ICON: Journal of the International Committee for the History of Technology 27, no 1 (2022): 9–14

INTRODUCTION

Tools to Generate or to Solve Crises? Perspectives on Robots and Artificial Intelligence

Stefan Poser

When Karel Čapek's science fiction play *R.U.R. Rossumovi Univerzální Roboti* coined the expression "robot" in 1920, the field of robotics was created. It was immediately, and irreversibly, shaped by the idea of anthropomorphic robots and their popular representations in magazines and science fiction. As research into human-robot interactions has shown, those types of robots and their implied humanity still shape our views and expectations of robots today.

Whereas Čapek's robots were living beings,[1] "robot" soon became an expression for a specific kind of technology. In the beginning, the expression was clearly linked to anthropomorphic items. Since then, different types of robots and (later) artificial intelligence (AI) have emerged and declined, linked to negative and positive prognoses. Robots are inevitably linked to utopic or dystopic visions. Beside the popular representation of robots, individuals became familiar with robots because such machines for industrial work were produced starting in the 1950s. Since the 1980s, industrial robots have gained influence. These robots, however, only worked insulated from human workers. This changed; intelligent systems for service industries have been widely introduced since the 2000s. Recent developments have been dedicated to so-called "co-bots," robots for production processes that are prepared to work in direct collaboration with human workers. At the start of what may be just a new fashion in robots/AI or a saddle time for these new technologies, it is crucial that we gain a better understanding of and discuss criteria for the application of robotic technology. Indeed, this special issue on robots is embedded in a growing number of research projects and publications in the humanities.

The first problem with the apparently simple suggestion of discussion and understanding is that there are so many different kinds of robots. It is difficult, if not impossible, to figure out a definition that can include all of the items that we consider robots. Perhaps the notion of "family likeness" (*Familienähnlichkeiten*), which Wittgenstein coined with respect to different types of playing, might be

1 See the cover illustration of this special issue of *ICON*.

helpful in case of robots, too.[2] Robots range from fixed industrial robots that carry out mechanical work to moving robots for different services to those used primarily (if not solely) for entertainment. Some robots depend on inputs to "know" their environment. Recently, robots have been combined with sensor systems to collect information about the environment for (in some cases immediate) decision-making. As for shape: some look more like machines, while others are designed in anthropomorphic or zoomorphic shapes.

In 1990s, the Association of German Engineers (VDI) stated that: "a robot is a . . . multifunctional manipulator with at least three independent axes. It moves materials . . . tools or special devices on programmed, variable paths performing a wide variety of different tasks."[3] This definition, however, mainly covers industrial robots. They follow different programs to get something done, without reacting to their surroundings. Any notion of motion derives from imitating human arms: they are fixed (so not mobile) yet move.

Scholars from information sciences focus more on a robot's ability to act autonomously. According to them, a robot is "a freely programmable machine that acts on the basis of environmental sensors in environments that are not known at the time of programming and/or are dynamic and/or cannot be fully described."[4] This definition focusses on robots which are programmed to react to their surroundings. Such robots, developed for service industries and as consumer goods, for example, are designed to react both to people and their requests and to the environment. Thus, they are equipped with so-called weak AI that enables machines to find a solution for a specific task.[5]

But this type of modern robot is quite different from industrial robots and robots designed for entertainment. Thus, the definitions linked to those types do not cover more recently developed (social) robots that use sensors. It does not cover traditional robot toys either. Robot toys, on the other extreme to social robots, are near to mechanical automata: they are designed to move or even speak, normally

2 Wittgenstein, *Philosophische Untersuchungen*; Poser, "Playful Celebrations of Technology," 245.

3 "Ein Roboter ist ein frei und wieder programmierbarer, multifunktionaler Manipulator mit mindestens drei unabhängigen Achsen, um Materialien, Teile, Werkzeuge oder spezielle Geräte auf programmierten, variablen Bahnen zu bewegen zur Erfüllung der verschiedensten Aufgaben" (VDI-Fachbereich Produktionstechnik und Fertigungsverfahren, "VDI 2860").

4 Ein Roboter ist "eine frei programmierbare Maschine, die auf Basis von Umgebungssensorendaten in geschlossener Regelung in Umgebungen agiert, die zur Zeit der Programmierung nicht genau bekannt sind und/oder dynamisch und/oder nicht vollständig erfassbar sind" (Hertzberg et al., *Eine Einführung aus Sicht der Informatik*, p. 3).

5 Weak AI is employed in a huge number of machines and robots today, whereas so-called strong AI is only available in fiction—in theory, strong AI would enable a robot to think like a human.

based on fixed programs. They are equipped with different engines for motion and their own energy supply, but they do not have any tools for interacting with (or reacting to) their surroundings. In some cases, speaking is realized by a loudspeaker and a human actor. Now this can be assessed as a fake, or as part of a representation of robots, machines only apparently doing things that technology has since made possible. Yet since representations of robots existed much earlier than their real counterparts in industries or in the consumer world, they have shaped public recognition of robots to a high degree. For this reason, this issue combines articles outlining the popular history of robots with papers on the history of the scholarly discussion about robots and their implementation in industries and consumer products. What all ultimately do is allow us to better know the field. Each of the articles here demonstrates that we need to judge how our society should deal with robots so that we can shape future development in this important field. Although some people argue that science fiction allows us to make ethical decisions about a technology before it arrives, the different reflections on robots in this issue show that science fiction has by no means exhausted the dilemmas about robots or the need to set limits to their use.

Isaac Asimov initiated the development of regulations with his robot laws in the 1940s, which expressed basic conditions such as a ban on killing.[6] Meanwhile robots and AI have become an emerging field not only of engineering, but of studies in sociology, philosophy and history of technology.[7] Recently the Institute of Electrical and Electronics Engineers (IEEE) and the Association of German Engineers published guidelines for the development and use of robots and AI, and the European Commission is currently working on a law defining the safety standards of AI.[8] This special issue aims to contribute to the history of these artefacts and their popular representations. In so doing, it also seeks to inform contemporary discussions about ethics, ontology and the role of robots in different societies—discussions that often surface when laws are being made.

The first two contributions in the special issue are dedicated to the history of the popular representation of robots. They look at emotions that robots provoke among humans. Dustin A. Abnet analyses the growing American penumbra of robots in popular representations from the 1930s onwards. He argues that despite the term's European origins, the artefacts ultimately took on an important meaning in the American pursuit of a global consumer empire.

6 Asimov, *I, Robot*.

7 Among the first books on history of robots was: Nocks, *Robot*.

8 IEEE Guide for the Use of Artificial Intelligence Exchange and Service Tie to All Test Environments (AI-ESTATE), 2014; "Proposal for a regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain union legislative acts," 21 April 2021.

Whereas Abnet's article reflects particularly American developments, discussing also the role of race in debates about robots, the next article by Stefan Poser uses a successful 1963 science-fiction novel from Europe to show how the popular portrayal of robots as anthropomorphic and the portrayal of the emotions linked to robots has shaped our ideas of human-robot interactions. The article argues that the author both built on and contributed to the development of a popular image of robots as human-like. It argues that the popular image of anthropomorphic robots makes the adoption of robots difficult because rational thought about robots is overwhelmed by our emotional responses.

The next article focuses not on emotions *evoked* by robots, but emotions attributed to them. Jennifer Robertson is interested in the role of social robots in Japan. As her article shows, there the question of whether or not robots have *koroko* (a concept which combines the notions of heart, mind, and spirit) continues to attract a lot of attention. A crucial arena for this debate is that of religion, where Japanese "robot priests" debuted in the last couple of decades. The article explores how religious technologies and human-robot relations are imagined and created.

The special issue then turns to the question of making an exhibition about robots that can further human understanding of this type of machine/being. What might such an exhibition look like and what objects might it include? Nicholas Lange and Frank Dittmann discuss their choices in designing an exhibition for the Deutsches Museum. This is an article discussing the questions that arose while preparing the exhibition design—not a review.

A historiographical article follows that talks about the links between the value of labour in popular discourse and the valuation of robots. It provides an intellectual history of AI from the latter half of the twentieth-century. In creating this, Manolis Simos, Konstantinos Konstantis, Konstantinos Sakalis, and Aristotle Tympas argue for the existence of two periods in the discourse about robots: one defined by notions of post-industrialism and one by the notion of a fourth industrial revolution. Because both are related to discourses on computer automation and by extension AI, they use discourses on computer automation to support their point. They suggest that there is a relation between notions of work and the accepted applications of AI.

Following is an article about the promises and reality of one such use of AI: talking cars. The author, Tiina Mänistö-Funk, raises questions about how talking cars made humans question connections between machines, intelligence and the ability to speak. Talking cars were not intelligent, but nevertheless crucially shaped the idea of machine intelligence. As it turned out, speaking cars were successfully hyped (and very popular in entertainment) but ultimately disappointing in reality. Our experience with talking cars raises important questions about control and responsibility, especially in current debates about autonomous vehicles.

The next article focuses on the much-promised integration of AI into biomedicine. Katerina Vlantoni and Kornilia Papanastasiou use accounts of AI published by professionals in the last half century to argue that rosy predictions about the changes that the introduction of AI would bring to medicine were not met. Indeed, these predictions lead to a spiral of literature portraying an overly-excited and failure-ridden past and a more promising present in order to promote future applications of AI. The article thus draws a contrast between the progressivist ideology of practitioners and a reality defined by the limits of integration into biomedicine.

Lastly is an article by Dick van Lente that explores the tendency documented historiographically for the public to over-estimate the potential of technological solutions to their problems, particularly with respect to health-care, a much heralded application of robots and AI. The article shows that the idea of finding a "technological-fix" to social problems like health-care has a long history and provokes readers (especially in the context of the foregoing) to ask how much we really grasp about the potential of robots and AI to change society.

Mixed feelings of fascination and fear are typical of new technologies. This is especially true in case of robots and AI. Many areas, particularly ethical, require further research: for example, how dangerous are different types of collateral damage, if they occur, for example, due to image recognition errors? Secondly: how can society mitigate shifts in the labour market that result from increasing AI use? And—most importantly: how are we going to deal with decisions made by AI? Which fields can be handed over to AI and which depth of decision-making is agreeable? The directional choices of an autonomous vehicle are acceptable to most people, for example, but such independent decisions by a military, killing robot are frowned upon.

Defining regulations and frameworks for decision-making AI seems to be key in order to shape the development of robots and AI in a way that is suitable for society. The discussion is clouded by the fact that we respond more emotionally to robots and AI than to other technologies—this was clearly realised and played on by designers and individuals seeking to increase the acceptance of intelligent technology and to seeking to lessen or eliminate fears about the human ability to control the development of such technology. This generates fascination and potential entanglement. In order to avoid unwanted outcomes, decisions made by AI have to be reversible and subject to human control so that they can be corrected if necessary. Mankind is approaching—as far as artificial humans and their individual abilities are concerned—a trial by fire: never before has society been so close to realizing the Golem myth. Thus, it is high time to deepen our exploration of the ethical requirements for robot and AI technologies. This special issue, with its many perspectives, is a contribution to that necessary discussion.

Bibliography

Asimov, I. *I, Robot*. New York 1950.

Čapek, K. *R.U.R.: Rossum's Universal Robots; kolektivní drama o vstupní komedii a třech dějstvích*. 4th edition, Praha: Aventinum, 1922.

Hertzberg, J., K. Lingemann, and A. Nüchter. *Mobile Roboter: Eine Einführung aus Sicht der Informatik*. Berlin: Springer, 2012.

Institute of Electrical and Electronics Engineers. "IEEE Guide for the Use of Artificial Intelligence Exchange and Service Tie to All Test Environments (AI-ESTATE)." In *IEEE Standard 1232.3-2014*, 1–102. 2014. DOI: 10.1109/IEEESTD.2014.6922153.

Nocks, L. *The Robot: The Life Story of a Technology.* Westport, CN: Greenwood, 2007.

Poser, St. "Playful Celebrations of Technology: Technology at Amusement Parks, in Children's Playrooms and in Sports." In "Playing with Technology: Sports and Leisure," edited by H.-J. Braun and St. Poser, special issue, *ICON* 19 (2013): 244–63.

VDI-Fachbereich Produktionstechnik und Fertigungsverfahren. "VDI 2860 – Projekt: Handhabungsfunktionen, Handhabungseinrichtungen; Begriffe, Definitionen, Symbol." VDI-Gesellschaft Produktion und Logistik: 1990.

Wittgenstein, L. *Philosophische Untersuchungen*. Berlin: Surkamp, 2003.