Coordinated consensus analysis of multi-agent systems using event-B

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Abstract: Formal specifications and reasoning techniques in software modelling are needed to ensure the correctness of the system at the design phase. Event-B is a formal method with support tools that allows the stepwise development of reactive systems. Such systems include multi-agent systems as a subclass. In this paper, we propose an approach to specify capabilities of a number of software agents. We then verify whether these capabilities help the agents to accomplish a certain task using a supported tool for Event-B. We use the binary numeral system as a case study to illustrate our approach. ?? 2009 IEEE.
Index Keywords: Consensus analysis; Design phase; Event-B; Formal Specification; Reactive system; Reasoning techniques; Software modelling; Support tool; Multi agent systems; Software agents; Formal methods

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References:

1. http://event-b.orgAbrial, J.-R., (1996) The B-Book, Assigning Programs to Meanings, , Cambridge University Press
2. Ball, E., Butler, M., Event-B patterns for specifying fault-tolerance in multi-agent interaction (2009) LNCS, 5454. , Proceedings of Methods, Models and Tools for Fault Tolerance, of, Springer
3. Butler, M., Decomposition structures for Event-B (2009) IFM'09: Proceedings of the 7th International Conference on Integrated Formal Methods, pp. 20-38. , Berlin, Heidelberg, Springer-Verlag
4. Carli, R., Fagnani, F., Speranzon, Zampieri, A., Communication constraints in coordinated consensus problems (2006) American Control Conference, , IEEE
5. Fadil, H., Koning, J., A formal approach to model multiagent interactions using the B formal method (2005) LNCS, 3563, pp. 516-528. , International Symposium on Advanced Distributed Systems, of, Springer Verlag
6. V. Hilaire, P. Gruer, A. Koukam, and O. Simonin. Formal specification approach of role dynamics in agent organisations: Application to the satisfaction-altruism model. Int. Jour. of Software Engineering and Knowledge Engineering, 17(5):615-641, 2007Lanoix, A., Event-B specification of a situated multiagent system: Study of a platoon of vehicles (2008) TASE '08: Proceedings of the 2008 2nd IFIP/IEEE International Symposium on Theoretical Aspects of Software Engineering, pp. 297-304. , IEEE Computer Society
7. Olfati-Saber, R., Fax, J.A., Murray, R.M., Consensus and cooperation in networked multi-agent systems (2007) Proceedings of the IEEE, 95 (1), pp. 215-233
8. Poppleton, M., The composition of Event-B models (2008) ABZ '08: Proceedings of the 1st international conference on Abstract State Machines, B and Z, pp. 209-222. , Springer-Verlag
9. Regayeg, A., Kacem, A.H., Jmaiel, M., Specification and verification of multi-agent applications using temporal Z (2004) Intelligent Agent Technology Conference, pp. 260-266. , IEEE Computer Society
10. Rogers, A., David, E., Jennings, N.R., Schiff, J., The effects of proxy bidding and minimum bid increments within ebay auctions (2007) ACM Trans. Web, 1 (2), p. 9
11. Nathan Schurr, Janusz Marecki, Milind Tambe, and Paul Scerri. The future of disaster response: Humans working with multiagent teams using defacto. In In AAAI Spring Symposium on AI Technologies for Homeland Security, 2005Shoham, Y., Leyton-Brown, K., (2009) Multi-agent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, , Cambridge University Press, New York
12. Sun, R., Naveh, I., Simulating organizational decision-making using a cognitively realistic agent model (2004) J. Artificial Societies and Social Simulation, 7 (3)
13. Emre Tuna, S., Sepulchre, R., Quantitative convergence analysis of multi-agent systems (2007) 7th IFAC Symposium on Nonlinear Control Systems, pp. 236-241. , August
14. Weiss, G., (2000) Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, , The MIT Press
15. Wickler, G.J., (1999) Using Expressive and Flexible Action Representations to Reason about Capabilties for Intelligent Agent Cooperation, , PhD thesis, The University of Edinburgh
16. Wooldridge, M., (2002) An Introduction to MultiAgent Systems, , John Wiley & Sons