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ADAPTIVE MESHING AND NON-CONVENTIONAL DISCRETIZATIONS

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ABSTRACT

This minisymposium aims at gathering researchers in numerical simulation, mathematics and numerical geometry, with the goal of fostering new research approaches on adaptive meshing and non-conventional discretizations.

Accurately tracking interfaces and heterogeneities is a challenging issue in fluid dynamics (free surfaces, shocks), structural mechanics (cracks) and topological optimization. With this minisymposium, we take a multi-disciplinary approach to the problem, and aim at connecting researchers in numerical geometry, computational sciences and applied mathematics. In particular, we are interested in computer simulation with (generalized) Voronoi meshes [1], [2], [3], [6] and mesh-adaptation techniques based on error estimation and distance functions [4], [5]. In particular, we are very interested in discussing applications of Optimal Transport [2],[3],[7],[8] and encouraging scientific discussions on this topic, with potential interesting applications in adaptive meshing and efficient methods for tracking interfaces and heretogeneities. We plan to invite contributions from the following research groups:

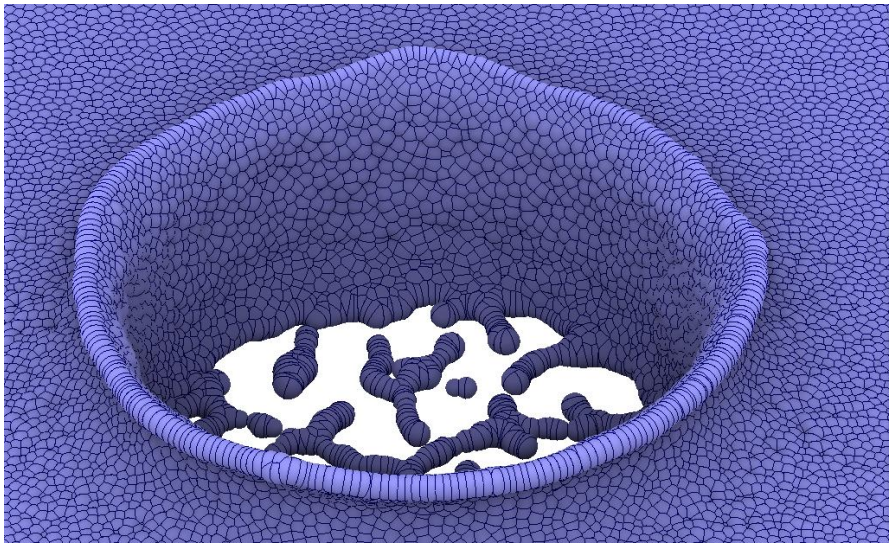
Semi-discrete optimal transport and fluid dynamics: Quentin Merigot/Thomas Gallouet

Topological optimization: Pascal Frey/Gregoire Allaire/Charles Dapogny

Mesh adaptation: Frederic Alauzet/Adrien Lozeille *Boundary conditions:* Franz Chouly

Voronoi-based fluid simulation and astrophysics: Roya Mohayaee/Volker Springel

Computer graphics: Fernando de Goes / Mathieu Desbrun / Chris Wojtan



REFERENCES

[1] Simon D. M. White, Volker Springel: Fitting the universe on a supercomputer. Computing in Science and Engineering 1(2): 36-45 (1999)

[2] Thomas O. Gallouët, Quentin Mérigot,A Lagrangian Scheme à la Brenier for the Incompressible Euler Equations. Foundations of Computational Mathematics 18(4): 835-865 (2018)

[3] Fernando de Goes, Corentin Wallez, Jin Huang, Dmitry Pavlov, Mathieu Desbrun: Power particles: an incompressible fluid solver based on power diagrams. ACM Trans. Graph. 34(4): 50:1-50:11 (2015)

[4] Grégoire Allaire, Charles Dapogny, Pascal Frey: A mesh evolution algorithm based on the level set method for geometry and topology optimization, Structural and Multidisciplinary Optimization, 48(4): 711-715 (2013)

[5] Stéphanie Chaillat, Samuel P. Groth, Adrien Loseille: Metric-based anisotropic mesh adaptation for 3D acoustic boundary element methods. J. Comput. Physics 372: 473-499 (2018)

[6] Francis, Natarajan, Atroshchenko, Lévy, Bordas: A one point integration rule over star convex polytopes Computers & Structures (2019)

[7] Bruno Lévy, Erica L. Schwindt: Notions of optimal transport theory and how to implement them on a computer. Computers & Graphics 72: 135-148 (2018)

[8] Bruno Lévy, A Numerical Algorithm for L2 Semi-Discrete Optimal Transport in 3D, ESAIM: M2AN 49, 1693-1715 (2015)