CoModels, engineering dynamic compositions of coupled models to support the simulation of complex systems

Mots clés :
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Résumé du projet de recherche (Langue 1)

There are no methodologies today that can support modelers in: ? Representing and reasoning about these “composite” models ? Implementing and experimenting these assemblages of models Some technologies have however been proposed in the latest years, but they are mostly oriented towards proposing technological solutions to the operational coupling of models (HLA, DEVS) [1][2], leaving aside the “semantic” problem of their static or dynamic composition. In particular, there is no way one can provide, let alone revise and reuse, a description of their composition, such as, for instance, the spatial and temporal scales of the models involved, their transfer functions, how they are supposed to be combined during experiments, etc. Consequences are: the scattering of models in the same disciplines, the difficulty to compare, to reuse and combine them, and also the difficulty to reuse existing schemes for composing models. We propose in the PhD to tackle this problem by simultaneously addressing the questions of the modeling and simulation (execution) of these co-models (as a contraction of « combination of models »). The central claim of the thesis will be to consider a « co-model » as a model, and more specifically an agent-based model, in which the agents wrap one or several instances of the models to couple, with their own life-cycle, operations, collaborations, conflict resolution mechanisms, etc. which will draw from the numerous works already published on multi-agent systems. A co-model, in this perspective, will be a model that captures and represents a particular collaboration between these « sub-models », which can be based on existing collaboration schemes between experts, or any other way of organizing their contributions. Conversely, this work will allow to consider « regular » agent-based models as very specific implementations of co-models, where agents only wrap models of individuals. The ultimate goal of the candidate will be to provide both a language and an infrastructure for co-modeling, and it is expected that, while reusing results from domains ranging from software engineering to distributed simulation, innovative proposals will be made that will extend beyond the field of modeling. The development of this infrastructure will be based upon the existing GAMA Platform [4], which already provides modelers with the possibility to design complex, multiple scales, heterogeneous agent-based models [3]. It will benefit from its modular structure and will in turn enable it to easily use and reuse legacy models