

How can a comprehensive view of the research process be modelled in a social simulation? The structured search for knowledge can be described in the (inter)actions of individuals and is an observation object of several fields of research. As Philosophy has concepts about knowledge, language and logic, Sociology has its theories about interactions. The research process has a lot of facets. A layer model with defined mappings allows the integration of different concepts in a broader picture.

The combination of the concept of theory revolutions with more precise and domain specific models is a starting point for creating an overarching model of the research process. For the formal representation of theories, the non-statement view gives a clear model for precise theory networks and dependency descriptions. The computational theory of science shows concrete concepts for discovering laws and problem solving, which are necessary for simulating the research process. As the real world research is not purely based on rational reasoning processes or limited in methods, focussing on the reasoning process or on rational agents is just a part of the reasoning. In some situations, irrationality and contingency are necessary. Besides that, the research system consists of a variety of interacting systems and factors (politics, society), which are not purely based on rational processes (from a local viewpoint).

With this in mind, the scientific research process can be described by the interaction of the following three layers: 1. On the theory layer, the structure of theories and networks is represented. Theories

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are according to the non-statement view not represented as closed sentences, but in their structure und realisation. 2. The psychosocial layer is representing the actual processes inside and between the researches. This layer represents not only the researchers (e.g. reasoning, but also other types of agents with other processes (e.g. publishers, students), which have a huge impact on the research process. 3. The research system is in a strong connection to a society, which empowers the researchers. This includes economical and political aspects. There are transitions between these layers, which allow, for example to show effects of changes on the psycho-social layer on theory networks.

This layer concept is the frame for a social simulation which is implemented in Prolog. Artificial agents are representing researchers with their (inter)actions and knowledge bases and form scientific communities, which are interacting with surrounding systems. This simulation allows basically two kinds of experiments: On the one hand, it allows research about basic assumption on the described layers (concepts about the structure of theories, social theories, models of reasoning, and so on) and on the other hand experiments with concrete system conditions, which could be constructed or loosely based on real systems. Questions like the effect of the open science movement on the scientific process or the effect of plagiarism on the theory evolution and the structure of scientific communities can be investigated.

Daniel Kurzawe is PhD student at Ludwig-Maximilians-Universität München (LMU). He holds a M.A. in Logic and Philosophy of Science, Philosophy of Computational Linguistics from LMU. His research interests are Digital Humanities and Information- and Research Data Management. He is deputy head of the Research and Development Department of the Göttingen State- and University Library. Recent publication: Balzer, W.; Kurzawe, D.; Manhart, K.: *Künstliche Gesellschaften mit PROLOG. Grundlagen sozialer Simulation* (2014).