Workshop Donau-Isar-Inn 2015
Fakultät für Informatik und Mathematik
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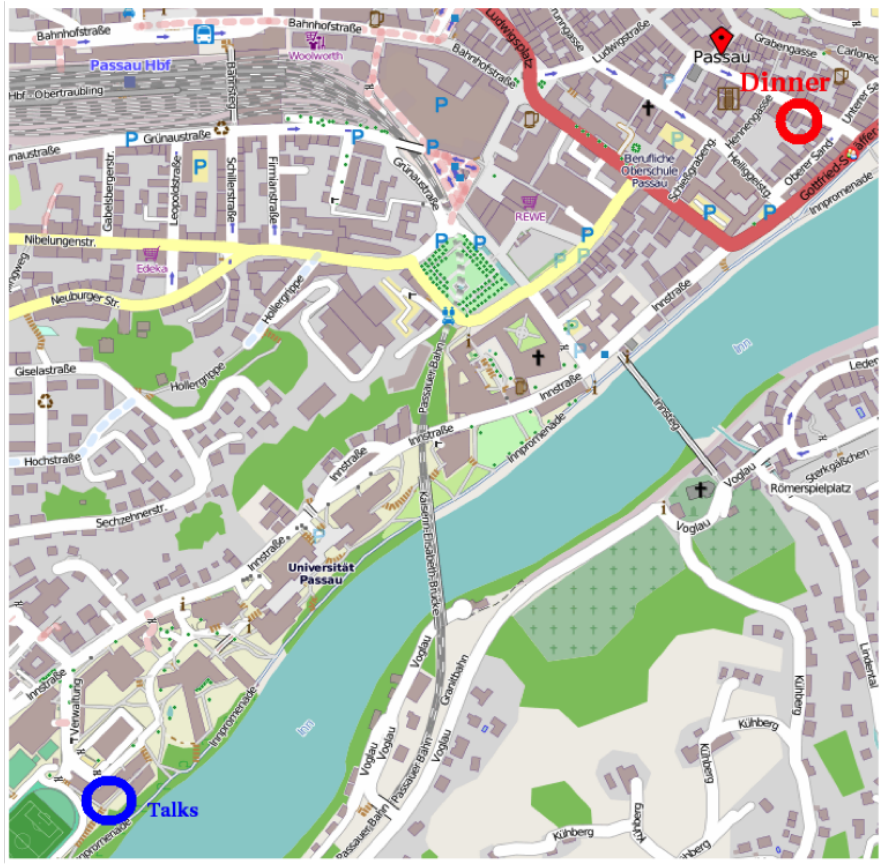

Workshop
Donau-Isar-Inn 2015
Approximation Theory and Applications

Friday, 16.10.2015 Universität Passau, ITZ SR 004

14:30 Markus Haltmeier, Universität Innsbruck
Image reconstruction in photoacoustic tomography

15:30 Juliane Sigl, TU München
Non-linear ℓ_p-residual minimization in a greedy algorithm for phase retrieval

16:00 Coffee break

16:45 Holger Wendland, Universität Bayreuth
Multiscale approximation by radial basis functions

17:45 Jörg Handeck, Universität Passau
Spline multiresolution

19:00 Dinner

Session I

14:30 Markus Haltmeier, Universität Innsbruck
Image reconstruction in photoacoustic tomography

Photoacoustic tomography is a newly developed non-invasive medical imaging modality that combines the benefits of pure optical imaging with those of pure acoustic imaging (ultrasound). In this hybrid modality, pulsed light is used to induce acoustic waves depending on the structure of the sample. The acoustic waves are measured outside of the sample and the mathematical task is to reconstruct an image of the interior. In this talk we give a selected review on recent progress made in photoacoustic image reconstruction. We address aspects such as explicit inversion formulas, data sampling, numerical inversion, and quantitative image reconstruction.

15:30 Juliane Sigl, TU München
Non-linear ℓ_p-residual minimization in a greedy algorithm for phase retrieval

Motivated by a very efficient greedy algorithm we introduced recently for solving phase retrieval problems with convergence guarantees, we present a modification to iteratively reweighted least squares to solve non-linear residual minimizations in ℓ_p-norms.

Session II

16:45 Holger Wendland, Universität Bayreuth
Multiscale approximation by radial basis functions

Radial basis functions (RBFs) are a popular meshfree discretisation method. They are used in various areas comprising, for example, scattered data approximation, computer graphics, machine learning, aeroelasticity and the geosciences. The approximation space is usually formed using the shifts of a fixed basis function. This simple approach makes it easy to construct approximation spaces of arbitrary smoothness and in arbitrary dimensions. Multiscale RBFs employ radial basis functions with compact support. In contrast to classical RBFs they do not only use the shifts of a fixed basis function but also vary the support radius in an orderly fashion. If done correctly, this leads to an extremely versatile and efficient approximation method. In this talk, I will discuss the basic ideas of multiscale RBFs, I will give and analyse an explicit algorithm for the reconstruction of multivariate functions from scattered data. After that, I will discuss how multiscale RBFs can be used for data compression, for the resolution of different scales in the target function and how they can be used to solve partial differential equations numerically.

17:45 Jörg Handeck, Universität Passau
Spline multiresolution

In many applications, especially in context of CAD/CAM systems, splines are still the first choice to represent or manipulate data sets. For that reason, algorithms are needed that operate on spline curves and surfaces with a sufficient amount of flexibility, especially with arbitrary knot configurations. We present a “wavelet-like” decomposition of spline curves, a multiresolution approach with adaptive knots and least-squares projection. This approach will be used for feature detection in CAM trajectories, where the detected features, such as edges or cusps, require special attention and treatment in the production process.