Postdoctoral position in flow control and large-scale model reduction

CORMORED Project

The aim of this project is to contribute to the development of innovative theoretical and numerical methods of flow control well adapted to large scale problems. A significant part of the project will be devoted to the determination of both accurate and robust reduced order models. Different theoretical approaches will be investigated by the members of the project: linear model based on global modes or balanced truncation and non linear model based on POD modes or extensions. The resulting reduced order models will then be used in both open (optimal control) and closed loop (robust control) control strategies. A significant part of the project will be more specifically devoted to the closed loop control. A special emphasis will be put on the development of numerical methods allowing to solve the Riccati equation for large scale systems and on the derivation of a state estimator, physically realistic and mathematically consistent.

Job description

For this project, a 18 month-postdoc grant is available. The specific objective is to develop new and innovative techniques for model reduction in order to guarantee both good performances (accuracy with respect to the actual flow) and some robustness with respect to unknown fluctuations of the flow conditions. These requirements are necessary to apply these techniques to "real-life" configurations. In addition to the development of model reduction techniques, the candidate will also develop techniques to control the flow, both in open (optimal control) and closed-loop framework and in presence of uncertainties (Reynolds number, external perturbation, etc.). Efficient strategies to determine the reduced order model time evolution will be proposed and new techniques for the closed-loop control will be investigated.
The work is then two-fold. First, theoretical developments of innovative approaches for the system reduction and its subsequent control. Second, numerical investigations of the proposed methodology on a physical configurations (2- or 3-D cavity flow).

The net salary is about 27,000 euros per year. The job will take place in France at LIMSI (Orsay, near Paris) and/or PPRIME Institute (Poitiers) at the candidate convenience.

LIMSI is a well-recognized lab with several teams devoted to computational fluid dynamics, flow control and numerical analysis: see http://www.limsi.fr/index.en.html
PPRIME is one of the largest institute in France for fluid mechanics, thermal sciences and combustion. PPRIME/ATAC (Aerodynamics, Turbulence, Acoustic and Control) is working mainly on different aspects of flow control, see http://www-lea.univ-poitiers.fr/?lang=en

Required skills

The candidate should ideally be comfortable in fluid mechanics and with the basic theoretical aspects of the control theory or model reduction. Skills in applied mathematics and numerical linear algebra will be appreciated. She/He should also be experienced in numerical simulations and programming to numerically investigate the performance of the techniques she/he will develop.
Finally, and most important of all for a decent scientific research, a high motivation is necessary.

No citizenship condition applies, foreigners application is welcome.

Contacts

For application, please send a resume to:
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