Reading Seminar on Geometry Processing and Computational Fabrication

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Date: Every two weeks, starting on Thursday 18.9.2025
Time: 10-11am
Place: BCAM, Maryam Mirzakhani seminar room

Abstract: Geometry Processing and Computational Fabrication are two disciplines on the borderline of applied geometry and computer science. With the nowadays trends in hi-tech manufacturing, many manufacturing pipelines require first reliable simulation of the manufacturing process, CNC machining and 3D printing being two prime examples.

This reading seminar will cover some classical papers and also some recent works from the field and the goal for the participants will be to work with scientific material, understand its key parts, and interpret it to the peers.

Programme: The participants will be given a folder containing 20-30 papers from the field. Each participant will select at least 3-4 papers from the list, will read them, and then selects one that will present in front of the class. The presentation will be in a conference-like style, i.e., 20-25 mins presentation, followed by questions from the audience.

The presentation shall interpret the main idea of the paper in a detail such that the rest of the class (who did not read the paper) will understand the main technical contributions of the paper. The presentation should also highlight the strengths, and possibly weaknesses, of the presented paper and, eventually, propose alternative solution(s) to the given problem.

Selected papers:

Bartoň, M., Shi, L., Kilian, M., Wallner, J., and Pottmann, H. (2013). Circular arc snakes and kinematic surface generation. In *Computer Graphics Forum*, volume 32, pages 1–10. Wiley Online Library.

Bommes, D., Zimmer, H., and Kobbelt, L. (2009). Mixed-integer quadrangulation. *ACM transactions on graphics (TOG)*, 28(3):1–10.

Choi, Y.-K., Chang, J.-W., Wang, W., Kim, M.-S., and Elber, G. (2008). Continuous collision detection for ellipsoids. *IEEE Transactions on visualization and Computer Graphics*, 15(2):311–325.

Cohen-Steiner, D., Alliez, P., and Desbrun, M. (2004). Variational shape approximation. In *ACM SIGGRAPH 2004 Papers*, pages 905–914.

Ezair, B., Fuhrmann, S., and Elber, G. (2018). Volumetric covering print-paths for additive manufacturing of 3d models. *Computer-Aided Design*, 100:1–13.

Ezair, B., Massarwi, F., and Elber, G. (2015). Orientation analysis of 3d objects toward minimal support volume in 3d-printing. *Computers & Graphics*, 51:117–124.

Hofer, M. and Pottmann, H. (2004). Energy-minimizing splines in manifolds. In *ACM SIGGRAPH 2004 Papers*, pages 284–293.

Kazhdan, M., Funkhouser, T., and Rusinkiewicz, S. (2003). Rotation invariant spherical harmonic representation of 3 d shape descriptors. In *Symposium on geometry processing*, volume 6, pages 156–164.

Liu, Y., Pottmann, H., Wallner, J., Yang, Y.-L., and Wang, W. (2006). Geometric modeling with conical meshes and developable surfaces. In *ACM SIGGRAPH 2006 Papers*, pages 681–689.

Sellán, S., Kesten, J., Sheng, A. Y., and Jacobson, A. (2020). Opening and closing surfaces. *ACM Transactions on Graphics (TOG)*, 39(6):1–13.

Sorkine, O. and Alexa, M. (2007). As-rigid-as-possible surface modeling. In *Symposium on Geometry processing*, volume 4, pages 109–116.

Várady, T., Salvi, P., and Karikó, G. (2016). A multi-sided bézier patch with a simple control structure. In *Computer Graphics Forum*, volume 35, pages 307–317. Wiley Online Library.

Yang, Y.-L., Yang, Y.-J., Pottmann, H., and Mitra, N. J. (2011). Shape space exploration of constrained meshes. *ACM Trans. Graph.*, 30(6):124.

Zhang, T., Fang, G., Huang, Y., Dutta, N., Lefebvre, S., Kilic, Z. M., and Wang, C. C. (2022). S3-slicer: A general slicing framework for multi-axis 3d printing. *ACM Transactions on Graphics (TOG)*, 41(6):1–15.

The full reading material can be found here:

`https://drive.google.com/drive/folders/1d2Z5fI-b19J7iBatzxRQJi2PRRa3MM3A?usp=drive_link`