Research under the microsope: A Simulation of the scientific research process

Daniel Kurzawe
Research and Development Department,
State and University Library
University of Göttingen, Germany
kurzawe@sub.uni-goettingen.de

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Extended abstract [1]

I present a multi-agent simulation of the scientific research process (SRP). Members of the research community are represented as social agents and interact in a dynamic environment. In the simulation, different views on the SRP are interconnected.

As a complex and dynamic entity with many methodical, economic, linguistic, physical and social challenges, the SRP, is studied by many dedicated research disciplines. Their research subjects range from the theoretical structure of theories [1] to the interplay of the actors in research [2].

The simulation shows the interplay of three methodologically different layers: (1) a theory layer, (2) a social layer (3) and a society layer. Students, Researchers and Research Funders are the actors in this scenario and are represented as autonomous social agents. A set of actions, beliefs and abilities enable the agents to perform their actions. Several actions and action types are implemented which allow the agents to develop theories (analogue to Kuhns Theory life cycle [3]) and build theory networks. Examples of such actions are the observation of events happening in the simulated world, the publication of articles, the contribution to reviews or the application for research funds.

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Speaker: Daniel Kurzawe, kontakt@daniel-kurzawe.de.

Agents conduct their actions in an interactive and dynamic world, which they can observe [4]. This world is represented in a frame consisting of a limited 2-d space $D =< x, y >$ with a discrete and limited time T and a list of laws and events. A pattern of events through space and time form complex *event shapes* which determines laws and transform the world from t_i to t_{i+1}.

The application of the simulation is shown in experiments, which show aspects of the SRP. Examples are different strategies of research funding or the impact of open access publishing vs. traditional publishing methods. This social simulation is written in a custom simulation environment and implemented in SWI-Prolog [5].

Keywords
Social Simulation; Research Process; Philosophy of Science; Research Networks

References

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