

Guest editorial

Satinder Gill · Guglielmo Tamburrini

Published online: 25 July 2007
© Springer-Verlag London Limited 2007

1 Background and organisation

This special issue is concerned with the ethics of human interactions with bionic, artificial intelligence, and robotic systems and technologies. These technologies are all presenting challenges for our conceptions of what it means to be social, autonomous, and responsible human beings. These challenges require our immediate attention due to the pervasive impact of these technologies on communication and information environments and their increasing presence in all spheres of social life, including home, education, workplace organisations, and healthcare. Bionics embeds technology within our own physical bodies, and affects our sense of self, emotions, and cognitive relationships to other people. Artificial intelligence shapes agency with its powerful technologies and systems for intelligent information processing and cognitive interaction, which engage us in artificial spaces of communication. Robotics is increasingly becoming an interaction technology, with service and personal robotics paving the way to rich cognitive and bodily interactions with non-biological systems. All these technologies are valuable for the positive contributions they can make to the promotion of human rights and quality of life, for example helping the disabled person have mobility with an artificial prosthetic device, helping those who are isolated to be connected, and undertaking missions in physical environments that are difficult or dangerous for humans to tread on. But human rights and values have to be protected too. It is important to

S. Gill (✉)
School of Computing Science, Middlesex University, Ravensfield House,
The Burroughs, Hendon, London NW4 4BT, UK
e-mail: sattisan@yahoo.com

G. Tamburrini
Dipartimento di Scienze Fisiche, Università di Napoli Federico II,
Complesso University Monte S. Angelo, Via Cintia, 80126 Napoli, Italy
e-mail: tamburrini@na.infn.it

raise ethical awareness of the potentially negative effects these systems and technologies may bring about, so that one can proactively address these problems in future design and application developments.

The papers in this special issue have emerged from the discussions and research being undertaken by the European funded FP6 Science and Society Coordination Action, ETHICBOTS [Emerging Technoethics of Human Interaction with Communication, Bionic, and Robotic Systems]. This special issue on “Socio and Techno Ethics of Human Interaction with Communication, Bionic, and Robotic Systems” is based upon the international workshop held in October 2006 at the Università di Napoli Federico II, Italy, in the framework of the European project ETHICBOTS.¹ The workshop was organized in cooperation with Istituto Italiano per gli Studi Filosofici and Istituto di Cibernetica “E. Caianiello” of the Italian National Council of Research. The papers collected here represent the diversity of ethical reflections and concerns for society that we think are pertinent for consideration in the current and future design and applications of robotics, artificial intelligence, and bionics.

In the ETHICBOTS October 2006 workshop, a multidisciplinary group of about 50 participants, that aptly included roboticists, computer scientists, anthropologists, sociologists, moral philosophers, theologians, and philosophers of science presented their reflections. The workshop was opened by Alan Mackworth, president of the American association for Artificial Intelligence, and Bruno Siciliano, president elect of the IEEE Robotics and Automation Society. The papers we have selected for this special issue jointly provide a comprehensive picture of the variety of topics addressed during the workshop and include invited papers from authors whose work is directly concerned with these issues. Socio-ethical issues addressed in these papers include the following topics: adaptive machinery and the protection and promotion of fundamental human rights; autonomy, responsibility and privacy in human-machine interaction; human-centred intelligent system design; individual and societal impact of human-machine cognitive and affective bonds; regulatory, policy shaping, and legal themes concerning adaptive and intelligent/machines.

2 Overview

In his paper on *Technology as an excuse for questionable ethics*, Abbe Mowshowitz (City University of New York, USA) emphasises that no technology is in itself dehumanizing or alienating. He claims that reification of technology veils human shortcomings: by endowing technology with the power to wreak havoc human beings are ethically sidelined and relieved of responsibilities. In order to counter this tendency one should be careful to trace back the responsibilities of human beings for

¹ ETHICBOTS is the Acronym for: Emerging Technoethics of Human Interaction with Communication, Bionic, and RoBOTic Systems, a EU Coordination Action within the programme “Science and Society” of FP6 with a duration of 2 years. For further information on the project and the project consortium see <http://ethicbots.na.infn.it>. The interested reader can find an extended abstract of every presentation at the website <http://ethicbots.na.infn.it/meetings/firstworkshop/abstracts/abstracts.htm>. For a paperbound copy of the workshop “Book of abstracts”, please contact Guglielmo Tamburrini (tamburrini@na.infn.it).

improper uses of AI and ICT technologies which lead, for example, to invasion and violation of privacy in the information society.

The new conditions of interaction that come with the integration of intelligent interactive artefacts (multi-modal and multi-sensory) in our daily activities may impact on central aspects of being human, such as social intelligence and our capacity to synchronise and coordinate with others and perform collective action. In her paper on *Socio-Ethics of Interaction with Intelligent Interactive Technologies*, Satinder Gill (Middlesex University, London, UK) considers these human capacities as being essential to social cohesion. She gives the example of human “coordinated autonomy”. Autonomy is a concept that can be misunderstood as pertaining to the “individual” only, and systems built on this principle may impact on human cognition and communication in a manner that does not afford co-evolution in a symbiotic interactive structure. This concept of autonomy needs to be rethought in the framework of the social dynamics of everyday life where, for example, the rhythmic coordination of our bodies and voices enable us to ground our understanding of any communicative situation. Interactive “intelligent” technologies impact on coordinated autonomy and give rise to distinctive ethical problems that are explored in connection with a variety of application domains, notably including healthcare and interactive media.

The issues of machine autonomy is taken up again in connection with the actions of learning robotic and AI systems, in the paper *Learning Robots Interacting with Humans. From Epistemic Risk to Responsibility* by M. Santoro, D. Marino and G. Tamburrini (Università di Napoli Federico II, Italy). Moral responsibility and liability ascription problems concerning damages caused by learning robot actions are discussed in the light of epistemic limitations concerning prediction and explanation of the behaviour of learning automata. And a broad framework is outlined for ethically motivated scientific inquiries, which aim at improving our capability to understand, anticipate, and selectively cope with harmful errors by learning robots.

Learning robots play an equally prominent role in the paper *Care-Giving Robots and Ethical Reflection. The perspective of interdisciplinary technology assessment*. Michael Decker (ITAS—Institute for Technology Assessment and Systems Analysis, Forschungszentrum Karlsruhe, Germany) argues there that robots are primarily a means to an end in their role of human action proxies. He asks whether and to what extent a replacement of this kind makes ethical sense in terms of technology, economics, and legal aspects. His analysis proceeds from an ethical perspective derived from Kant’s formula of humanity, concentrating on examples concerning the use of learning robots for the care of the elderly and the infirm.

René von Schomberg (European Commission, Directorate General for Research, Bruxelles), in his paper *From the Ethics of Technology towards an Ethics of Knowledge Policy. Implication for Robotics*, spells out central shortcomings of conventional ethical practice in connection with technological developments. These are qualified as the shortcomings of individual role responsibility ethics, for individuals in our society cannot be held fully accountable for their individual role within the context of scientific technological developments. He claims that these shortcomings propagate to our conception of robots taking up typically human roles.

From there, it is argued that one has to move on towards an ethics of knowledge assessment, in the framework of social foresight and deliberative procedures concerning technological developments in general, and robotic technologies in particular.

In their paper *Ethical Regulations on Robotics in Europe*, Michael Nagenborg, Rafael Capurro, Jutta Weber, Christoph Pingel (Hochschule der Medien, Stuttgart, Germany) point out that there are only a few European regulations dealing explicitly with robots, but these gaps are partly compensated by the vast number of extant regulations, which can be specialized and applied to robotics. This viewpoint is argued for on the basis ethical issues concerning responsibility and autonomous robots, machines as a replacement for humans, and tele-presence, and by means of an examination of relevant cases from medicine and healthcare, military technologies, and entertainment.

In his paper on *The social impact of Intelligent Artifacts*, Richard Rosenberg (University of British Columbia, Canada) laments that while biologists have to explain why research on cloning, for example, will have long-term benefits, such concerns rarely arise in artificial intelligence and robotics: it seems to be taken for granted that benefits to society of intelligent artefacts are so obvious that critical review is unnecessary. Rosenberg challenges this viewpoint and explores from a proactive ethical standpoint issues of fair access and justice, privacy, and liberty, physical and mental integrity, that potentially arising in future interactions between people and their intelligent robots and softbots. He asks whether robots will eventually be able to learn ethical rules of behaviour emphasizing thought-provoking twists of this idea.

In their paper *Implications of an Ethics of Privacy for Human-Centred Systems Engineering* Peter Carew, Larry Stapleton and Gabriel Byrne (Waterford Institute of Technology, University College Dublin, Ireland) address the ethical issue of privacy as a complex human value. The relevance of privacy for artificial intelligence applications is then examined and a rationale for incorporating the concept in contemporary systems engineering forwarded. They identify the moral imperative to respect the privacy of individuals when implementing a system and the objective rationale to avoid harmful ramifications such as user resistance. Given the complexity of meanings that privacy has in any given context, an objective and prescriptive universal model of privacy is bound to fail. One approach that provides a foundation for building methodology and design principles for privacy is the human-centred systems design tradition. At present, however, the human-centred design tradition under represents the concept of privacy. There is a need to further research, develop and apply this approach to shape a professional “ethic of privacy” for systems engineers.

Responsibility and ethical considerations need to be embedded within the design process of systems. L.Stapleton, in his paper on “*Ethical Decision Making in Technology Development: A Case Study of Participation in a Large Scale Information Systems Development Project*” argues that an “ethics of care” rather than an “ethics of rights and rules” would be better able to support the designers of Information Systems to embed ethical considerations in their design practices. This would improve communication and decision-making for successful design by being

more inclusive of design needs. At present there is a lack of design methodology in the Information Systems Development field that addresses ethical concerns. A human-centred systems approach with the ethics of care could provide the basis of such a design methodology with principles of ethics.

Pericle Salvini, Edoardo Datteri, Cecilia Laschi, and Paolo Dario (Scuola Superiore Sant'Anna, Pisa, and Università di Milano-Bicocca, Milano, Italy), in their paper entitled “*Scientific Models and Ethical Issues in Hybrid Bionic Systems Research*”, provide an informative survey of current developments in hybrid bionic systems (HBS). They claim that these results suggest that HBS technologies can be extensively employed to restore sensorimotor functionalities in disabled and elderly people. At the same time, HBS research raises ethical concerns related to possible exogenous and endogenous limitations to human autonomy and freedom. These ethical concerns, it is argued, call for and motivate scientific inquiries into key aspects of sensorimotor coordination and plastic adaptations mechanisms in the brain.

Federica Lucivero (European Commission, Directorate General for Research, Bruxelles) and Guglielmo Tamburrini (Università di Napoli Federico II, Italy), in their paper *Ethical Monitoring of Brain Machine Interfaces. A Note on Personal Identity and Autonomy* discuss the ethical monitoring of a special class of HBSs, that is, the Brain-Machine Interfaces (BMIs), with respect to their potential impact on distinguishing traits of persons, changes of personal identity, and threats to personal autonomy. The personal identity monitoring problem is approached by identifying physical and psychological features potentially affected in BMI interventions that play a central role in philosophical accounts of personal identity and person persistence over time. The personal autonomy monitoring problem is approached by identifying various ways in which the inclusion of a robotic controller in the motor pathway of an output BMI may limit or jeopardize personal autonomy.

3 Discussion and future developments

The intuitive motivation for having this integrated discussion on robotics, artificial intelligence, and bionics is that human interactions with adaptive and intelligent systems that are themselves machines (robots or softbots—intelligent software agents) or comprise machine parts (bionic systems), require novel and unified analyses from an applied ethics perspective. Adaptive and intelligent systems that are as a whole or in some of their parts identified as machines are a relatively recent acquisition of human scientific and technological undertakings. Human beings experience bodily and mental interactions with these systems that have not been experienced with any non-human biological system known to us as capable of adaptive and intelligent behaviour. The papers in this special issue enable one to frame ethical and social problems raised by current developments of bionics, artificial intelligence, and robotics into the broader picture of ethical and social issues concerning technological developments at large. At the same time, however, the papers collected here enable one to appreciate the difficulty of adapting

traditional ethical conceptions, extant regulations, and legal procedures to the conditions of interaction with adaptive and intelligent machines. Ultimately, the novelty of the social and ethical challenges identified by the papers brought together in this special issue, and made pressing by the increasing presence of bionic, AI, and robotic systems in all spheres of social life, stems from the fact that these systems afford capabilities for perception, action, learning, reasoning, decision-making, and goal-directed behaviour, which single them out from any other kind of machine developed in the history of the human kind.