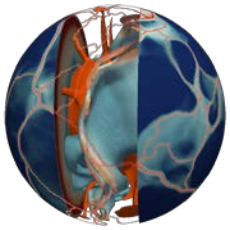
UNIVERSITÉ DE NEUCHÂTEL

CHYN
Centre d'hydrogéologie et de géothermie

MSc in Hydrogeology and Geothermics

Thesis topic proposal 2017

PARALLEL VISUALIZATION WORKFLOW AUTOMATION



Introduction

The visualization of scientific simulations at very high resolution is a great challenge. Parallel visualization software packages (e.g. Paraview[1], Visit[2]) have been developed to transform the large amount of generated data into images. However, the learning curve is very steep to become an efficient user of these general software packages, and data transfer from the simulation application to the visualization software is cumbersome.

Context and objectives

The aim of the project is the automation of the full visualization process of certain types of scientific simulations (geothermics and geodynamics 2D/3D applications; provided to the student). This development includes (a) the automation of the data transfer from the simulation application to the visualization software, and (b) the automation of commonly required and/or useful visualizations. The generation of novel and particularly appealing visualization methods would be a great plus. Simplicity of usage is key priority, as users are typically not computer scientists.

Research approach and methodology

a) Automation of data transfer

Data transfer from the simulation application to the visualization software typically involves routes through the hard drive. For this purpose, the data must be written in special formats (e.g. VTK file format[3]). Recent developments permit the visualization software to access the data from the simulation application directly from memory, i.e. it is not required to write any data to the hard drive (so called *in-situ visualization*).

The student can choose either way of data transfer. The second (in-situ visualization) would be a significant achievement because this is rarely used real-world scientific simulations, yet offers wide-ranging benefits.

b) Automatization of commonly required/useful visualizations

Major visualization methods (e.g. isosurfaces, slices, etc.) can be applied across a large variety of projects in numerical geothermics and geodynamics. Automating these methods application is therefore a major aim.

Some common visualization methods will be given to the student for automation, and the student is challenged to innovate and derive other useful visualization schemes.

Partners and collaboration

The project will be supervised by Prof. S.A. Miller (UniNE), Dr. Samuel Omlin (CSCS) and Reza Sohrabi (UniNE). It will be carried out in collaboration with the Swiss National Supercomputing Centre (CSCS) in Lugano which will enable the student to come into contact with members of other research facilities and participate in scientific conferences.

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1 www.paraview.org
2 visit.llnl.gov
3 www.vtk.org