The Art in the Machine

Christian Kroos

Abstract Here the major themes that arise in the twenty-one chapters of this book are introduced and discussed within the framework of how robotic art relates to the general public and how it interconnects with science and engineering.

If you ask the person standing next to you at the train station or bus stop about their notion of robotic art, the answer will most likely conjure up some kind of robotic contraption producing works of art by drawing, painting, sculpturing, performing music and, already less often, playing a role in a theatre play. The robot replaces the human artist and fails or excels in doing so dependent on the interviewee's view of the current and near-future abilities of robots. If the robot is assumed to ultimately fail, the lack of success is construed as the consequence of a part of human thinking that cannot be approximated by machines, a quality of human thinking that is fundamentally unattainable for computational procedures. In popular culture this is frequently attributed to 'emotions' which are not 'logical' and cannot be paralleled in machines through algorithms. If on the other hand the robot is considered to match or even exceed the human artist's capabilities, the perceived perfection of machines is often invoked and contrasted with human imprecision and variability. The robot, capable of executing precise movements and repeating them exactly, creates works of art which themselves are characterised as an attempt to physically realise a perfect aesthetic ideal. In all these cases the robot becomes the artist. Rarely is the robot itself considered the artwork.

As this book documents, robotic art is almost exactly the opposite. The robot or robots constitute the work of art and do not create it, even if they sculpture, paint or draw, as for instance the '5 Robots Named Paul' by Patrick Tresset. Despite the five robots even signing their portraits, it's the entire robotic installation which

C. Kroos (✉)
Centre for Vision, Speech and Signal Processing, University of Surrey,
Guildford GU2 7XH, U.K.
e-mail: chkroos@gmail.com

D. Herath et al. (eds.), *Robots and Art*, Cognitive Science and Technology,
DOI 10.1007/978-981-10-0321-9_2

is exhibited, not the drawings on their own. The pretended drawing session with a sitter and the robots' probing again and again with their camera eyes emphasise this point further. An exception might be Leonel Moura's small mobile robots, which create large floor paintings through moving and dispersing paint [5]. Even there, however, the human artist does not vanish and Moura does not confine himself to the role of an art agent or manager.

Given that robots actively change and/or witness their environment, the layperson's assumption seems to be much more reasonable than the prevalent approach in robotic art. It is as if photographic art would almost exclusively consist of photo cameras and thematise the process, in which light reflected from the environment is captured on a two-dimensional plane and leaves a permanent impression. There are, of course, artworks, which do just that, but they do not define the area. Similarly, video art does not exclusively deal with the depiction and critical appraisal of the dynamic version of this process, but is largely about the captured content and the associated issues of arranging and presenting it.

Why have the developments been so different? The long answer can be found in the following nineteen chapters of this book and is rather multifaceted. A shorter (and probably oversimplified) explanation might be that in the cultural imagination of society robots are not understood as mere tools. They occupy a special place even among the machines, no matter how complex these other machines might be and how much they would be able to automate entire production cycles. Robots appear inextricably connected with the notion of autonomy, with the assumed ability to sense, act and navigate without a human operator, even though the reality of, for instance, robot arms in industrial production looks rather differently. The robot is the 'man-made thing' that does something on its own accord and by this claims agency. At least in the Judeo-Christian tradition the stage is set for the miraculous and the uncanny alike, for an extraordinary challenge of cultural and religious believes, if not even for 'man' attempting to become god (Fig. 1).

Even within a contemporary technoscientific and non-religious context, the ability to create a robot (in the sense of an autonomous machine) is far more enthralling—not to say, enchanting—than the product of the robot's activity. This does not apply to cameras, notwithstanding how much of a sacred object an individual exemplar can be become in the eyes of its owner. The camera is not granted a life on its own, no independence from the creator or owner is assumed and that is why in the end it remains a tool despite its ability to sense. Like other tools the camera might be integrated into the human body scheme [1] and it is often compared to the photographer's extended, mechanical eye.

The British philosopher Gilbert Ryle coined the term of 'the ghost in the machine' in order to criticise Descartes' dualism of body and mind ([7], p. 11):

> Now the dogma of the Ghost in the Machine […] maintains that there exist both bodies and minds; that there occur physical processes and mental processes; […]

In a similar way one could claim—empirically, not on principle—that the art in robotic art is not external to the robot, neither the product of the robot actions nor

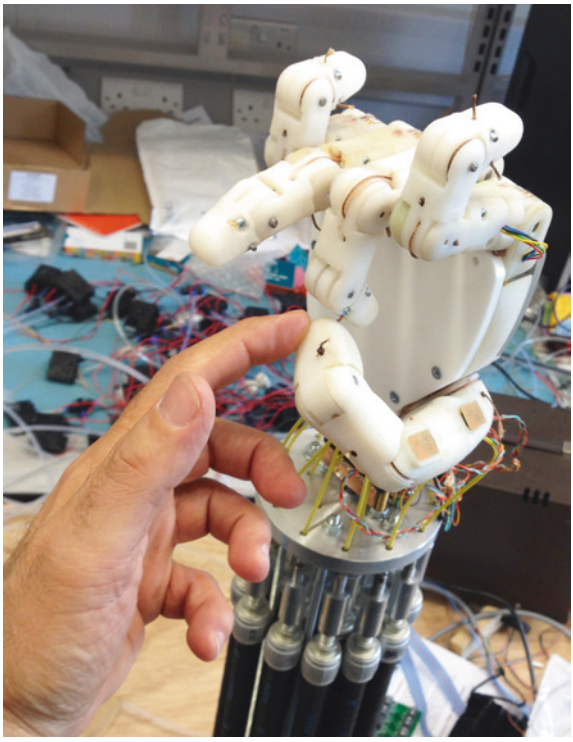

Fig. 1 Ambidextrous arm by Stelarc (developed and engineered by Emre Akyurek and Tatiana Kalganova, School of Engineering and Design, Brunel University, London; *photo* Stelarc)

some abstract symbolic meaning to be found within the robotic artwork. The artworks stand for themselves and do not symbolise ideas of autonomous machines or mechanistic biology. They reference a multitude of concepts such as agency, presence, aliveness, transspecies communication, but they do so through their physical existence and their interaction with the audience. The art is not in the machine, the machine is the art.

This book is organised according to the major themes conceptualised in robotic art as presented in the chapter contributions and as identified by the editors. It starts with a section, which puts contemporary robotic art into the historical context (‘*Then and now’*). Here diachronic conditions are investigated with respect to the 18th century beginnings and subsequent development of machine art (‘*We Have Always Been Robots: The History of Robots and Art*’ by E. Stephens and T. Heffernan), with respect to the history of robotic engineering starting in the 1950s (‘*Robotics: Hephaestus Does It Again*’ by J.-P. Laumond), and by examining its foundations and challenges in the past and current-day present (‘*Robotics and Art, Computationalism and Embodiment*’ by S. Penny). There is no section, however, that is explicitly dedicated to the relationship between science/engineering and the arts and their mutual influences and interdependencies. It is an implicit thread woven into the fabric of almost all the chapters and omnipresent as it is, this

inextricable relatedness appears as one of the defining characteristics of robotic art, being more prominent here than in most other media art. In this respect robotic art might be close to bio-art and as the two also share the fundamental relevance of embodiment, combinations are possible and maybe even likely, for instance, by enabling bio-engineered neural networks of living neurons to control the remaining robotic body (‘*Bio-engineered Brains and Robotic Bodies: From Embodiment to Self-portraiture*’ by G. Ben-Ary and G. Ben-Ary).

The overarching themes we identified in the contributions to this book are: *Otherness*, *Explorations*, *Embodiment* and *Interactions*. Arranging the contributions under these section headings should not be understood as exclusive and limiting, though. Most of the chapters with their descriptions of artworks and art practices, biographical notes and theoretical critiques touch on several of the topics and vice versa, the topics accommodate much that had to be left out in this book.

From the special place robots occupy in our cultures mentioned above results also their nature as marked others. An other, with which humans are (sometimes unwillingly) faced and which faces them, the robot perceived more as a different species than a specific category of technological artefact. The confrontation—whether real or imagined—steers up fears and hopes, centred first on the question ‘What will it do?’ and only then on ‘What is it?’, the order of the inquires arguably caused by our lack of experience with more sophisticated robots in contrast to the familiarity with our fellow animals. As emerging intentional agents robots are still newcomers in the posthuman mind setting, their poor performance in the physical world betraying their highflying portraits in fiction. Even a honeybee with a brain size of 0.64 mm^3 and weight of 1 mg [4] can at present easily outperform the most advanced robot.

As a new species, the robotic agent enters a discourse that extends far wider than the robotic kind. It encompasses all types of biological systems (including plants) and re-positions the human in a mesh of interdependencies with its environment (‘*Embracing Interdependencies: Machines, Humans and Non-humans*’ by Amy Youngs). Importantly, this is not seen as the outcome of recent technological or scientific development, but as a sociocultural shift in the way the human is understood, abandoning the view of an isolated mind put in an isolated body springing from the Cartesian paradigm. The new perspective offers the potential for a symbiogenesis between the many living systems and machines (‘*Trans-Species Interfaces: A Manifesto for Symbiogenesis*’ by Ken Rinaldo), but the autonomous robot might not always be welcomed so smoothly into the extended family of intentional agents. Humans would have to overcome feelings of uncanniness evoked by the new machines that signal awareness independent of whether they are anthropomorphoid or without resemblance to human appearance. In fact, the reservations might not be limited to humans as hinted at by numerous documented attacks on drones by birds, bees and other animals and in particular by a premeditated downing of a drone by a chimpanzee in the Royal Burgers’ Zoo in Arnhem, The Netherlands [6]. Robotic transspecies artworks confront us with this uncanniness and might habituate us (‘*Cultivating the Uncanny: The Telegarden and Other Oddities*’ by E. Jochum and S. Goldberg) or at least make an

unmediated experience available, a glimpse of the likely shape of things to come. And robotic otherness offers more opportunities. It provides the chance to move beyond a model of communication that overemphasis commonalities between the interaction partners (‘*The Potential of Otherness in Robotic Art*’ by E. Sandry). The rejection of concordance as a necessary condition for communication is neither originating from considerations of human-machine interaction nor it is ending there, but it is interactive robots that bring myriads of variations of communicating others into the world and thus force a more radical test of long held believes of communication’s sole grounding in congruence. Similarly, future robotic intentional agents will present us with problems of identity as sameness, with problems of individuality and subjectivity, challenging the self-concept of humanity. These questions have started to surface not just in fiction but in the physical world, owing to the advent of perfectly identical agents realisable in the control systems of robots (‘*Being One, Being Many*’ by C. Kroos and D.C. Herath).

The further we intrude into the uncharted territory of new concepts brought to and upon us by exploring posthumanism, postcognitivism and new robotic technologies, the more robotic art resembles a journey not unlike past geographic explorations such as the iconic forays into Antarctica. While art leaves the race and the ‘glorious’ conquests to science and engineering (e.g., in the last two decades the development of the first bi-pedal walking robot), it assimilates other less visible aspects of these explorations: the limitation of the human and the crucial interconnectedness with the environment as well as feelings of displacement and expendability. Robotic art rarely runs with Amundsen, so to say, it might be with Shakelton, but more often it walks with Scott, with failing machines and dying horses, with reaching the target when someone else had already been there and in the end not making it home. Robotic art had to come a long way and pioneering robotic art had been the proverbial winding road (‘*Way of the Jitterbug*’ by N. White), creating itself on the run. Challenging both the fundamentals of robotics and testing the limits of otherness still has the mark of encountering the limits of the experienced world (‘*Still and Useless: The Ultimate Automaton*’ by N. Reeves and D. St-Onge).

We have pointed out before that robots—in the way we understand the term—act in the physical world, excluding virtual agents such as chat bots. The prevalent technical separation of (analogue) hardware and (digital) software—mostly a consequence of the separate development history of computer chips and robotic mechanics—created indeed something akin to the ghost in the machine: A control system isolated from mechanical body and physical world. But as the ‘winters of artificial intelligence’ have shown, it could be and might have always been a dead end. Embodiment in robotic art is overwhelmingly understood as going beyond the self-evident aspect of giving the robot a physical form, it is seen as the embodiment of the control system, too, rejecting the Cartesian dualism in the same way as in biological agents and using the physical world for and instead of computations (‘*The Multiple Bodies of a Machine Performer*’ by L.-P. Demers). From different embodiments follow different behaviours and different ways of interaction with humans: An anthropomorphic robot is expected to act human-like and any

deviation is quickly noticed (‘*Android Robots as In-between Beings*’ by K. Ogawa and H. Ishiguro), while soft, inflatable structures embodying the more transient qualities of human movement enjoy a greater freedom in their abstractness (‘*Into the Soft Machine*’ by C. MacMurtie).

It should be noted that the difference in the human response due to the choice of robotic embodiment does not imply qualitative limitations in the resulting interactions. In particular, a structurally complex embodiment does not necessarily lead to complexity in the interaction and vice versa a morphologically simple robot does not constrain interactions to sparse, rudimentary exchanges. Interaction flows from the robot’s behaviour and again it is not the complexity on its own which is decisive, but the degree to which the behaviour works within the enfolding dynamic relationship between the interaction partners [3]. Plain robotic structures can have a strong emotional impact on the audience, elicit empathy and force us to re-evaluate our relations to machines (‘*I want to Believe—Empathy and Catharsis in Robotic Art*’ by B. Vorn). The ensuing almost boundless diversity of designs in appearance, functionality and actualised behaviour of robots, however, opens Pandora’s box in scientific human-robot interaction research. How can findings be generalised when changes in appearance or behaviour are influencing all interactions? How can the overflowing abundance of potential experiments ever be managed? Science-art collaborations do not provide an answer as they always reside in the specific that is the single artwork. But they lead the way in which the complexity of human interactions is acknowledged and considered from the onset in the design of robot appearance and behaviour (‘*Designing Robots Creatively*’ by M. Velonaki and D. Rye). They are less likely to fall prey to an ‘one shape fits all’ simplification in the interpretation of experimental findings and they highlight the intricate relationship between contemporary technology and the humans that conceive, implement or simply use it—relationships that long have deeply permeated everyday life. Robotic art can bring these relationships, which are constantly at the brink of slipping out of awareness, back into the light of conscious appraisal, both through its practice and its works (‘*Robot Partner—Are Friends Electric?’* by S. Doepner and U. Jurman).

Where will robotic art go in the future? From the descriptions and considerations above it might already be evident that no definite answer can be given. Too plentiful are the potential paths of development on the engineering side alone and clearly beyond prediction when combined with scientific insights not yet known and the limitless creativity in the arts. In addition, the world’s industrialised societies are in the process of a substantial change as robots are about to enter daily lives, both as part of the private homes of people and foreseeably soon at their work places, too. New avenues of mixing and interfacing the human body with robotic technology have emerged blurring further already instable boundaries. Robotic art will likely continue contesting traditional concepts of aliveness, embodiment and agency (‘*Encounters, Anecdotes and Insights—Prosthetics, Robotics and Art*’ by Stelarc). Chances are also that robotic art will remain at the forefront of probing human-robot interaction and that the robot itself will mostly be its topic, not the robot’s creations, although the latter is already less certain.

With significant advances in technology there will surely be a few scientific and engineering surprises which in turn will reflect strongly on robotic art. We might be forced to alter our conceptualisation of agency, intentionality, subjectivity and presence. Judging by the last half century of robotic research, it is also almost guaranteed that science will encounter 'hard' problems, for which a straightforward (even if mathematically and algorithmically complex) solution will be found, and others, which had been so much underestimated that not even their fatal nature had been noticed. Again, this knowledge will eventually have an impact on culture and society at large and as history shows the arts have always processed, assimilated or contested new scientific insights and have never been intimidated by scientific complexity.

If one takes an overall look at the contributions of this book, two observations stand out: The diversity of approaches, which is reflected in all aspects of the writing—including the chosen terminology—and the depth of the questions asked (compared, for instance, to the functional focus of typical papers at scholarly robotic and automation conferences). Robotic art uses technology, very often state-of-the-art technology, and it rarely shuns a direct involvement in the technoscientific functional approach, but it then takes what it can get and creates artworks that critique, subvert, transcend, play with or expose the original function of the appropriated technology and its social consequences, its ethics and cultural meanings. With this it often reveals the blind spots in scientific and engineering research and development [2] and opens unexpected perspectives. These new viewpoints and concepts diffuse osmotically back to science and engineering, influencing its progression, and if it would only be in the form of unorthodox ideas sparked in the minds of the next generation of scientists and engineers.

References

1. Black DA (2014) Where bodies end and artefacts begin: tools, machines and interfaces. Body and Society 20(1):31–60
2. Goodall J (2011) Magnetic encounters and embodied conversations. In: Presentation given at 2011 ICRA workshop 'Robots and Art: Frontiers in Human-Centred Robotics as Seen by the Arts', Shanghai, China
3. Kroos C, Herath DC, Stelarc (2012) Evoking agency: attention model and behaviour control in a robotic art installation. Leonardo 45(5):133–161
4. Mares S, Ash L, Gronenberg W (2005) Brain allometry in bumblebee and honey bee workers. Brain Behav Evol 66(1):50–61
5. Moura L (2016) Machines that make art. In: Herath D et al. (eds) Robots and Art, Springer, Heidelberg. doi: 10.1007/978-981-10-0321-9_13
6. Press Association (2015) Ape millimetre: chimpanzees smash camera drone. *The Guardian*. http://www.theguardian.com/world/2015/sep/03/ape-millimetre-chimpanzees-smash-camera-drone-zoo. Accessed 11 Feb 2016
7. Ryle G (1984/1949) The concept of mind. London: Hutchinson

http://www.springer.com/978-981-10-0319-6

Robots and Art
Exploring an Unlikely Symbiosis
Herath, D.; Kroos, C.; Stelarc (Eds.)
2016, XIX, 456 p. 218 illus., 200 illus. in color.,
Hardcover
ISBN: 978-981-10-0319-6