Scattered Data Fitting with truncated Fourier Series

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A scattered data fitting method is proposed based on penalised least squares technique and truncated Fourier series. This method depends on a choice of a smoothing parameter which is computed via the generalized cross-validation algorithm. The Fourier coefficients are determined by solving a linear system consisting of the partial derivatives of a Lagrangian function. The linear system is solved in parallel using GPUs. The method is applied to the problem of calculating the surface area of a landscape and additionally in the interpolation of the Lagrangian trajectories of a Newtonian fluid flow simulated by computer means. Finally a comparison with the thin plate spline interpolation method is presented.