Ören, T.I. (2002). Rationale for A Code of Professional Ethics for Simulationists. Proceedings of the Summer Computer Simulation Conference.

Rationale for a Code of Professional Ethics for Simulationists

Tuncer Ören, Professor Emeritus
Ottawa Center of the McLeod Institute of Simulation Sciences of the SCS
School of Information Technology and Engineering
University of Ottawa, Ottawa, Ontario, Canada

"The unexamined life is not worth living." Socrates (469-399 BC)
"What you don't want done to yourself, don't do to others." Confucius (551-479) BC)

Keywords: Rationale, Code of Professional Ethics for Simulationists

Abstract
Growing importance of and scope of application areas of modelling and simulation oblige us to re-examine our field and reflect upon whether or not those who are involved in any aspect of it have any responsibility. Classes of examples are given to enumerate important consequences of and hence responsibility and accountability areas in modelling and simulation studies. Clarifications are offered on the timeliness and the reasons our profession deserves and needs a code of professional ethics.

INTRODUCTION
Ethics is the missing link on serious validation as well as verification studies of modelling and simulation. The growing importance of and the scope of application areas of modelling and simulation oblige us to re-examine our field and reflect upon whether or not those who are involved in any aspect of it have any responsibility.

The term *ethic* means: (1a) A set of principles of right conduct. (1b) 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. One of the meanings of the term "ethics" is *professional ethics*, i.e., the rules or standards governing the conduct of a person or the members of a profession [American Heritage Dictionary]. The terms medical ethics and business ethics are used similarly [Hartman, 1998].

The respect for the rights of others is the essence of right conduct. It is also a fundamental concept in civilized societies, essential for the regulation of the social dynamics in order to sustain the civilization. The origins for the respect for the rights of others is summarized in Figure 1 [Ören 2000a]. When this respect does not voluntarily stem from individuals or organizations, it has to be enforced externally to assure accountability of the individuals and/or organizations. Professional societies need and often have regulations and codes to guide and regulate the conduct of their members. 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 Appendix provides some examples). 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*."

WHY IT IS TIME FOR A CODE OF PROFESSIONAL ETHICS FOR SIMULATIONISTS
Simulationists are professionals involved in modelling and simulation activities and/or with providing modelling and simulation products and/or services. For a detailed and enumerative definition, see [Ören 2000a, b]. There are several reasons for the need to formulate and adopt a code of professional ethics for simulationists:

1. Simulation is goal-directed experimentation with *dynamic models* (i.e., models with time-varying behavior). It has thousands of applications; hence, simulation studies can affect numerous people as well as the environment in many different ways. Types of usages of simulation, and possible problem areas which point out to the responsibility and accountability areas in modelling and simulation studies/systems are outlined in Tables 1a and 1b. Table 1a is for training and education and Table 1b is for other usages. Modelling and simulation is multifaceted; while some would argue whether it is art or science –while it is both–

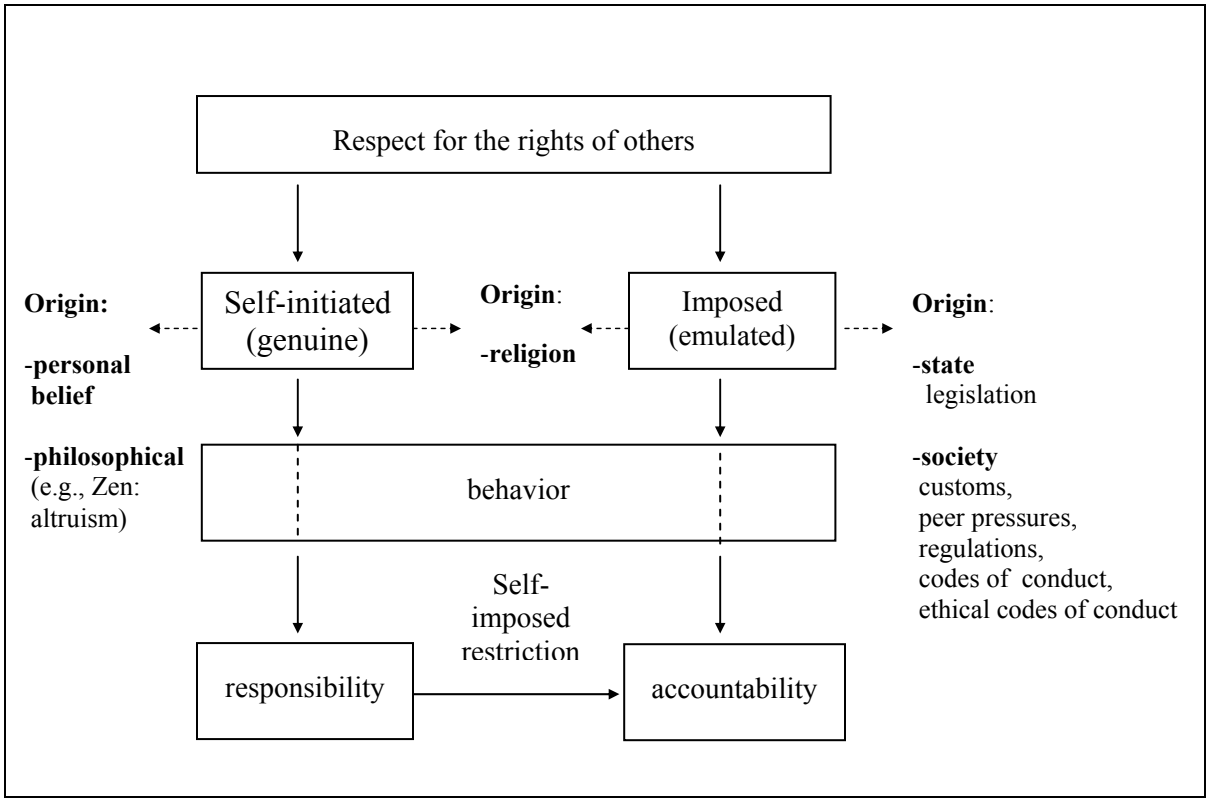

Figure 1. Origins of the respect for the rights of others

it is a fact that it is an important business as well as an enabling technology (for a multitude of application areas such as business, economy, and all branches of engineering and science). With this scope of influence, it is interesting to notice that the profession and hence its practitioners, i.e., simulationists do not have a code of professional ethics.

2. It is important that at least one, but hopefully all Simulation Societies will provide leadership in urging their members to adopt a Code of Professional Ethics. In this way the members can show the acceptance of their responsibilities and accountabilities. In early 2002, a search on Web with "code of ethics" results over a million hits and with "code of conduct" –albeit with redundancies– results over two million hits. Some are related to simulation such as *ethics simulation*, i.e., use of simulation in teaching ethics. A U.S. Federal site refers to "Code of Conduct for the members of the Simulation." (The National Government Simulation is an online forum-based discussion and debate area which is structured to write, develop, and pass legislation.) [NGS]. None of the sites refer to an adopted code for the members of a simulation society. As Socrates says *"The unexamined life is not worth living."* And "life" may well cover professional societies and professions as well.

3. The 50th anniversary of the foundation of the Society for Modeling and Simulation International (SCS) is a good occasion to formulate and adopt a "Code of Professional Ethics for Simulationists." Which will hopefully be endorsed by other Modelling and Simulation societies as well.

RELEVANT CODES

Modelling and simulation has several facets which suggest that ethical and professional considerations of many closely related domains apply equally in modelling and simulation. Some Web references are given by [Ören].

- Modelling and simulation is *computer-based*; hence, several aspects of ethical considerations of computerization, software engineering, Internet, and artificial intelligence are also applicable to modelling and simulation.

Table 1a. Examples of usages of simulation in training and education and possible problem areas which point out the responsibility and accountability areas in modelling and simulation studies/systems

Usage of simulation	Examples:	Possible problems –hence **responsibility and accountability areas** in simulation studies/systems
Training to enhance *motor and operational skills* (and associated decision making skills)	- virtual simulation (i.e., using virtual equipment and real people (human-in-the-loop) in a simulation study) - aircraft simulator for pilot training - augmented reality simulation (such as in-flight pilot training with additional artificial intelligence aircrafts) - virtual body for medicine - nuclear reactor simulator - power plant simulator	- ill-prepared operators (civilian as well as military) for *regular operating conditions* - ill-prepared operators (civilian as well as military) for *rare emerging conditions*
	- simulators for the selection of operators (such as pilots)	- recommending unfit personnel for jobs requiring high dexterity
	- live simulation (use of simulated weapons along with real equipment and people)	- false sense of achievement
Training to enhance *decision making skills*	- constructive simulation (war gaming simulation) - simulation for operations other than war (non-article 5 operations, in NATO terminology): peace support operations; conflict management (between individuals, groups, nations) - business gaming simulations	- ill-prepared decision makers (civilian as well as military) for *regular operating conditions* - ill-prepared decision makers (civilian as well as military) for *rare emerging conditions*
	- agent-based simulations - holonic agent simulations (to explore benefits of cooperation between individuals, companies (mergers), nations)	- "dehumanization" of decisions
Education	- simulation for the teaching/learning of dynamic systems (which may have trajectory and/or structural behavior): simulation of adaptive systems, time-varying systems, evolutionary systems, …	- missed opportunity to better learn the subject matter - misinformation

Table 1b. Examples of usages of simulation in other areas and possible problem areas which point out the responsibility and accountability areas in modelling and simulation studies/systems

Usage of simulation	Examples:	Possible problems –hence **responsibility and accountability areas** in simulation studies/systems
Evaluating alternative courses of actions	- simulation in business - use of simulation to provide predictive displays (in economy, in other complex systems) - policy modelling and simulation - drug modelling and simulation	- missed opportunity to gain insight in the subject matter - insufficient or incorrect advice - interpretation of results influenced by desired (political) outcome - models used beyond their scope of applicability - not enough evidence to evaluate results
Acquisition	- defense acquisition	- acquisition of equipment not fully fit for the purpose
Operational support	- operations management	- wrong recommendation or explanation - insufficient representation of reality
Engineering design	- virtual ship (per se and as a platform to integrate several components) - earthquake simulation to design better structures: buildings, bridges, …	- equipment malfunctions - unreliable structures - neglect of engineering knowledge and regulations - numerical inaccuracies - incomplete models
Prototyping	- chip prototyping - engine prototyping	- recall of thousands of defective units - deficient representation of novel technologies
Diagnosis	- on-line use of simulation to compare real-system's behavior and simulated behavior to detect anomalies in the functioning of an equipment	- false alarms - inability to detect "faint" alarms
Proof of concept	- simulation of safe disposal of nuclear fuel waste (for tens of thousands of years)	- burden to future generations - unwarranted extrapolation of present knowledge
Understanding	- scientific simulations to understand reality	- missed opportunity to have proper understanding - modelling and simulation used as 'proof of concept' rather than as 'investigation of concept'

- 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 applicable to the "simulation business."
- In *defense applications*, additional business ethics for defense industry −such as The Defense Industry Initiative [DII]− is desirable.

Acknowledgments

This article has benefited from the valuable comments of Prof. ir. Maurice S. Elzas, Dr. Iva Smit, and Prof. Louis G. Birta on early drafts. I gratefully acknowledge Bruce Fairchild, President of the Society for Modeling and Simulation International for his encouragement and support for the development of a Code of Professional Ethics for Simulationists.

Appendix: On Code of Ethics, Professional Conduct, and Professional Ethics

1. Some professional codes refer only to ethical duties. For example, "IEEE Code of Ethics," focuses on ethical issues [IEEE].

2. Some other professional codes cover both ethical and purely professional issues: for example, "Code of Ethics and Professional Conduct" [ACM], "Code of Ethics and Standards of Conduct" [CIPS], "Software Engineering Code of Ethics and Professional Practice [IEEE-CS/ACM], and The Accreditation Board for Engineering and Technology's Code of Ethics for Engineers [ABET}.

3. At the other end of the spectrum, some professional codes titled "Code of Conduct" explicitly refer to ethical conduct within their text.

- For example, in the "Code of Conduct – Obligations of officials and servants of the European Parliament," the following is stated: "As the Committee of Independent Experts pointed out in its second report, codes of conduct do not constitute formal procedures, but are intended to provide an ethical frame of reference for Civil Servants and other public office-bearers." [EuroParl].

- The "Code of Conduct" of The Accreditation Board for Engineering and Technology states: "The Accreditation Board for Engineering and Technology, Inc. [ABET] requires ethical conduct by each volunteer and staff member engaged in fulfilling the mission of ABET." [ABET].

- In the Foreword section of "CEPIS: Professionalism – European Professional Informatics Certificate," the following is stated: "This code sets out the general principles of professional and ethical conduct which should be in any Code of Conduct adopted by a Member Society of CEPIS." [CEPIS].

- "The Code of Professional Conduct of the Ergonomics Society" states: "In pursuit of their profession, those on the Registers of the Ergonomics Society shall at all times value integrity, impartiality and respect for evidence, and shall sustain the highest ethical standards." [Ergonomics].

- A code of conduct site: HON – Health on Net Foundation states: "It only defines a set of rules to hold Web site developers to basic ethical standards in the presentation of information" [HON].

- The Corporate Code of Conduct of Compaq states: "Compaq Computer Corporation is committed to promoting integrity and maintaining the highest standard of ethical conduct in all of its activities" [COMPAQ].

4. Internet has over a million references on "*professional ethics.*"

References

[ABET] The Accreditation Board for Engineering and Technology – ABET's Code of Ethics for Engineers: http://www.abet.org/ethics.html

[ACM] Code of Ethics and Professional Conduct: http://www.acm.org/constitution/code.html

[ACS] Australian Computer Society Code of Ethic: http://www.acs.org.au/national/pospaper/acs131.htm

[American Heritage Dictionary] http://www.bartleby.com/61/79/E0227900.html

[CEPIS] European Professional Informatics Certificate: http://www.cepis.org/prof/epic/

[CIPS] Code of ethics and Standards of Conduct of CIPS (Canadian Information Processing Society): http://www.cips.ca/about/ethics/

[COMPAQ] The Corporate Code of Conduct of Compaq: http://www.compaq.com/inside/ethics/code_conduct.html

[DII] The Defense Industry Initiative on Business Ethics and Conduct: http://www.dii.org/links/links.html

[Ergonomics]. The Code of Professional Conduct of the Ergonomics Society: http://www.ergonomics.org.uk/membership/conduct.htm

[EuroParl] European Parliament: http://www.europarl.eu.int/codex/default_en.htm

Hartman, L.P. 1998. *Perspectives in Business Ethics*. McGraw-Hill International Editions, http://www.mhhe.com

[HON] Health on Net Foundation: http://www.hon.ch/HONcode/

[IEEE] IEEE Code of Ethics: http://www.ieee.org/about/whatis/code.html

[IEEE-CS/ACM] Software Engineering Code of Ethics of IEEE-CS/ACM Joint Task Force: http://www.computer.org/tab/seprof/code.htm

[NGS] National Government Simulation: http://pub88.ezboard.com/frepnetfrm91.showMessage?topicID=194.topic

[Ören] A list of ethical links: http://www.site.uottawa.ca/~oren/Links_ethics.htm

Ören, T.I. 2000a. "Responsibility, Ethics, and Simulation." *Special Issue of Transactions of the SCS on Ethical Issues in Modeling and Simulation* 17:4 (Dec.), 165-170.

Ören, T.I. 2000b. "Educating the Simulationists." In Conception of Curriculum for Simulation Education, (H. Szczerbicka, ed.) http://www.informs-cs.org/wsc00papers/225.PDF *Proc. of the 2000 Winter Simulation Conference* (Orlando, FL., Dec. 10-13), 1635-1644.

Biography

Dr. Ören is the Founding Director (except mid 1996-mid 2001) of the Ottawa Center of the McLeod Institute of Simulation Sciences of the SCS. Has been active in simulation since 1965. Over 320 publications. Contributions in approximately 300 conferences and seminars held in 27 countries. Several conference or program chairmanships. Over 70 invited contributions since 1990. His research areas include applications of artificial intelligence in modelling and simulation and to software engineering; reliability and quality; and professional ethics. (http://www.site.uottawa.ca/~oren/research_interest.htm)

During 1996-2001, was active at several NATO research groups on modelling and simulation: Member of the Steering Group on NATO Simulation Policy and Applications tasked to developed the NATO Modelling and Simulation Master Plan (SGMS) (1996-1998). Member of the Industrial Policy Subgroup on Modelling and Simulation (IPSG) of NATO's Industrial Advisory Group (NIAG) (1996-2000). Member of NATO's Research and Technology Organization (RTO), Studies, Analysis and Simulation (SAS) Panel (1997-2001).

Founding Chairman of the Executive Committee of the Chairmen of the Canadian Computer Science Departments (1981-82). Invitations from United Nations; sponsorship from NATO; as well as fellowships, scholarships, or sponsorships in 11 countries: Austria, Brazil, Canada, China, France, Germany, Italy, Japan, the Netherlands, Turkey, and the USA. Included in over 20 Who's Who publications. "Information Age Award" from the Turkish Ministry of Culture (1991). Other awards as well as plaques and certificates of appreciation from organizations including NATO, Atomic Energy of Canada, and ACM.

Web site: http://www.site.uottawa.ca/~oren/