SOCIAL INFLUENCE AMONG AGENTS

The Simulation of Social Psychological Theories

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Abstract

Social influence is an elementary aspect of human societies. People influence others and are influenced by friends, work colleagues, neighbours and even chance acquaintances. In this way, personal attitudes, the attitudes of groups and the attitudes of larger aggregates (like societies) are formed. This makes social influence a constitutive element of societies and one that must be taken into account in simulations. In the field of social psychology, there are several theories that specify the variables and processes of human interaction. However, these theories have found little representation in the literature on simulation. In response to this deficit, we discuss simulations that make social influence a central topic using examples to illustrate the procedures and results. One of our own projects, a simulation of the theory of social comparison explicates the challenges and findings of simulations grounded in social psychology. This serves to demonstrate that the simulation of social psychological theories can be a fertile approach to theory development and can enrich multi-agent simulations.

1. Introduction

In the social sciences, the simulation method must meet the challenge of contributing to the resolution of problems in the real world. For example, we may be interested in finding out why people in a large city like Zürich do not use public transportation more and tend to use their own cars despite the stress and delays involved. In investigating such an issue, implementing the traffic system of a city dynamically on the computer is nothing new. We can also model the social system (the drivers and their behaviour) on the computer.
Under favourable conditions, when both the technical and social systems are modelled adequately, the simulation will reproduce the traffic patterns of the city. While the model will correctly represent the real behaviour of the socio-technical system, it is hardly able to pinpoint the causes of this behaviour or find solutions to the corresponding problems. The reason is that the model is valid in its behaviour, but not necessarily in its structure. The question of validity is a very important (but often neglected) subject in social simulation (van Dijkum et al. 1999, Stanislaw 1986). If simulation is going to be used to find the causes of a real world phenomenon then the structure and rules of the phenomenon must be modelled as simply as possible but also as precisely as necessary. This challenge becomes even more pressing if concrete interventions are to be derived from the results of the simulation. Not every social simulation even considers the demand that the structure of the real system should be reproduced in a more or less valid way. If it does, however, it should be tested for validity in the following four areas:

- How valid is reproduction of the structure of the physical environment surrounding the agent? This demand for validity can sometimes be fulfilled comparatively easily if the physical system is well understood. (This is the case for an aeroplane for example.) It is considerably more difficult, however, to reproduce a natural environment with complex (and in part unknown) characteristics. This is the case, for example, with the use of a natural resource where exogenous dynamics play an important role (Smithson 1999).

- How valid is the reproduction of the inner structure of the agent? To do justice to this issue, theoretical knowledge from various disciplines (mainly psychology and sociology) can be of great help. A number of studies have already been published which use theory derived modelling of agents (Latane 1996, Jager, Janssen and Vlek 1999, Deadman, Schlager and Gimblett 2000).

- How valid is the reproduction of interaction between an agent and its physical environment? In this area, some approaches have also been developed that contain, for example, agents' perceptions (Urban 2000) or the formation of mental maps (Janssen and Jager 1999).

- How valid is the reproduction of interaction between one agent and another? Most simulations do not address this last issue adequately. For this reason, it forms the core of the present paper.

The interaction among agents is, besides the other validity issues mentioned above, the most important characteristic of an agent-based computer simulation. The unique strength of agent-based simulation is generally seen to be the fact that social dynamics (such as the rise and fall of cultures) can be modelled from the bottom up and thus explained post hoc. (For examples, see Gilbert and Troitzsch 1999, Dean et al. 1999, Marney and Tarbert 2000 and Epstein and Axtell 1996). Agent-based simulations claim to reveal (and sometimes to