Advances in the Simulation-Based Analysis of Attitude Change

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Abstract

In this paper we provide an overview of the most relevant research work on the simulation of attitudes which evolved in the late 90's and mainly after the year 2000. The general framework for the modeling, simulation and computational research on attitudes integrates research approaches (both fundamental and applicative) which combine theories from sociology, social psychology, social economics, political science, conflict theories, human-computer interaction areas with complexity theory, computer science, autonomous agents, artificial life, artificial intelligence, machine learning and decision making. One of the main dimensions is that of elaborating agent-based studies and simulations of the attitude dynamics.

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1. Introduction: Whether and to what extent the fields and topics of "political attitude and mentality" are likely to promote scientific innovation and possibly, improve applications ?

The attitude modeling and simulation with artificial societies and agent-based artificial systems are becoming more and more the area of

(i)   experimental evaluation of both classical social, economic and (geo)political theories and of newly emerging theories of social complexity, conflict theory or risk analysis,

(ii)   development of complex artificial platforms of artificial life able to appropriately support the development of research work in the areas mentioned above, and least but not last

(iii)   integrating results and achievements already reported by other research communities, like the Social Simulation one represented by ESSA, JASSS, among others.

2.   Brief History of Attitude Change Simulation-Based Research Approaches

The most relevant research work on the simulation of attitudes evolved in the late 90's and mainly after the year 2000. The general framework for the modeling, simulation and computational research on attitudes integrates research approaches (both fundamental and applicative) which combine theories from sociology, social psychology, social economics, political science, conflict theories, human-computer interaction areas with complexity theory, computer science, autonomous agents, artificial life, artificial intelligence, machine learning and decision making. One of the main dimensions is that of elaborating agent-based studies and simulations of the attitude dynamics:

(i)   dynamics of attitude change (Jager and Amblard, 2004; Voinea, 1997; Voinea, 1999);

(ii)   dynamics of the relation between behavior and attitudes (Voinea, 1995, 2003; Ben Said, Drogoul and Bouron, 2001; Boero, Castellani and Squazzoni, 2004; Jager and Amblard, 2004);

(iii)   dynamics of attitudes as outcomes of persuasive processes (Mosler and Martens, 2008);

(iv)   dynamics of the relation between attitudes and ethnic conflict (Srbljinovic, Penzar, Rodik and Kardov, 2003; Cederman, Wimmer, and Min, 2009).

Another relevant dimension is that of elaborating agent-based simulations of the attitude processes like attitude formation or attitude change for different types of agents:

(i)   economical (consumer) agents (Ben Said, Drogoul and Bouron, 2002);

(ii)   industrial companies as agents (Boero, Castellani and Squazzoni, 2004);

(iii)   political agents (Johannes Kottonau and Claudia Pahl-Wostl**,** 2004);

(iv)   artificial communities/ societies (Hans Joachim Mosler, T. Martens, 2008).

The area of research of political attitude is of particular relevance: though the political psychology approaches are rather scarce, the domain is important for the study of political attitude formation and change. The main issues which have been approached in this respect are:

(i)   the study of the attitude's attribute of strength (Krosnick, 1988),

(ii)   the study of the importance and range attributes of attitude (Liu & Latane, 1998),

(iii)   the influence of information in political attitude change during electoral campaigns (Huckfeldt & Sprague, 2000; Lavine, 2001; Kottonau and Pahl-Wostl, 2004),

(iv)   the study of attitude's attributes of involvement and accessibility (Lavine, Borgida, & Sullivan, 2000), or

(v)   the multidimesionality of political attitudes (Meffert, Guge, & Lodge, 2000).

Apart from the theoretical approaches mentioned above, there are more and more approaches on computational models of attitude change. In this respect, the computational models are mainly based on the influence of information in the attitude formation and change processes. The computational models are concerned with subjects like:

(i)   the dynamics of the social impact (Latane, 1981; Nowak, Szamrej and Latane, 1990),

(ii)   the emergence of social change (Latane, Nowak, and Liu, 1994).

(iii)   attitude learning (Voinea 1995a; 1995b; 1997; 2001)

In this area, several simulation technologies are involved and analysed:

(i)   computer simulations (Mosler, Schwarz, Ammann, and Gutscher, 2001),

(ii)   cellular automata (Hegselmann, Flache, and Möller, 2000),

(iii)   agent-based systems (Hegselmann, Müller, and Troitzsch,1996).

(iv)   artificial societies (Voinea, 2003; Neumann, 2009)

Also relevant are the areas of specialization of different simulation technologies in analyzing various aspects of political attitudes and different real situations which involve political attitudes:

(i)   conflict dynamics (Neumann, 2008; 2010a; 2010b)

(ii)   normative architectures (Neumann 2008, 2009)

(iii)   state emergence (Cederman, 1997; Neumann, 2005)

(iv)   political attitudes and mentalities, political decision making (Voinea et al. 2007a, 2007b; 2007c)

A third dimension of research on the issue of attitude is that of elaborating and creating modeling and simulation platforms: new software and/or hardware platforms and experimental case studies involving artificial agents and societies (Social simulation Platform: MAS-SOC, 2005; SWARM; NetLogo).

3.   Research Potential. Whether and to what extent the issues of political attitudes and mentalities are likely to be perceived as good challenge within given sectors of the scientific community

Attitudes as subject of interdisciplinary research would require a more powerful working framework based on the use of agent-based simulations and artificial societies in elaborating predictions and analyses of near-future or distant-future socio-economical phenomena with relevant political impact.

Classical statistical measures of attitudes are already considered by the scientific community as insufficient and nearly powerless in building up global maps of attitudes evolution and change for large populations of subjects. For instance, no research community has tried so far to base the analysis of socio-economical and political attitudes in the case of a financial crisis (like the one which has recently affected the world) on agent-based simulations. No research community has ever reported research studies and predictions concerning a possible major social and political attitude change in the countries of North-Africa and Middle–East with respect to the political regimes and local governments as the current huge attitude change the news agencies are describing these days. Another example is the rejection of the European Constitution when it was first issued and voted by the European countries members of the European Union: several powerful rejection answers have surprised the European Union leadership and have proved that the formation and change of the social attitude with respect to major European actions need to be investigated in advance with more powerful scientific instruments. Also relevant is the impact of the attitudes modeling and simulation in the areas like institution building and institutional authority building: due to the complex functional and beaurocratic structure, the organization and efficiency of the European Union's and of the European Parliament's institutions might depend in a greater extend in the near-future on the ability of developing appropriate instruments for the analysis and prediction of their functions.

In spite of the evidence that statistical theories, data and processing means, while extremely rich, are actually becoming less and less efficient for the description of global data describing attitudinal phenomena, the agent-based simulations or the simulations based on artificial societies are not yet officially considered as proper means of prediction making in the area of socio-economic attitude emergence and change. While still at the beginning of their technological development, both modeling and simulation based on the autonomous agents and on the artificial societies have already proved powerful and efficient in approaching complex issues like the socio-psychological and political attitudes.

Such theoretical and experimental research tools could prove extremely useful for prevention aims: most challenging on going processes and current phenomena like the recent economic crisis, global

terrorism, ethnical conflict or the social and economical impact of the climate change to take only the well-known examples, need to be prevented. To give believable support to this idea it would be enough to mention only the several simulation sectorial studies already developed mainly by individual members or research groups of the ESSA community involved in the study of different aspects of social-psychological attitude: attitude dynamics, attitude formation and change, reputation, opinion, conflict emergence, the role of emotion and knowledge in attitude changing processes both from a theoretical point of view and from an experimental or applicative perspective. The past and current research areas hosted by ESSA are true and valuable indicators on the growing scientific and experimental interest in the development of attitude simulation and modeling since many actual members and groups are already developing researches in this area.

A relevant development dimension from this point of view is the creation of a new research community on the issue of attitude research in the Eastern and South-Eastern European university environments. The main purpose of creating such a new research community is to develop a distinct interdisciplinary framework for different research communities and groups in Europe which need to communicate, made known their advances, combine and scale up their research efforts.

4. Prospective Analysis. Whether and to what extent they are likely to be perceived as a good investment by the funding agencies.

Since the attitudes in its different public and institutional perceptions represent the real issue in such examples of global institutions, organizations and areas of public interest, we can draw the conclusion that they are actually suggesting themselves as the first to take the advantage of financing and supporting the development of such modeling and simulation technologies as tools of attitude analysis.

However, the research on attitude issues have developed so far more like sectorial research: they have focused on different aspects of the attitudes and aimed at proving theories or experimental analysis with respect to particular research approaches on issues like reputation, opinion and conflict-connected issues. If a global approach on socio-economical and political attitude is actually needed and this is the point this application tries to make, then a global research approach should be taken. That is why past and ongoing sectorial research inside ESSA community proves both its considerable scientific interest in this research issue of attitude and the need to scale up to a global level its own perspective over the study of attitudes and especially on the impact, benefit and use of this kind of approach for public purposes like prevention and social, economic or political prediction.

The expected results concern:

(i)   The systematic extension of the investigation of a larger domain of research issues concerning the attitude besides the existing ones in the ESSA SIGs areas of research;

(ii)   The creation of a research framework for the systematic development of attitude agent-based simulations as an artificial life simulation technology useful for prevention and prediction purposes;

(iii)   The opportunity to gather together research groups and individuals, organizations and sponsors interested or already involved in attitude prospection;

(iv)   The opportunity to create and organize scientific and research events able to provide the chance to meet to all those who are currently working on this research issue or who are currently in need to investigate and evaluate social attitude.

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