IGOR DOUVEN

INTRODUCTION: COMPUTER SIMULATIONS IN SOCIAL EPISTEMOLOGY

Over recent decades, computer simulations have become a common tool among practitioners of the social sciences. They have been utilized to study such diverse phenomena as the integration and segregation of different racial groups, the emergence and evolution of friendship networks, the spread of gossip, fluctuations of housing prices in an area, the transmission of social norms, and many more. Philosophers of science and others interested in the methodological status of these studies have identified a number of distinctive virtues of the use of computer simulations. For instance, it has been generally appreciated that as simulations require the formulation of an explicit algorithm, they foster precision and clarity about whatever conceptual issues are involved in the study. The value of computer simulations as a heuristic tool for developing hypotheses, models, and theories has also been recognized, as has been the fact that they can serve as a substitute for real experiments. This is especially useful in the social domain, given that human beings cannot be freely manipulated at the discretion of the experimenter (for both points, see Hartmann 1996). However, the main virtue of computer simulations is generally believed to be that they are able to deal with the complexities that arise when many elements interact in a highly dynamic system and which often evade an exact formal analysis (see, e.g., Humphreys 1991).[1]

While philosophers have become increasingly interested in the methodological status of computer simulations, it might seem that in their own field, there can be no use for such simulations. This may have been true until recently, but with the emergence of social epistemology, it is no longer the case. Traditional epistemology is characterized by its purely individualistic perspective on knowledge and justification. Indeed, many an epistemologist built him- or herself a career by thinking and publishing solely about the truth conditions of 'S knows that p', or 'S is justified in believing p', without an S′, let alone an S″, ever entering their thinking, or, for that matter, their publications. It is a core insight of social epistemology that others play a role in our doxastic and epistemic lives that is much more important and crucial than traditional epistemology has been willing to acknowledge: much of our knowledge, or at least of our belief system, depends, and could not but depend, on the testimony of others. Even if we are in the position of ascertaining things ourselves, it is not evident that we should try to do so instead of relying on others; it may, for instance, be much less costly to gain information via others than it is to get it directly from the world, by doing the relevant experiments or making the necessary observations.

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Meanwhile, social epistemology has firmly established itself as a new subfield of philosophy. However, it can just as properly be regarded as being a branch of social science. Studying the transmission of social norms or cultural values is not essentially different, it appears, from studying the transmission of beliefs, or warrant, or knowledge. It would certainly be wrong to think that, for instance, economics and sociology are purely descriptive disciplines, whereas social epistemology (also) has normative aspirations. Just as social epistemologists have been thinking hard about the question under which conditions we should rely on the word of others and under which it is best not to do so, economists have been thinking hard about the question under which conditions the government should try to restrain wages or to promote capital investments. Hence, it is only natural to think that social epistemology should be able to benefit as much from the use of computer simulations as do the social sciences. Indeed, in the past ten years or so, various socio-doxastic and socio-epistemic questions have been investigated by means of computer simulations.

Motivated by this recent trend, a conference on computer simulations was organized in Leuven in October 2008.[2] The current issue contains the papers presented at that event.

Predictably, most computer simulations used in social epistemology are agent-based simulations, featuring populations of artificial agents that can interact in ways that can be given epistemically meaningful interpretations. *Stephan Hartmann*, *Carlo Martini*, and *Jan Sprenger* use a model of this type to investigate the sensitivity of certain analytical results concerning the resolution of peer disagreement. The paper illustrates how computer simulations can complement the use of analytical methods in social epistemology as well.

One of the most popular agent-based simulation models is the so-called Hegselmann-Krause model, which studies the dynamics of belief formation in populations of agents that actively seek the truth, both by interacting with one another and by responding to evidence they receive.[3] In their contribution to this issue, *Rainer Hegselmann* and *Ulrich Krause* offer a number of new results within this framework.

The paper by *Alexander Riegler* and *Igor Douven* presents a model that extends the Hegselmann-Krause model, equipping agents with belief states more complex than those figuring in the Hegselmann-Krause model. Various properties of populations of such agents are studied, in particular their ability to converge on the truth.

Jason McKenzie Alexander uses computer simulations to study and compare different ways of updating beliefs regarding a social deliberation problem. He shows that for some well-known social deliberation problems, simulations featuring agents that learn by imitation are better predictors of the behavior of real-life agents than are simulations involving agents equipped with the kind of learning mechanisms more commonly considered in the game-theoretic literature (such as Bayesian updating).

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Kevin Zollman studies, by means of agent-based simulations, various strategies that academic journals might implement for selecting papers for publication. The simulations show, for instance, the circumstances under which it would be helpful or unhelpful for journals to also publish negative results. It is also shown that by publishing less, journals might do a greater service to science than by publishing more, as the former strategy may help to maintain a greater diversity of views in science.

Gerhard Schurz considers the topic of inductive learning. He argues for the optimality of 'meta-inductive' learning, in which (in its simplest form) one keeps track of the relative success rates of various (first-order) learning methods and settles at any time for the method whose track record is, at that time, the best. The paper is another illustration of the complementary role of analytical methods and computer simulations: the case for meta-inductive learning is supported by both mathematical proofs and the results of a number of agent-based simulations.

Finally, *Paul Humphreys*'s contribution is concerned not with computer simulations per se, but rather with computer networks and hybrid networks of computers and other instruments (which one could well think of as implementing a simulation of sorts). He develops an epistemology for such networks, arguing that they require an important reanalysis of some key concepts of traditional epistemology, both social and individualistic.

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NOTES

1 See also Epstein and Axtell (1996) and Gaylord and D'Andria (1998) about the benefits of computer simulations for the social sciences.

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3 See, for instance, Hegselmann and Krause (2002).