ADDECCO

Project ID: 226316
Funded under: FP7-IDEAS-ERC

Adaptive Schemes for Deterministic and Stochastic Flow Problems

From 2008-12-01 to 2013-11-30, closed project

Project details

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<th>Total cost:</th>
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<td>EUR 1 432 770</td>
<td>ERC-AG-PE1 - ERC Advanced Grant - Mathematical foundations</td>
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<td>EU contribution:</td>
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<tr>
<td>EUR 1 432 769</td>
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<td>Coordinated in:</td>
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Objective

The numerical simulation of complex compressible flow problem is still a challenge nowadays even for simple models. In our opinion, the most important hard points that need currently to be tackled and solved is how to obtain stable, scalable, very accurate, easy to code and to maintain schemes on complex geometries. The method should easily handle mesh refinement, even near the boundary where the most interesting engineering quantities have to be evaluated. Unsteady uncertainties in the model, for example in the geometry or the boundary conditions should represented efficiently. This proposal goal is to design, develop and evaluate solutions to each of the above problems. Our work program will lead to significant breakthroughs for flow simulations. More specifically, we propose to work on 3 connected problems: 1-A class of very high order numerical schemes able to easily deal with the geometry of boundaries and still can solve steep problems. The geometry is generally defined by CAD tools. The output is used to generate a mesh which is then used by the scheme. Hence, any mesh refinement process is disconnected from the CAD, a situation that prevents the spread of mesh adaptation techniques in industry! 2-A class of very high order numerical schemes which can utilize possibly solution dependant basis functions in order to lower the number of degrees of freedom, for example to compute accurately boundary layers with low resolutions. 3-A general non intrusive technique for handling uncertainties in order to deal with irregular probability density functions (pdf) and also to handle pdf that may evolve in time, for example thanks to an optimisation loop. The curse of dimensionality will be dealt thanks Harten's multiresolution method combined with sparse grid methods. Currently, and up to our knowledge, no scheme has each of these properties. This research program will have an impact on numerical schemes and industrial applications.

Related information

Report Summaries

Final Report Summary - ADDECCO (Adaptive Schemes for Deterministic and Stochastic Flow Problems)
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Beneficiaries

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To know more

http://erc.europa.eu/

Subjects

Mathematics and Statistics - Physical sciences and engineering

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