

Descriptions of available dissertation projects in MATH+

AA1-13: Placing Steiner Points in Constrained Tetrahedralizations

<https://tub.stellenticket.de/en/offers/128448/>

Numerical simulation on 3D objects requires the generation of an appropriate mesh. The object is commonly given as a piecewise linear boundary representation and a decomposition into tetrahedra is desired. The crucial part in generating this decomposition is finding an initial tetrahedral mesh without creating many additional vertices, so-called Steiner points. The mesh can be later adaptively refined if higher accuracy is required. The placement of Steiner points significantly affects the quality of the mesh and there are currently no methods that would provide any form of guarantee or termination. What makes the problem even more difficult in practice is that placement of Steiner points is often constrained. The main goal of the project is to develop and implement algorithms that generate a tetrahedral mesh with few well-placed Steiner points conforming to a given PL complex, preserving elements that are constrained.

Requirements:

- Successfully completed university degree (Master, Diplom or equivalent) in Mathematics, or with appropriate specialization, in a related field,
- very good programming skills (C++, Python...)
- solid background in geometry processing, mesh generation, and related areas
- solid mathematical background in geometry
- very good spoken and written skills in English or German
- team player, good communication skills, flexibility, self-motivation, analytic thinking, interest in academic work

[BMS Research Training Area 1, 4, and 5](#), Faculty: [Marc Alexa](#)