MATHEMATIKKOLLOQUIUM

Das Institut für Mathematik lädt zu folgendem Vortrag ein:

Timo Eirola

Department of Mathematics and Systems Analysis
Aalto University, School of Science, Finland

Particle trajectory computations in a fusion reactor

We consider the computation of a large number of trajectories of charged particles in given electric and magnetic fields. First a few experiments testing some exponential integrators are shown. These turn out to allow relatively large time steps.

Then we consider interpolation of the pre-computed fields given on a uniform grid. Higher order ordinary differential equation solvers usually expect smooth right hand sides. To this end the interpolation should provide a smooth function. On the other hand electric fields are always curl-free and magnetic fields are divergence-free. From the experiments of our physics collaborators we know that the latter, divergence-free approximation of the magnetic field, is more important for good quality particle simulations. Hence we concentrate on that in this preliminary approach.

On the other hand, for efficiency, it is required that the evaluation of the field at a given point should be fast, i.e., local. We will consider smooth divergence-free polynomial spline interpolation in two dimensions with bicubic and biquintic polynomials. The given problem, to produce a div-free interpolation, is a global one. In our approach we first solve a linear global problem. The requirements of interpolation, being div-free, and smooth are not enough to fix the splines. We use the extra degrees of freedom to minimize the H^2 seminorm of the interpolated field. After solving the corresponding linear system the evaluation of the interpolation at any point is a simple local computation.

Zeit: **Mittwoch, den 13. Juni 2012 um 17:15 Uhr**

Ort: **Bauing.-Gebäude, Technikerstraße 13, HSB 6**

Gäste sind herzlich willkommen!

Alexander Ostermann