Ethics in Modeling and Simulation (SimEthics)

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ABSTRACT

The events leading to the development and acceptance of the code of professional ethics for simulationists are outlined. Basic concepts of ethics as well as the origins of ethical behavior are reviewed. The need for ethical behavior in general and need for ethical behavior in M&S are elaborated on. Codes of professional ethics in areas other than M&S are reviewed and those relevant to M&S are pointed out. Code of professional ethics for simulationists is given in the appendix. The code consists of five sections which are: (1) Personal development and the profession, (2) Professional competence, (3) Trustworthiness, (4) Property rights and due credit, and (5) Compliance with the code.

ABOUT THE AUTHOR

Dr. Tuncer I. Ören is a professor emeritus of computer science at the School of Information Technology and Engineering of the University of Ottawa (Canada). His Ph.D. is in Systems Engineering (1971, University of Arizona, Tucson, AZ). *Research Interests*: (1) Applications of artificial intelligence in modeling and simulation, such as fuzzy software agents with dynamic personality. (2) Advanced modeling and simulation methodologies and environments especially for conflict management in computational social science. (3) Reliability and quality assurance in modeling and simulation, user/system interfaces, and professional ethics for sustainable civilized behavior (for humans as well as for software agents). He has extensively contributed to: (1) the advancement of the state-of-the art in simulation methodology, (2) the synergy of simulation, system theories, cybernetics, artificial intelligence, and software engineering, (3) the reliability issues on modeling and simulation, and (4) ethics in simulation. *Publications*: over 340. Contributions in about 300 *conferences* and *seminars* held in nearly 30 countries. In 2005, ten invited talks in conferences, seminars, and panels held in China, France, Turkey, and the USA. Currently he is a member of the Board of Directors, AVP on Ethics, and Director of the M&SNet (McLeod Network of Modeling and Simulation) of the Society for Modeling and Simulation International. He is the past director of MISS (McLeod Institute of Simulation Sciences) and the founding director of Ottawa Center of MISS. http://www.site.uottawa.ca/~oren/

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INTRODUCTION

Development of a code of professional ethics for simulationists was an idea for which time was ripe a few years ago. A brief history of the recent events which lead to the code of professional ethics for simulationists is outlined in Table 1. Currently, two Web sites are available for SimEthics (Ethics-SCS, Ethics-Ören).

Table 1. Recent History of Ethics in Simulation

1999 July	"Simulation and Ethics Symposium" at the Wageningen University, The Netherlands; organized by Dr. D. Kettenis in honor of the 60th birthday of Prof. Ir. M.S. Elzas.
	Ören's invited presentation: "Responsibility, Ethics, and Simulation."
2000	Special Issue Transactions of the SCS, 17:4 (Dec.) edited by Dr. Kettenis (2000)..
	Ören's article: Responsibility, Ethics and Simulation,Transactions of the SCS, San Diego, CA. 17:4 (Dec.), 165-170. (Ören 2002a).
2001	Bruce Fairchild, the President of the SCS (2000-2002), after reading Ören's article, motivated him to develop a Code of Ethics.
	Prof. Maurice S. Elzas organized an Ethics Session at the 4th International Eurosim Congress, Delft, The Netherlands. Tuncer Ören presented: *"Responsibility, Ethics, & Simulation: A Review of Issues"* Dr. Iva Smith was very active in theSession.
	The Ethics Committee of the SCS is formed: Ören (Chair), Birta, Elzas, and Smith.
2002	A **Code** of Professional Ethics for Simulationists is developed by the founding members of the Ethics Committee
	The **Code** and its **Rationale** are presented at the SCSC 2002 (The Summer Computer Simulation Conference 2002, San Diego, CA) and were published in its Proceedings.
	SimSummit (with the leadership of W. Waite) was held during July 18-19, 2002 with the representatives of major Modeling and Simulation institutions. One of the resolutions of SimSummit: "A Code of Professional Ethics should be one of the four pillars -along with Science, Technology and Applications- for Modeling and Simulation to be considered as a profession."
2003	At the Board of Directors Meeting of the Society for Computer Simulation International (SCS), in Montreal, July 24, 2003, the SCS adopted a Code of Professional Ethics for Simulationists, effective January 1, 2004 .
2003-2005	Other organizations adopted the Code.

After a brief review of some concepts of ethics and origins of ethical behavior, the question of why there is a need for ethical behavior in M&S activities is elaborated on. Then, codes of ethics for some related areas and in M&S are discussed.

ETHICS

The term *ethic* means: (1) A set of principles of right conduct. (2) A theory or a system of moral values (i.e., values concerned with the judgment of the goodness or badness of human action and character. *Ethics* refers to the general nature of morals and the specific moral choices to be made by a person. Ethics is a branch of philosophy which studies the principles of right or wrong in human conduct (moral philosophy or moral science). It is derived from Greek êthikos, êthikê; from the root: ethos which means manners, customs. Moral is a Latin word derived from the root moralis, moralitas meaning manners, customs. A glossary of terms for terms related with ethics is given at (Ethics-glossary.) Professional ethics, refers to the rules or standards governing the conduct of a person or the members of a profession.

Origins of Ethical Behavior

The respect for the rights of others is the essence of the right conduct. It is also a fundamental concept in civilized societies. It is essential for the regulation of the social dynamics in order to sustain the civilization. Also, no business –how lucrative it is– can be sustained if one looses the trust of the stakeholders.

The origins of the ethical behavior, or the respect of the rights of others is summarized in Figure 1. Respect for the rights of others can be genuine when it is self-initiated; or it can be emulated when it is imposed.

The genuine respect for the rights of others can be based on personal belief or can be an adopted philosofical view. For example, in Zen, altruism is a promoted view. The emulated respect for the rights of others can be based on the legislation of state or several pressures of the society such as customs, peer pressures, regulations, codes of conduct, and ethical codes of conduct. From a pragmatic point of view, behaviors based on both types of origins for the respect for the rights of others may generate desirable behavior. In the genuine case, the individual feels responsible and with self-imposed restriction the individual feels also accountabe. In the emulated case, the individual may be held accountable. However, in this case, since the control is not genuine, external controls are needed.

Figure 1. Origins of Ethical Behavior

Responsibility is the ability to fulfil one's moral obligations. It is an ideal of character, a virtue and only maturity may imply responsibility. Accountability is being required to answer for one's actions.

Why Ethical Behavior is Needed in M&S Activities?

Need for ethical behaviour in M&S activities is expressed by Elzas (2000). Bertrand Russell posits: "We all think electricity is entirely governed by natural laws, and yet we think it is rational to put up lightning conductors. Well, I should say that an ethic is, as it were, a lightning conductor for human passions, to enable them within a deterministic world to work in a way that produces a minimum of disaster" (Russell 1942).

Another point of view is: If our activities have no (serious) implications to others, then it does not matter whether or not we should feel responsible towards them or we should be held accountable. Similarly, if simulation has no (serious) implications to others, then it does not matter whether or not simulationists should feel responsible towards them or should be held accountable. Hence, to justify the need for ethics in M&S activities, one should perceive M&S from a large perspective and should be convinced that it can have se3rious implications if not carried out properly.

SIMULATION: ITS SCOPE AND IMPORTANCE

Simulation has two meanings: "imitation" and "goal-directed experimentation with dynamic models, i.e., models with time-dependent behavior. Experimentation is the essence of scientific thinking. And, the need and superiority of performing experiments using a model rather than the real system is well accepted. Simulation is a very large number of application areas. As it is also expressed in another tutorial on the Body of Knowledge of M&S, there are two types of simulation activities, depending whether or not simulation program runs independently from the system it represents. Hence, there are stand-alone and integrated simulation activities

Stand-alone simulation activity where the simulation program runs independently from the system of interest. There are five categories of purpose:

- Decision making
- Training to enhance decision and/or communication skills (gaming simulation)
- Training to enhance motor skills (simulators)
- Understanding and education (Links-EdSim)
- Entertainment (simulation games, animation of dynamic systems)

Use of simulation for decision making is done for the following main categories of activities:

- *Prediction* of behavior or performance of the system of interest within the constraints inherent in the simulation model (e.g., granularity)
- *Evaluation of alternative* models, parameters, experimental and/or operating conditions on model behavior or performance
- *Sensitivity analysis*
- *Engineering design*
- *Prototyping*
- *Planning*
- *Acquisition* (or simulation-based acquisition)
- *Proof of concept*

Integrated simulation activity where the simulation program operates together with the system of interest.

Two main purposes are to *support* and to *enrich* real system operation

To support real system operation, the system of interest and the simulation program operate alternately to provide predictive displays.

To enrich the real system operation, the system of interest and the simulation program operate *simul-taneously* to assure *on-line diagnosis* and *augmented reality* (enhanced reality) operation.

Importance of M&S activities are elaborated on by Ören (2002). From a pragmatic point of view, existence of several validation, verification and accreditation techniques and tools attest the impor-tance of the implications of simulation. Allegiance to a well defined code of ethics would ease establishment of the credibility of simulationists as individual(s) or groups. As mature members of a mature profession, we can act proactively to assuming our responsability and accountability. Else, a code might be imposed by others.

CODES OF PROFESSIONAL ETHICS IN OTHER AREAS

A review of codes of ethical behavior in areas other than M&S may provide a background for the Code for simulationists. Some professional codes refer only to ethical duties. Some other codes cover both ethical and purely professional issues with or without referring to "ethics" in their title. The term "*professional ethics*" implies ethics and professional conduct. Hence, the term "*code of professional ethics*" is a conveniently short term to denote "*code of ethics and professional conduct*." Several sources for ethical conduct and codes of ethics are listed in the Web site of SimEthics.

M&S is *computer-based*; hence, several aspects of ethical considerations of computerization, software engineering, Internet, and artificial intelligence are also applicable to modelling and simulation. For *scientific and engineering* applications, modelling and simulation entails considerations of codes of ethics in science and engineering. Modelling and simulation is used extensively in *research*; hence the principles of responsible conduct in research are applicable to avoid fabrication, falsification, and plagiarism (data, text, and ideas) and other misconduct. When modelling and simulation is business, most of the ethical issues in business are also applicable In defense applications, additional business ethics for defense industry −such as The Defense Industry Initiative − is desirable. While preparing the code of ethics for M&S, the existing codes of ethic in business, science and engineering, software engineering, artificial intelligence, use of software agents, and Internet applications were very useful.

CODE OF PROFESSIONAL ETHICS FOR SIMULATIONISTS

The Code can be accessed from both of the Web sites of SimEthics (Ethics-SCS, Ethics-Ören). It also appears at the site of MSIAC (Code-MSIAC) and is provided at the Appendix. As seen in Figure 2, the Code is arranged according to the responsibilities of simulationists to themselves, to the profession, to others, and to the code. It consists of five sections: Personal development and the profession, Professional competence, Trustworthiness, Property rights and due credit, and Compliance with the cod.e

Figure 2. Responsibilities of Simulationists

ORGANIZATIONS WHICH ADOPTED THE CODE

The following organizations have adopted the Code of Professional Ethics for Simulationists: The Society for Modeling and Simulation International (SCS), McLeod Institute for Modeling and Simulation Sciences (MISS), McLeod Modeling and Simulation Network (M&SNet), The Simulation Interoperability Standards organization (SISO), SISO Canada, and Alabama M&S Council (AMSC). : Lists of centers and member organizations of MISS, M&SNET, and AMSC can be accessed from (Ethics-Ören).

CONCLUSION

It is hoped that in our continuing journey to M&S professionalism you would support: (1) The view that M&S is so important that there is a need for ethical professional conduct. (2) This specific code of Professional Ethics. (3) The adoption of this code by your company, group, and/or professional society. (4) Contribute to the widespread acceptance, practice and revision of the Code.

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APPENDIX- A: CODE OF PROFESSIONAL ETHICS FOR SIMULATIONISTS

PREAMBLE

Simulationists are professionals involved in modelling and simulation activities and/or with providing modelling and simulation products and/or services. A detailed definition of the term "simulationist" is given by Ören (2000a, b). Rationale for this code is given in Ören (2002).

1. PERSONAL DEVELOPMENT AND THE PROFESSION

As a simulationist I will:

1.1 Acquire and maintain professional competence and attitude.

1.2 Treat fairly employees, clients, users, colleagues, and employers.

1.3 Encourage and support new entrants to the profession.

1.4 Support fellow practitioners and members of other professions who are engaged in modelling and simulation.

1.5 Assists colleagues to achieve reliable results.

1.6 Promote the reliable and credible use of modelling and simulation.

1.7 Promote the modelling and simulation profession; e.g., advance public knowledge and appreciation of modelling and simulation and clarify and counter false or misleading statements.

2. PROFESSIONAL COMPETENCE

As a simulationist I will:

2.1 Assure product and/or service quality by the use of proper methodologies and technologies.

2.2 Seek, utilize, and provide critical professional review.

2.3 Recommend and stipulate proper and achievable goals for any project.

2.4 Document simulation studies and/or systems comprehensibly and accurately to authorized parties.

2.5 Provide full disclosure of system design assumptions and known limitations and problems to authorized parties.

2.6 Be explicit and unequivocal about the conditions of applicability of specific models and associated simulation results.

2.7 Caution against acceptance of modelling and simulation results when there is insufficient evidence of thorough validation and verification.

2.8 Assure thorough and unbiased interpretations and evaluations of the results of modelling and simulation studies.

3. TRUSTWORTINESS

As a simulationist I will:

3.1 Be honest about any circumstances that might lead to conflict of interest.

3.2 Honor contracts, agreements, and assigned responsibilities and accountabilities.

3.3 Help develop an organizational environment that is supportive of ethical behavior.

3.4 Support studies which will not harm humans (current and future generations) as well as environment.

4. PROPERTY RIGHTS AND DUE CREDIT

As a simulationist I will:

4.1 Give full acknowledgement to the contributions of others.

4.2 Give proper credit for intellectual property.

4.3 Honor property rights including copyrights and patents.

4.4 Honor privacy rights of individuals and organizations as well as confidentiality of the relevant data and knowledge.

5. COMPLIANCE WITH THE CODE

As a simulationist I will:

5.1 Adhere to this code and encourage other simulationists to adhere to it

5.2 Treat violations of this code as inconsistent with being a simulationist.

5.3 Seek advice from professional colleagues when faced with an ethical dilemma in modelling and simulation activities.

5.4 Advise any professional society which supports this code of desirable updates.