Master Thesis / Student Researcher Position

dco/c++ and TAPENADE:

Algorithmic Differentiation by Source-Transformation and Overloading

Description: Algorithmic differentiation is a program transformation technique for the automatic generation of *adjoint codes* for a given numerical simulation program. Adjoint codes play a crucial role in sensitivity analysis and optimization, since they deliver derivatives of computed outputs with respect to parameters in a runtime which is a constant multiple of the runtime of the original program. Sensitivity information reveal highly desirable properties of the underlying system, see for example the figure on the right.
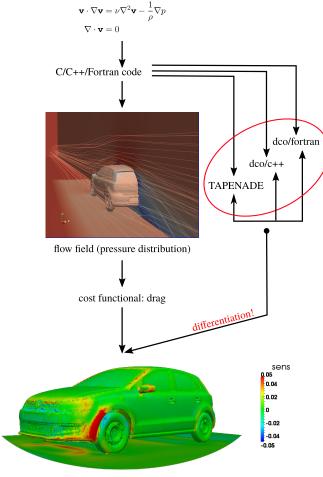
Goal: In cooperation with INRIA Sophia-Antipolis (France / travel expenses covered), you will develop an automatic coupling between TAPENADE and dco/c++ (dco stands for *derivative code by overloading*). This corresponds to a combination of source-transformation and overloading approach yielding better efficiency and flexibility of the adjoint code generation step.

Profile: You should know C/C++ as well as Fortran. In addition, knowledge in the field of GPGPU programming, compiler construction and numerical simulation / optimization is advantageous.

If you are interested in a master thesis or a student researcher position (up to 19 hours a week) on this topic, please do not hesitate to contact us!

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$$\mathbf{v} \cdot \nabla \mathbf{v} = \nu \nabla^2 \mathbf{v} - \frac{1}{\rho} \nabla p$$
$$\nabla \cdot \mathbf{v} = 0$$

C/C++/Fortran code

flow field (pressure distribution)

cost functional: drag

dco/fortran

dco/c++

TAPENADE

differentiation!

sensitivities w.r.t. mesh nodes on the surface