinders, and cones. These elementary shapes provide a structured representation beneficial for disciplines such as computer graphics, among others. This project aims to compare different methods of parametric primitive segmentation, shedding light on their strengths, weaknesses, and applicability.

Deep Learning-based methods

- Surface and Edge Detection for Primitive Fitting of Point Clouds [1].
- ComplexGen: CAD Reconstruction by B-Rep Chain Complex Generation [2].
- CAPRI-Net: Learning Compact CAD Shapes with Adaptive Primitive Assembly [3]

Requirements

Interest in 3D graphics and deep learning. Application development in Python.

Work Load

- 30% Theory
- 50% Implementation
- 20% Test

Project Type

Based on the scope of the topic and optional tasks, this project goals can be adjusted for Bachelor or Master thesis.

Supervision

- Prof. Dr. Renato Pajarola
- Lizeth J. Fuentes Perez (assistant)

Contact

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References

[1] Yuanqi Li, Shun Liu, Xinran Yang, Jianwei Guo, Jie Guo, and Yanwen Guo. Surface and edge detection for primitive fitting of point clouds. In *ACM SIGGRAPH 2023 Conference Proceedings*. Association for Computing Machinery, 2023.

[2] Haoxiang Guo, Shilin Liu, Hao Pan, Yang Liu, Xin Tong, and Baining Guo. Complexgen: Cad reconstruction by b-rep chain complex generation. *ACM Trans. Graph.*, (4), 2022.

[3] Fenggen Yu, Zhiqin Chen, Manyi Li, Aditya Sanghi, Hooman Shayani, Ali Mahdavi-Amiri, and Hao Zhang. Capri-net: Learning compact cad shapes with adaptive primitive assembly. In *2022 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 11758–11768, 2022.

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