

Services

{tab=Services}

blueCAPE provides consulting services in areas of relevance to aerospace, automobile, energy and environment related industries. Our main focus is on:

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Fluid flow simulation (including heat and mass transfer phenomena). This comprises both turn-key solutions as well as research work, done on behalf of the customer;

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Install, train and assist in the operation of fluid flow simulation software and related support platforms;

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Serve as adviser in the development and establishment of in-house R&D units;

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Distribute, install, train and assist in the operation of optimisation software.

As an example of blueCAPE's capabilities we quote, among others, simulation and optimisation works on:

exterior aerodynamics;

plastic and metal cooling process (and their optimisation);

the thermal behaviour of cooling devices (like intercoolers and radiators) or simply the management of thermal loads irrespective of its source (e.g., cooling of electronic components);

structures subject to turbulence or their behaviour in fluid/structure interaction problems;

interior ventilation (industrial hangars, parking lots, offices, etc);

dispersion of pollutants in nature (atmosphere, water flows) and industrial environments;

internal combustion engines exhaust systems behaviour;

industrial combustion process;

noise and comfort analysis.

blueCAPE's team has collected a great deal of expertise in its area of service through the execution of several works worldwide.

{tab=Training}

During the first quarter of 2013, blueCAPE will start to offer training courses. Among them will feature:

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How to fully exploit blueCFD, specially in heterogenous computer environments.

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CFD fundamentals.

Please subscribe to one of our feeds to be kept up-to-date on our upcoming courses and all other offerings.

{tab=AVAC/HVAC}

Detached house in Castelo Branco. Architecture Project by Cláudia Melo.
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Ventilation inside road tunnels.
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Paper: External wind influence on a fully developed indoor fire.
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{tab=Automatic Optimization}

The information contained herein is not meant to be exhaustive or present the best-in-class references in the field. Instead, it just contains a brief perspective on the topic. Surely, important aspects are neglected here, but that does not happen on purpose.

Automatic optimization is a field with much work still to be carried out on several fronts. Among them we have:

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Optimization algorithms, in particular the choice of the most appropriate one for any given problem at hand;

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Speed-up strategies for very expensive cases, like the Response Surface methodology, again something which can be very much case-dependent;

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Ancillary steps, like Design-of-Experiments or Uncertainty Quantification (e.g., as required in Robust Design) for optimal usage of resources and real-life analysis of problems.

In the general context of CAE, optimization is simulation-time intensive, making its usage cost to be high, at times. However, this does not diminish its usefulness. So much so that there are already quite a few commercially available tools which have a fair amount of success:

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OPTTEK: <http://www.opttek.com>

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VisualDOC: <http://www.vrand.com>

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IOSO: <http://www.iosotech.com>

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SmartDO: <http://www.fea-optimization.com>

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modeFrontier: <http://www.esteco.com>

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iSight: <http://www.simulia.com/products/isight2.html>

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OptiY: <http://www.optiy.de>

This list has not been ordered in any particular way. More details can be seen in this Wikipedia article: [Multidisciplinary design optimization](#)

blueCAPE has worked with modeFrontier in the past, and can therefore testify to the efficiency and effectiveness gains that Automatic Optimization can deliver.

However, there also very good tools available in the Open Source world. In particular, if you know your optimization problem well and have human resources skilled enough to work directly at source code level, you can do things in-house (or hire someone to do it for you). Some good sources of information:

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Tools: Automatic Differentiation, Modeling Systems, Demos and Analysis Tools

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Arnold Neumaier's page on Global Optimization

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Computational Infrastructure for Operations Research

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DAKOTA, a Multilevel Parallel Object-Oriented Framework for Automatic Optimization, Parameter Estimation , Uncertainty Quantification and Sensitivity Analysis (it includes JAGUAR, a GUI).

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openMDAO, which is an open-source Multidisciplinary Design Analysis and Optimization (MDAO), written in Python. It can be used to develop an integrated analysis and design environment in engineering problems.

If you are after a GUI, there are also some alternatives, like:

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Evolutionary Algorithms Workbench - EvA2

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Metaheuristic Algorithms in Java - jMetal

{tab=Software Development}

We at blueCAPE have a wide experience in software development oriented for engineering solutions. Our expertises include:

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Development and implementation of Computational Fluid Dynamics algorithms;

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Implementation of Fire Propagation models for wildlife fires;

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Development of Graphical User Interfaces;

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Development of multi-platform software.

Our experience with programming languages include, with varying degrees of experience: C, C++, C#, FORTRAN, Ruby, LUA, Pascal, PHP, ECMA Script (JavaScript), Java, MATLAB.

Software toolboxes we are familiar with and use regularly:

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Qt - A cross-platform application and UI framework

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OpenCV - Open Source Computer Vision

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VTK - Visualization Toolkit

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OpenFOAM - Open Field Operation and Manipulation CFD Toolbox

Here are a few examples of our software developments:

{slide=blueFIRE}

blueFIRE is a robust computer program to simulate the propagation of wildfire fires. Due to its degree of interactivity and faster-than-real-time nature, it aims to be a helpful tool in forest-fire fighting.

Several physical and numerical models are available to choose from, allowing the user to adapt the program to his/her needs or to conform to best practices established with other modelling systems, like FARSITE. Also, the range of valid fuel models comprises several classification systems, including the one from the Northern Forest Fire Laboratory, USA.

It has the capacity to employ detailed meteorological fields (e.g., prognostic) in the forest-fire simulation, alongside variations in the fuel moisture content.

Possible uses include but are not limited to training, decision-aid, controlled fire planning or, naturally, forest-fire fighting.

blueFIRE has been designed from the ground-up to be a flexible tool, that can either work as a standalone application or embedded in other, more encompassing, environments.

{flv}video_blueFen{/flv}

blueFIRE was developed in 2007 to be included in the SIGEL project developed by TECMIC - Tecnologias de Microelectrónica, S.A.

SIGEL stands for "Sistema Integrado para a Gestão de Situações de Emergência e Logística", which translates to "Integrated System for Management of Emergencies and Logistics", one of which such emergencies is forest fires. BlueFIRE handles the forest fire simulations in a seamless integrated manner in SIGEL.

{/slide}{slide=blueCFD (summary)}

blueCFD® is a product portfolio, for which more information is provided here.

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