A Conceptual Graph Petri Net Model based Multi Agent System

Abstract

In this work, we propose a new formal tool called CGPN (Conceptual Graph Petri Nets) which is a combination of CG (Conceptual Graph) and CPN (Color Petri Net) to model collaborative behavior of agents in a MAS (Multi Agent System) to achieve some goals. The CG is used to represent knowledge and on the other side CPN is used to model the concurrent and dynamic aspects of a system. It is difficult to extract precise information from MAS which is dynamic in nature. Modeling MAS with CGPN will help in representing the knowledge and dynamic behavior together. Finally, the CGPN model for MAS is tested for deadlock freedom and reachability analysis to verify its correctness.

References

- M. J. Wooldridge, "Introduction to Multiagent Systems",
- A. Idani, "B/UML: Setting in Relation of B Specification and UML Description for
  Help of External Validation of Formal Development in B",
- M-J. Yoo, "A Componential For Modeling of Cooperative Agents and Its
  Validation",
- P. H. P. Nguyen, D. Corbett, "A basic mathematical framework for conceptual
  graphs",
  In: IEEE Transactions on Knowledge and Data Engineering, Volume 18, Issue 2,
  2005.
- John F. Sowa, Conceptual Graphs, in "The Handbook of Knowledge
  Representation",
  213-237.
- John F. Sowa, "Knowledge Representation: Logical, Physical and Computational
  Foundations",
  (Thomson Brooks/Cole, 2000)
- K. Jensen, "Color Petri Nets – Basic Concepts, Analysis Methods and Practical
  Use",
- Quan Bai, Minjie Zhang and Haijun Zhang, "A Coloured Petri Net Based Strategy
  for Multi-agent Scheduling",
  Proceedings of the Rational, Robust, and Secure Negotiation
  Mechanisms in Multi-Agent Systems (RMS&apos;05)
- Vedran Kordic, "Petri Net, Theory and Applications, in, Use of Petri Nets for
  Modeling an Agent-Based Interactive System: Basic Principles and Case Study",
  ed. Houcine Ezzedine and Christophe Kolski,( I-Tech Education and Publishing, Vienna, Austria,
  2008) , pp. 534
- Su Jindian, Guo Heqing, Yu Shanshan, "A Coloured Petri Net Model for Composite
  Behaviors in Multi-Agent System",
  978-1-4244-1674-5/08 /$25. 00 ©2008 IEEE
- Danny Weyns, Tom Holvoet, "A Color Petri Net for Multi Agent Application",
- Jose R. Celaya, Alan A. Desrochers, and Robert J. Graves, "Modeling and
  Analysis of Multi-agent Systems using Petri Nets",
  Journal of Computers, vol. 4, no. 10, October 2009
- Quan Bai, Minjie Zhang and Khin Than Win, "A Color Petri Net Based Approach for
  Multi-agent Interactions",
  2nd International Conference on Autonomous Robots and
- Borhen Marzougui, Khaled Hassine, Kamel Barkaoui, "A New Formalism for
  Modeling a Multi Agent Systems: Agent Petri Nets",
  J. Software Engineering & Applications. 3(2010) 1118-1124
- Dianxiang Xu, Richard Volz, Thomas Ioerger, John Yen, "Modeling and Verifying
  Multi-Agent Behaviors Using Predicate/Transition Nets",
  SEKE &apos;02.
- Tadao Murata, Peter C. Nelson, "A Predicate-Transition Net Model for Multiple
  Agent Planning",
  Information Sciences (1991) 57-58, 361-384
- J. -D. Vally, R. Courdier, "Hybrid Model to Design Proactivity and
  Multi-Agent-Systems",
Conference on evolutionary computations, 2002
- Laura Recalde, Enrique Teruel, and Manuel Silva, "On Linear Algebraic
Techniques for Liveness Analysis of P/T systems";

**Index Terms**

Computer Science  
Artificial Intelligence

**Keywords**

Multi Agent System  
Petri Net  
Conceptual Graph  
Deadlock  
Reachability