Models of Multi-Agent Systems

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Field of Study:
Theoretical computer science
Classification: I-1

Abstract

Multi-agent systems typically utilize a non-blocking asynchronous communication in order to achieve required flexibility and adaptability. High performance computing techniques exploit the current hardware ability of overlapping asynchronous communication with computation to load the available computer resources efficiently. On the contrary, widely used parallel processes modeling methodologies do not often allow for an asynchronous communication description. At the same time those models do not allow their user to select the granularity level and provide only a fixed set of machine and algorithm description quantities. In this work[1] we addressed this issue and designed a new parallel processes modeling methodology. Its main features include an open set of atomic operations that are calculated and predicted for the algorithm in question, and the computer aided semi-automatic measuring of operation counts and approximation of cost functions. This allows not only for tuning the model granularity as well as accuracy according to user needs, but also to reach a such description complexity that would be very difficult to obtain without any computer aid. We demonstrated that our approach gives good results on the parallel implementation of a selected generalized genetic algorithm. A model was constructed and its predictions compared with the reality on various computer architectures, including one parallel cluster machine. We also designed and implemented an open multi-agent system suitable for the above mentioned experiments and many others. This system synthesizes the areas of high performance computing, multi-agent systems and computational intelligence into an efficient and flexible means of running experiments.

[1]The work was partially supported by the project 1ET100300419 of the Program Information Society (of the Thematic Program II of the National Research Program of the Czech Republic) “Intelligent Models, Algorithms, Methods and Tools for the Semantic Web Realisation”.