

## **ESR4: Adjoint-based optimisation workflows**

Engys Ltd. (London)

### **The hosting group**

Engys is an engineering software and systems services company centred around open source CAE tools and networked platforms. Engys currently provides consulting, development and support for OPENFOAM (CFD), DAKOTA (multi-disciplinary optimisation) and Code\_Aster (structural analysis) as well as a growing list of optimisation oriented SaaS (software as a service) products. The company is currently a partner in the FP7 MAAT project and provides CAE services to a large number of blue chip companies.

The work is supervised by Dr Eugene de Villiers, head of Research and Development at Engys. His specialisations include mesh generation, adjoint solver systems, numerical schemes and large eddy simulation.

### **The work**

- Familiarisation with advanced C++ programming in OPENFOAM.
- Application of current continuous adjoint methodology to mid and large size topology optimisation test cases.
- Level-set and Immersed Boundary. Improvement of current solid-fluid interface handling in continuous adjoint topology optimisation tool. Include level-set based curvature limitation and other constraints.
- Workflow for extracting, re-meshing and validating optimal surface based on final level-set field. Application of new interface treatment and multi-objective approach to a 3-D industrial topology optimisation benchmark case for a single operating point.
- Multi-point optimisation. Extension of topology optimiser to efficiently incorporate multiple primal input fields running concurrently with the adjoint evaluation. Application to 3-D industrial topology optimisation benchmark case for a multiple operating points.
- Submission of PhD thesis and Publications.

The ESR (early stage researcher) will work closely with network partners NTUA (National Technical University of Athens) and VWAG (Volkswagen Audi Group) to integrate robustness and speed improvements into the optimisation tool. The Ph.D. will be pursued via one of the network partner institutions (QMUL (Queen Mary's University London, NTUA, RWTH (Aachen University))).

### **Required background**

**Essential:** You need to have

- a good Masters degree (or equivalent) in Mechanical/Aerospace Engineering. Candidates with a Masters-level background in Applied Mathematics, Physics

or Computer Science will also be considered if they have an acceptable background in modelling of fluid flow.

- obtained your last degree within 4 years of application, not have an existing Ph.D. qualification
- experience with CFD code development and application.
- demonstrable capability of working with and deriving complex mathematical constructs such as the continuous adjoint of the Navier-Stokes equations.
- the ability to give presentations and write scientific publications
- the willingness and ability to attend the regular network training events in the EU and to spend two 2 month secondments at network partners.
- permission to work in the European Union.

**Desired:** it would be good if you had experience with

- OPENFOAM code development and application
- the derivation and application of adjoint optimisation methods for fluid dynamic problems
- familiarity with finite volume numerical methods

## **Salary, conditions and environment**

The salary is approximately £43,000\* per annum before deductions (gross) (\* at current €/£ exchange rates).

The network will provide a range of workshops on scientific aspects relevant to adjoint-based optimisation that will be directly or indirectly relevant to the work in this research position, see the About Flow webpage for details. You will also be offered a range of skills complementary to your core research area such as project management, thesis writing and entrepreneurial skills.

Engys and the About Flow project are committed to Equal Opportunities for all candidates and will follow the principles of the European Charter for Researchers.

Contract Duration: 36 months

Project Start Date: 1 May 2013

## **How to inquire and apply**

Applications for the position are open. For informal enquiries about this position please contact

Eugene de Villiers

E-mail: [e.devilliers@engys.com](mailto:e.devilliers@engys.com)

To apply for the position please send a CV and a signed reference letter to the following address:

Francisco Campos

Engys Ltd.

Studio 20, Royal Victoria Patriotic Building,

John Archer Way,

London, SW18 3SX

Or by email to [f.campos@engys.com](mailto:f.campos@engys.com)

Application Closing Date: 14/12/2012