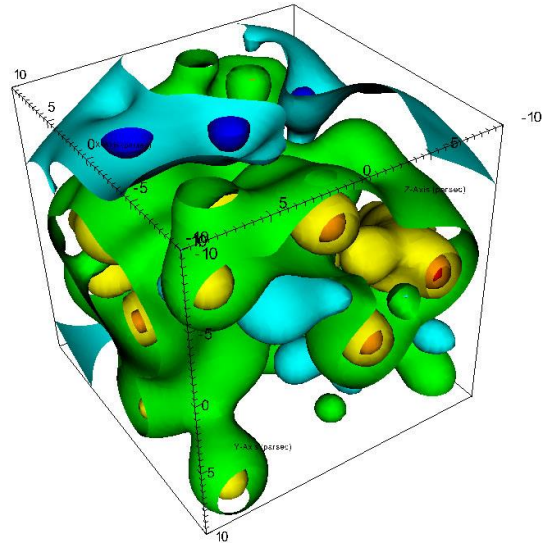# KTH Computational Science and Engineering Centre

Visualisation Workshop 5-6 December 2013

KTH Campus (Salongen & VIC), Stockholm, Sweden

Lecturer: Dr. Jean Favre, CSCS Switzerland

The application of simulations and computers in nowadays Science and Engineering also requires an adequate interpretation and presentation of the simulation results. In particular, data sets obtained by large-scale simulations, *e.g.* for the high-resolution DNS (direct numerical simulation) of turbulent flows, at each time instant gigabytes of data on billions of grid points are available to model reality. In order to understand and draw conclusions from the wealth of data, advanced method to visualise and interact with the data are necessary. For this purpose, a number of visualisation concepts, usually available in software packages, has been developed. However, the proper usage of scientific visualisation is not straightforward, in particular if large data sets are concerned. Therefore, KCSE has invited Dr. Jean Favre, head of the Scientific Visualisation Group at CSCS (Lugano, Switzerland), for this two-day workshop, to discuss both basic and advanced concept of modern visualisation. The workshop will be mainly concerned with the software package VisIt (www.llnl.gov/visit), which is an Open Source code based on the VTK toolkit. VisIt is available at KTH also at PDC, and can easily be installed on any laptop. However, the discussed concepts are general and not necessarily tied to Visit.

Course organisation: This workshop is organised by KCSE, the KCSE Centre for Computational Science and Engineering. For more information please contact Dr. Philipp Schlatter, KTH Mechanics (pschlatt@mech.kth.se).

Course times: December 5, 9-18 (Salongen, KTH Library), December 6, 9-16 (VIC). On Friday we will be in the KTH VIC and experience the 4K stereoscopic screen available at KTH.

Course content:

- Introduction to visualisation, concepts, purpose, past, future
- Basic theory, ways of visualising: contours, isosurfaces, volume rendering, streamlines, LIC, vectors etc. Popular toolkits: VTK, Matlab, VisIt, Paraview.
- Data formats: standard formats such as HDF, VTK, big data, XDMF; how to use these formats, which one for what purpose.
- Demonstration of stereoscopic visualisation
- Usage of Visit:
    - Basic features, installation, preparing and loading data
    - Scripting with Python
    - Parallel Visit / client-server
    - Time-dependent data
    - Interaction with Nek5000
    - Other advanced topics such as in-situ visualisation, moving meshes, particles.
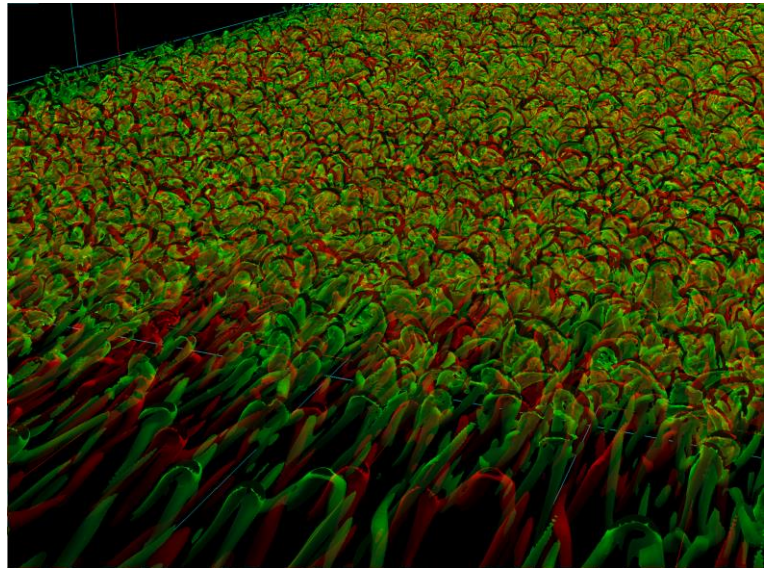
Audience: Mainly PhD students and Postdocs of KCSE (KTH Centre for Computational Science and Engineering). Some basic knowledge of simulation, scientific data formats and postprocessing is necessary. The topics are cross-disciplinary, but will mostly be shown on the example of fluid-dynamics data sets (essentially 3D vector fields and Lagrangian fields). You can bring own data sets and interact with the other participants/lecturer for specific questions.

Prerequisites: Please have a recent installation of VisIt ready on your laptop, and bring the laptop to the course. Wireless access to Eduroam is also necessary to download the course material and examples.

Registration: The attendance is free of charge and will include the lectures plus refreshments during the two days (no lunch however). The number of seats is limited to 20. Please register as soon as possible with Dr. Zilvinas Rinkevicius (rinkevic@kth.se), but by the latest November 29. A confirmation will be sent out then.

Pictures:
1) Density isosurface generated by VisIt. See Snapshots from VisIt homepage.
2) DNS of a turbulent boundary layer close to tripping of turbulence. See http://www.youtube.com/watch?v=DX_wPZJYfAQ.