

CEA/CADARACHE

DIRECTION DES SCIENCES DE LA MATIÈRE (DSM)

INSTITUT DE RECHERCHE SUR LA FUSION PAR CONFINEMENT MAGNETIQUE (IRFM)

CEA/Cadarache - 13108 St Paul-lez-Durance Cedex

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PROPOSITION DE STAGE 2012-2013

Nom du Responsable du Stage : Guillaume Latu	e-mail : guillaume.latu@cea.fr
	téléphone : 04 42 25 63 57
	secrétariat :
Équipe de Recherche : IRFM/SIPP/GP2B	

Niveau du stage : INGENIEUR – MASTER 2
Durée du stage : 6 mois

sujet du stage :

<p><u>Title:</u> Data compression to store large sparse matrices</p> <p><u>Topics:</u> Scientific & parallel computing.</p> <p><u>Context:</u> The non-linear MHD simulation code JOREK is used to study the evolution of the ELM instability inside a Tokamak. To simulate the complete cycle of an ELM instability, a large range of time and spatial scales need to be resolved simultaneously. A fully implicit time evolution scheme is used in the JOREK code in order to deal with this large spectrum of scales. To deal with the implicit scheme, a parallel direct solver, Pastix, is coupled with JOREK. Pastix solves the large matrix produced by JOREK at each time step. An hybrid thread/MPI programming model has been chosen both in JOREK and Pastix in order to improve the scalability on parallel platforms. The reduction of memory footprint is a major goal in order to consider larger physical cases.</p> <p><u>Objectives of the internship:</u> The large input matrix storing the whole system to be inverted represents a lot of memory. The first objective will be to consider few compression techniques in order to reduce the footprint of this matrix, even if it induces some computation expenses. This large matrix is mainly used as input for the Pastix solver, and for the GMRES driver. A second objective will consist in improving the GMRES driver using up-to-date parallel implementation of GMRES in order to better parallelize computations and also to lower memory usage.</p>
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Domaine de spécialité, compétences : Computer science, Parallel computing, Applied Math.
Prolongement possible thèse : NON