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On agent cooperation

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On Agent Cooperation: The relevance of cognitive plausibility for multiagent simulation models of organizations

Rijks*universiteit* Groningen

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te Hilversum

Promotores

Prof. dr. H.W.M. Gazendam

Prof. dr. ir. J.L. Simons

Prof. dr. R.J.J.M. Jorna

I am, because we are

This thesis is dedicated to
Margo, Roos and Elmo

Beoordelingscommissie

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Acknowledgements

The research on multiagent systems described in this thesis was conducted at the faculty of Management and Organization (Faculteit Bedrijfskunde) of the University of Groningen, the Netherlands. People often ask how I got involved, as a cognitive psychologist, in doing research on multiagent systems. In looking back over the years, the answer is that people (individual) and how they interact as social systems (whole) always has been the focus of my attention. Early on in my career, I worked in the capacity of social therapist with groups of juvenile delinquents. After I graduated as a cognitive psychologist from the University of Utrecht in 1992, I worked as a research assistant for one year at the AI laboratory of the Rotterdam School of Management of the Erasmus University Rotterdam, on Distributed Management Information Systems. Considering this background, it was, conceptually speaking, not a difficult step for me to become a Ph.D. student and doing research on intelligent artificial "communities" that consist of collections of coordinated knowledge-based processes.

The research proposal that I wrote during my first year as a Ph.D. student already contained the ingredients and themes central to this thesis. First of all, the fact that multiagent systems are applied as simulation models of organization, to me held the consequence that the agents used must posses a degree of cognitive plausibility. The second theme is the notion that within artificial multiagent systems the social level sprouts from agent interaction and that the agents are the only tangible entities within social systems. The methodological implication is therefore that, being a distinct analytical level, the social level can only be described and explained in terms of the individuals and their representations. The third ingredient was the idea of an alignment study to prove the basic assumptions.

Despite this conceptual clarity, it took a while for me to understand the relation between the fields of cognition, multiagent systems and organization theory, and to understand what drove me to combine them. In retrospect, the central connection and my motivation was my firm belief that if one wants to understand collaborative systems one needs to have insight in the cognitive and representational aspects of the collaboration and coordination process. Modern team literature supports this notion with the acknowledgement that people involved in team activities, need (and have) team knowledge, i.e. knowledge that is related to the collaboration process itself, and which is additional to the individual task knowledge. The analyses of the cognitive aspects of cooperation and coordination, is nowadays labeled as Team Cognitive Task Analyses. The cognitive aspects of collaboration processes forms the conceptual counterpart of the so-called psycho-social factors covering phenomena like motivation, team coherence and leadership. At TNO Human Factors, my current employer, these two aspects are recognized and reflected by the fact that the Department of Group work consists of two sections called Distributed Decision Making and Psycho-Social Interactions. Working within the group work department, again provides me the opportunity of studying people working within collaborative and group work domains.

I thank my advisors Henk Gazendam, John Simons and René Jorna for allowing me the intellectual freedom and time for figuring out the deeper understanding of my work and for their trust in my competence and endurance to carry out this project. Having different backgrounds all three advisors had different roles and contributions to this project. René's background is on cognitive psychology and philosophy and I thank him for introducing me to the Soar cognitive architecture and the issue of knowledge representations in the mind. I thank John Simons, who is a mathematician, for the lessons learned on consistent reasoning and for guarding the logical consistency and transparency of this thesis. I thank Henk Gazendam, who has a background in formalization of organization theories, multiactor systems and financial information systems, for reading thousands of pages and discussing numerous drafts, for introducing me to organization theory and for sharing his insights with me. Apart from their individual contributions also the joint session where of much value to me because they always resulted in interesting and intense discussions in which the concepts and ideas where put to the test. I consider it an important collective and collaborative achievement that this thesis satisfies them all.

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