

Social Simulation as a Prognostic Tool for Communication Processes: Theoretical and Philosophical Perspectives

JOVILĖ BAREVIČIŪTĖ, VAIDA ASAKAVIČIŪTĖ

Department of Entertainment Industries, Faculty of Creative Industries, Vilnius Gediminas Technical University, 1 Trakų Street, 01141

Vilnius, Lithuania

Email: jovile.bareviciute@vilniustech.lt; vaida.asakaviciute@vilniustech.lt

The article presents social simulation from theoretical and philosophical perspectives as a prognostic tool for researching, analysing and anticipating communication and other processes in social environments. The first part discusses the phenomena of ontological and epistemological simulation, treating social simulation processes as epistemological ones. The second part analyses the attitude of the French sociologist and media philosopher Jean Baudrillard towards social simulation, which he himself treats as ontological one. The counterarguments to introduce Baudrillard's unidentified distinction between ontological and epistemological simulation processes are presented. The third part deals with the principles of the functioning of social simulations as a prognostic tool and provides analytical possibilities for various social environments, communication and other processes. At the end of the article, it is concluded that Baudrillard's concept of ontological simulation, which annihilates classical Western metaphysics, erroneously reduces the difference between *ontos* and *epistēmē*.

Keywords: communication processes, epistemological simulation, *epistēmē*, Jean Baudrillard, ontological simulation, *ontos*, prognostic measures, social environments, social simulation

INTRODUCTION

The theme of social simulation in academic discourses is not new, and scientific publications focusing on it have been published for decades already. However, the relevance of this topic is not diminished as it is reinforced by events that occur in social environments, certain emerging transformations, and challenges, that is, everything that raises questions about the need for forecasting one or other trends in order to anticipate the further direction of a certain social/community development in one or other changing/changeable social, political, economic, or other conditions (e.g. the COVID-19 pandemic, see Kreulen et al. 2022; Orge Retzlaff et al. 2022; Lorig et al. 2021; Cremonini, Maghool 2020). Social simulation, based on a variety of computational methods, attracts the attention of researchers in various fields and disciplines, including philosophers. The concepts of social simulation analysed by J. M. Epstein and R. Axtell (1996), R. Axelrod (1984; 1997a; 1997b), N. Gilbert and K. G. Troitzsch

(1999) pose considerable challenges to the philosophy of being and especially to that of science (Humphreys 2009; Frigg, Reiss 2009; Gräbner 2018; Durán 2018: 171–188) since questions of cognition, analysis, and prediction of social environments are inextricably linked to epistemological simulations and closely related to several approaches. In the perspective of philosophical thinking, social simulation focuses on epistemological, i.e. cognitive, goals achieved employing analytical methods. In this case, there are two possible approaches to social simulation, understood as (1) a problem-solving technique and (2) a way to describe behavioural patterns of actors in social environments (Durán 2021). In this article, we will combine these views from the perspectives of theoretical and philosophical thinking, interpreting social simulation as a prognostic tool of communication processes for the research, analysis and interpretation of various social environments.

EPISTEMOLOGICAL AND ONTOLOGICAL SIMULATIONS: KEY ASPECTS

The Argentinian writer J. L. Borges (1999) writes about the maps of the imaginary empire, which contain very precise symbols for almost all objects on its territory, in his short novella ‘On Exactitude in Science’ (in Spanish: *Del rigor en la ciencia*, the 1st edition in 1946). In the first essay ‘The Precession of Simulacra’ (in French: *La précession des simulacres*) of *Simulacra and Simulation* (in French: *Simulacres et Simulation*, the 1st edition in 1981), a small-size but well-known book in the fields of social sciences and the humanities, the French sociologist and philosopher Baudrillard (2002: 7–9) mentions the novella of Borges before continuing reflection on the phenomena of simulation and presenting own interpretation of them.

Firstly, based on the authors investigating this phenomenon, the word *simulation*, derived from Latin *simulatio*, means imitation of the process(s) or system(s) operating in the real world (Banks et al. 2009). The illustrative vocabulary of international vocabulary defines the phenomenon of simulation as a specific situation created by appropriate artificial conditions to investigate or experience what could exist in reality. In this case, possible examples of simulation phenomena are distinguished: (1) a computer simulation of how the planet functions; (2) a simulation model; (3) an important part of training is role play and the simulation of court cases (Oxford Learner’s Dictionary 2022). Simulation is also defined as (1) a model of a set of problems or events that can be used to teach someone how to do something or (2) the process of creating such a model. An example of a simulation phenomenon that is understood in this way could be a situation where the manager designs a computer simulation of sales performance forecast for the rest of the year (Cambridge Dictionary 2022).

As can be seen, these definitions reveal the function of simulation aimed at the processes of prediction, forecasting, cognition, or at least expected assumptions. The purpose of this intelligible simulation is to investigate, examine, analyse, discover and identify possible processes or trends, as well as the actions or possible decisions of the entities in the circumstances of certain situations in one or other of the relevant time frames. Therefore, it is an epistemological simulation: the Greek word *epistēmē* means scientific knowledge, cognition (knowing) or available knowledge, while the Greek *logos* is research (investigation) (Liddell, Scott 1996). In this case, some models are used for simulations that allow the achievement of predetermined cognitive or prognostic goals. These models represent certain real objects or real situations and, under appropriate artificially created conditions, construct the possible direction or nature of their operation/function for a longer or shorter defined period. The map of Borges (1999) of an imaginary empire can serve as an example of such a representative simulation model. A small map of a particular area replicates the objects in it

with very precise symbols, simulating its image. Thus, geographical knowledge of the area is facilitated by determining its specific geographical characteristics, identifying the location of the objects there, and predicting how that area could function in a defined period of time in the future, in the event of a change in certain conditions, and in the circumstances of the situation in question.

However, simulation phenomena can be defined in a different way, that is, not as the meaning of cognitive or prognostic nature, but as those of existence (not being!) expressed in the above-mentioned book by Baudrillard. Looking up the phenomenon of simulation in the dictionaries of international words and considering the meanings that have just been mentioned, it can be pointed out that simulation means (1) a kind of false act in which what is not real is treated as real (Oxford Learner Dictionary 2022); (2) deceptive moves, for example when playing football, were wronged to win a penalty kick or a fault (Cambridge Dictionary 2022). As we can see, these two meanings are very closely linked: the purpose of the simulation here is not to investigate something in order to achieve certain cognitive or prognostic results, but to give the status of reality to someone who is unable to claim it by a false or deliberately misleading act. In other words, what really does not exist or what cannot be regarded as existing is recognised in simulation as something that exists and how this can be treated as existing. This is a case of ontological simulations, where the Greek word *ontos* means being, and the meaning of Greek *logos* is research (exploration) (Liddell, Scott, 1996).

Baudrillard (2002) introduces the ontological concept of simulation in *Simulacra and Simulation* and many other works that formulate his own concept of hyperreality, that is, the result determined by the simulation process. He writes about the above-mentioned type of ontological simulation, in which modern information and communication technology generates an independent virtual reality, independent of empirical and composed exclusively of '<...> matrices and memory banks, of management models <...> of operations' (Baudrillard 2002: 8). Baudrillard then observes that there is no metaphysics in this context (2002: 8), i.e. the landscape of cumulated hyperreality leaves no space for classical Western metaphysics, its dichotomy, antinomies, and binary oppositions. This is an ontological concept of simulation mentioned by Baudrillard, in which the cumulated reality becomes a substitute for empirical reality, which forces it out and destroys it. According to him, this cumulated reality is as a reality generated by technological operations, is un-referred, i.e. not referring to reality as its sign, but rather as a sign representing that reality and taking over its status (Baudrillard 2002: 8–9), which does not belong to the traditional structure of F. de Saussure (2011) as signified and signifier as a marker.

SOCIAL SIMULATION AS A PROGNOSTIC TOOL: COUNTERARGUMENTS TO JEAN BAUDRILLARD

The above-discussed concept of Baudrillard's simulation belongs to the perspective of philosophical thinking and should therefore be referred to as philosophical. However, there are many more concepts and definitions of simulation, as mentioned above, and they are not necessarily, could not or should not be related to philosophy in any way. One of the concepts of simulation, which we will examine from the perspective of theoretical thinking in this article, is social simulation, albeit a little distance from traditional philosophical interests, but can be analysed from the point of view of philosophical thinking. Social simulation is one of the computational methods used in the field of social sciences to analyse various social

environments. Social simulation is based on certain computer models or applications that animate structures of social environments that would be extremely difficult, if not impossible, to explain by using traditional analytical and mathematical methods.

As it can be seen below, the advantage of social simulation in terms of cognition and forecasting is that these computer models or applications offer far more adequate and accurate conclusions than the traditional methods used by scientists and researchers mentioned above (Gilbert, Troitzsch 1999: 14–17). Social simulation allows for a successful analysis of the behaviour of members of various social environments according to the testimony of the model simulating that system. Moreover, when modelling certain social environments and practical situations in a computational way, problems that are difficult to solve become much simpler (Humphreys 1995; 1995–1996; 2004). One of the most important features of social simulation is that, according to P. Humphreys and contrary to Baudrillard's computer experiments, the virtual environment preserves the principal elements specific to the real social environment (Humphreys 1995–1996: 121). As a result, virtual reality, according to Humphreys, does not become a competitor or substitute for empirical social reality (2004: 137–152): on the contrary, virtual reality prolongs empirical social reality and makes it possible to know and predict it. However, Baudrillard (2001; 2002; 2004) maintains the opposite belief, which is unlikely to be accepted in this case. In addition, social simulation as a computational method is significantly superior to empirical experiments in social environments for three reasons: (1) social simulation is easily customisable in the development of theoretical analytical models and is free from practical limitations; (2) social simulation makes it possible to achieve precision; (3) in the case of social simulation, computer experiments performed in a virtual environment can be repeated many times until their results are fully accurate (Humphreys 2004: 115).

Social simulation is treated in this article as a kind of predictive tool to foresee the possible behaviour of entities, i.e. solutions and actions that would be expected during various communication processes in various social environments or in uncertain, unforeseeable and emergency situations. Thus, as we will see below, social simulation as a prognostic tool is appropriate to clarify possible behavioural scenarios of subjects in social environments in various communication processes, using artificially designed situations to achieve specific cognitive goals (e.g. possible behavioural scenarios of subjects in the event of certain social or political conflicts, economic crises, cultural revolutions, epidemic outbreaks¹, reproductive boom or shells, etc.). In this case, social simulation can be regarded as an epistemological simulation since its objectives are of cognitive and predictive character.

Referring to Baudrillard again, his philosophical perspective contains the view that simulations of modern information and communication technology have led to the emergence of such virtual reality, that destroyed classical Western metaphysics together with any magical or religious systems (2002), which seemed to have been in a rather distant past. Today, according to Baudrillard, in simulation practices using information and communication technology, virtual reality is so extensively developed and so deeply established that it has been given almost all possible forms – digital, information, computational, cloning, etc.

¹ Communication strategies aimed at properly presenting information to the public in the media in the event of various social crises and disasters, political upheavals, terrorist attacks, natural disasters and epidemics, in order to avoid risks of a collective scale and maintain the appropriate dynamics of opinions, with the help of agent-based models, are analysed in one of the research papers in the *Journal of Artificial Societies and Social Simulation* (see Giardini, Vilone 2021).

This means, he continues, that, using virtual technological tools, the world can be replaced by its artificial duo (Baudrillard 2001: 14). In this context, social simulation, as Baudrillard rightly points out, should be understood as a form of interpretation of social reality based on mathematical and technical models (2001: 118), computational methods, and numerical calculations (2004: 80), but which, by the way, should not be welcomed, not opening up new opportunities to know and predict the social reality around us, but rather destroying it. In this way, Baudrillard achieves the culmination of classical Western metaphysics, after which there is no meta-, i.e. no more than – or beyond – and thus a social reality that can be known and predicted. In his assessment, then only the artificial social reality double mentioned above remains (Baudrillard 2001: 14), consisting exclusively of control models and computer operations, and processed again by means of the same control models and computer operations (Baudrillard 2002: 8).

In this case, on the basis of Baudrillard, we should conclude that the destruction of the ontos is also annihilation of the *epistēmē*, i.e. the destruction of being annihilates the possibilities of cognition of that being, and the normal social reality becomes generated, modelled and managed by certain models and computer operations, i.e. transforming into a certain ontologically simulated technological structure. Baudrillard's extreme position encompasses not only the question of cognitive opportunities, but also the meaning of knowledge, to which the negative answer refers: if modern social reality is simply a fragmented technological structure, it makes no sense to know it and predict it, because any processes that occur in social reality are pre-designed, and their course and results are predicted in advance. However, if we do not follow social constructivism close to these thoughts, which states that any substance(s) or existences that are empirically proven from a scientific point of view only exist as social structures (Kukla 2000; Latour, Woolgar 1986; Goldman 1999), we will have to recognise not only the empirical existence of social reality, its subjects, and the communication and other processes that take place in it, but also the multifacetedness and heterogeneity of that social reality, which is worth exploring, analysing, and thus getting to know and predict.

PRINCIPLES AND POSSIBILITIES FOR SOCIAL SIMULATION FUNCTIONING AS A PROGNOSTIC TOOL

Analysing how social simulation works and what cognitive and predictive possibilities it opens to communication processes in various social environments, social simulation as a computational extension model of empirical social reality (rather than its destruction and the establishment of a virtual autonomous social reality, thus contradicting Baudrillard (see Humphreys 2004: 105–114)), can be realised in two ways. Firstly, using information and communication technology and constructing a certain social environment in which objects and entities and their communication processes are simulated under conditions of an artificial society, such as *Sugarscape*², followed by an analysis of the obtained results (Epstein, Axtell 1996). Secondly, the use of a particular computer program, such as computer tournaments or games, and experimentation in virtual reality, simulates and anticipates possible changes in communication and other processes in social environments. In this case, possible acts of cooperation or defection of actors are simulated in order to predict the behaviour of members

² *Sugarscape* is a model of artificial society developed by Epstein and Axtell (1996). This artificial society involves the sexual reproduction of its members, cultural processes, social conflicts, the development of free market exchanges and the fight against epidemics, i.e. what happens in normal societies.

of one or other community and its consequences (Axelrod 1984; 1997a; 1997b). Virtual reality simulates certain situations and then analyses how exactly they correspond to social reality communication and other processes. The method of social simulation in these two cases consists of three elements interlinked by mutual subordination: (1) model design, (2) realisation and (3) analysis. Therefore, in order to simulate a particular object or event, three steps are performed: (1) a mathematical model representing it is constructed; (2) an object or event is realised by computer simulation, i.e. by creating a specific computer program that updates the position of that object or event variables in the mathematical model; (3) a simulated model or event is analysed (Fishwick 1995).

As we can see, social simulation, as one of the main modern computational methods (Gilbert, Troitzsch 1999: 2), provides a wide range of possibilities for development of computer models of artificial environments and analysis (checking, confirmation or justification) of structures in social environments, communication, and other processes taking place there (Gräbner 2018). These computer models are simplified variants of original analysed objects. Simulations of certain social environments create mathematically accurate models, which can be understood as generation systems. The latter create artificial conditions for the living, communication, and activity of individuals and predict communication and other processes in real social environments (Humphreys 1995: 503). In technical sciences, for example, a toy car model can help to clarify the principles of construction and operation of a real car. By contrast, according to Gilbert and Troitzsch, using social simulation in social sciences, such models can serve as a way of better understanding the principles of social environments, predicting changes in the behaviour of the actors involved in them, identifying and formalising the consequences of appropriate behaviour, and facilitating the work of specialists in various fields of science by computer research (1999: 4–5).

The first version of social simulation is presented by Epstein and Axtell (1996) with the above-mentioned model of artificial society, *Sugarscape*. According to that provision, the hypothetical members of *Sugarscape* are placed in a certain complex environment in which social relations and communication processes are defined by the relevant living conditions. Sugar is the main raw material and its surplus or scarcity has a direct impact on social well-being and the preservation for life of both the individual and the artificial society as a whole. In *Sugarscape* communication processes, social structures and the behaviour of its hypothetical population groups are shaped by relationships between individuals, i.e. interactions established in this simulated environment, organised according to established rules and requirements under computational conditions³ (Epstein, Axtell 1996). Therefore, on the one hand, artificial society can be seen as a kind of social environment – a laboratory that simulates certain microsocial structures and their communication processes, helping to explain the functioning of macroeconomic structures and their communication processes in the current time and anticipate future trends. On the other hand, an artificial society can be understood as a laboratory in which it is established and then the rules of conduct of its members, defining, for example, entrepreneurship or inheritance, change again, in order to find out what stable factors prevail in the dynamic macro-social structure under investigation.

³ The interactions of individuals in social structures in the case of collaborating groups and the dynamics of the relationship between the individual and the group during the distribution of work tasks are analysed in one of the research papers published in the *Journal of Artificial Societies and Social Simulation* (Zöller et al. 2021; Wang et al. 2021).

Sugarscape is a computer experiment consisting of three main elements of simulated components: (1) environmental, (2) actors, and (3) their rules of conduct, where removal of at least one of them would destroy the whole model of artificial society. Epstein and Axtell refer to this computational model as a kind of multicompound society, in which, in turn, three principal areas of activity of its representatives interact: (1) sexual reproduction, (2) cultural processes, and (3) social conflicts (Epstein, Axtell, 1996: 154). Based on the *Sugarscape* example, it is possible to model the order of changing preferences for its actors, as systems of this kind are based on dynamic principles lacking in traditional static analytical and mathematical technologies (Humphreys 2004: 131). This is one of the most important advantages of the computational method compared to traditional analytical, logical and statistical methods. Moreover, this method is much cheaper than the latter, as it is experimented with in virtual social environments rather than in empirical ones.

The second version of social simulation is available in the works of Axelrod (1984; 1997a; 1997b), in which he develops the theory of cooperation between rational actors and analyses various hypothetical social situations through certain computer games and tournaments. The ability to cooperate occurs due to the fact that players who meet once in the game can meet again in the future. Actions carried out in the current time can therefore influence not only the game currently played and its outcome, that is, the final result, but also the decisions of certain players in the future. However, Axelrod believes that the future is less important than the present for several reasons: (1) according to him, players score fewer points in the current time than future winnings; (2) there is always a chance that players can no longer meet if one of the players leaves, changes the job, dies, or becomes bankrupt. The remuneration for the subsequent action, emphasised by Axelrod (1984; 1997b), is much lower than the one awarded to the current action, and the importance of the subsequent action, which is directly related to the action currently being conducted, is known as the *discount parameter* (w).⁴

The first of the computer games studied by Axelrod is the so-called *Prisoner's Dilemma* with two players. One of them chooses a row and decides to cooperate or defect, while the other, in turn, chooses a column and also decides to cooperate or defect. There are three possible consequences for players' choices: (1) if both players cooperate, do the right thing and both receive adequate remuneration, such as a certain amount of mutual cooperation allowance; (2) if one player cooperates and the other defects, the former receives a 'sucker's' payoff and the latter is tempted to defect; (3) if both players desert, both are punished for mutual desertion. Even the possibility of exploiting another player or being exploited by him, according to Axelrod, is not as good as mutual cooperation, because the reward for the latter is much higher than the average temptation and the 'sucker's' payoff (Axelrod 1984: 3–26).

⁴ Discount parameter (w) can be used to determine the remuneration of the entire sequence of operations. For example, each action is only 0.5 points relevant to the previous one, i.e. $w = 0.5$. Therefore, for the first step of mutual defection, 1 point is given, the second one is 0.5 points, the third one is 0.25, etc. Therefore, the sequence would be as follows: $1 + 0.5 + 0.25 + 0.125... = 2$. And with 1 point for each action, the sequence would be as follows: $1 + w + w^2 + w^3...$. The sum of this infinite sequence each w is greater than 0 and less than 1, i.e. $1/(1-w)$ (Axelrod 1984: 13). The higher the DP, the more successful the cooperation, and vice versa, the lower the discount parameter, the more likely it is that the cooperation will fail or gradually weaken. The discount parameter must be high enough to ensure that the subsequent scores are high. However, if a player does not care about the late reward, or he does not want to meet the same game partner anymore, then he may defect and not worry about further consequences (Axelrod 1984).

The second computer game analysed by Axelrod is a computer tournament with several or more players competing according to a particular game strategy. According to Axelrod, the *TIT FOR TAT*⁵ strategy (1984: 27–54) is considered to be superior to other strategies because it is characterised by the continuity of success, i.e. the fact that players can successfully complete as many stages of the tournament as possible and enter further (1997: 47–48). Here, Axelrod also uses the so-called *Prisoner's Dilemma*, because it illustrates the social relationships of players in the virtual reality best, where the interaction between one or the other gaming partner rather than the strategy chosen is of utmost importance. *Prisoner's Dilemma* occurs in computer tournaments at the moment when players need to choose one of the two possible positions, collaborating or deserting. The effectiveness of the strategy, based on Axelrod, depends not so much on its very nature, but on the interaction of several strategies. According to him, it is the *Prisoner's Dilemma*, which guarantees that the rules of their decision will be recognised by other participants (Axelrod 1984).

CONCLUSIONS

Social simulation is a set of computational methods and/or strategies or a set of strategies for researching, cognising, analysing, and predicting communication and other processes that are taking place and can occur in social environments. The methods of social simulation enable the creation of appropriate conditions in virtual media (virtual laboratories) with hypothetical entities and objects operating in them and behaving in one way or another, generating their relationships and/or interrelationship versions or scenarios that may occur in reality. Social simulation as a phenomenon is currently being dealt with in various fields and disciplines of science, with particular attention being paid to this in the field of scientific philosophy. The subject of social simulation is close to the French sociologist and media philosopher Baudrillard, but this author does not reflect the difference between ontological and epistemological simulation. In the perspective of ontological simulations, when *classical Western metaphysics* is annihilating, he misconstrues the fact of social reality, caused by modern information and communication technology (Baudrillard 2001; 2002; 2004) and does not identify social simulation as the potential of certain epistemological-prognostic processes, and thus the fundamental differences between *ontos* and *epistēmē*.

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⁵ The English name of the strategy *TIT FOR TAT* translated into Lithuanian, means *an eye for an eye, a tooth for a tooth*. According to Axelrod, the advantage of *TIT FOR TAT* is that, following this strategy, the player never deserts first. The first action of a computer tournament out of two hundred possible is always based on cooperation. This is followed by an action such as that performed by the tournament partner. *TIT FOR TAT* is deserted only if the first partner of the game defects (Axelrod 1984).

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JOVILĖ BAREVIČIŪTĖ, VAIDA ASAKAVIČIŪTĖ

Socialinė simuliacija kaip komunikacijos procesų prognostinė priemonė: teorinė ir filosofinė perspektyvos

Santrauka

Straipsnyje iš teorinės ir filosofinės perspektyvų pristatoma socialinė simuliacija kaip prognostinė priemonė, skirta tirti, analizuoti ir numatyti komunikacijos bei kitus procesus socialinėse aplinkose. Pirmoje dalyje aptariami ontologinės ir epistemologinės simuliacijos reiškiniai, socialinės simuliacijos procesus traktuojant kaip epistemologinius. Antroje dalyje analizuojamas prancūzų sociologo ir medijų filosofo Jeano Baudrillardo požiūris į socialinę simuliaciją, paties autoriaus traktuojamą kaip ontologinę: čia pateikiami kontrargumentai, siekiant įvesti J. Baudrillardo neidentifikuojamą skirtį tarp ontologinės ir epistemologinės simuliacijos procesų. Trečioje dalyje gvildenamos socialinės simuliacijos kaip prognostinės priemonės veikimo principai ir jos teikiamos analitinės galimybės įvairių socialinių aplinkų ir jose vykstančių komunikacijos bei kitų procesų atvejais. Straipsnio pabaigoje daroma išvada, kad J. Baudrillardo plėtojama ontologinės simuliacijos koncepcija, anihiliuojanti klasikinę Vakarų metafiziką, klaidingai redukuoja skirtį tarp *ontos* (būtis) ir *epistēmē* (pažinimas, žinios).

Raktažodžiai: epistemologinė simuliacija, *epistēmē*, Jeanas Baudrillardas, komunikacijos procesai, ontologinė simuliacija, *ontos*, prognostinės priemonės, socialinės aplinkos, socialinė simuliacija