Proposition de recherche doctorale

Real-time scheduling problems for distributed simulation of numerical models

Mots clés :

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● Co-encadrant(s) :
● Unité de recherche : Laboratoire inconnu!
● Ecole doctorale : École Doctorale Informatique, Télécommunications, Électronique de Paris
● Domaine scientifique principal : Divers

Résumé du projet de recherche (Langue 1)

When designing complex systems, engineers have to integrate numerical models from different modeling platform in order to simulate the whole system, even in the early stage of the process in order to estimate global system performances. If some parts of the system are already available, it is possible to connect these real components to the simulation in a Hardware-in-the-Loop (HiL) approach. In this case, the simulation has to be performed in real-time where models execution consists in periodically reacting to input from the real components and provide numerical output updates. The increase of requirements on the simulation accuracy and its validity domain requires models more complex, leading to forbid to reach real-time execution without using multiprocessor architectures. The model exchange and co-simulation interface FMI (Functional Mocked-up Interface), increasingly common standard, offers new opportunities for distribution of numerical models, by enabling intra model parallelization. One objective of this thesis is to define algorithms for extracting potential parallelism in a set of interconnected multi rate models. Another one consists in proposing algorithms for the distribution and scheduling of models, taking into account their real-time, data dependencies and allocation constraints. Finally, hybrid techniques for performing real-time distributed simulation will be studied: fixed step solvers are often imposed whereas multicore platforms could allow variable approaches using redundancy. This thesis is part of a joint action IFPEN - INRIA in which INRIA brings its real-time systems experience to the numerical simulation challenges of IFPEN. Keywords: real-time, multicore execution, co-simulation.