

Malachy Eaton: Evolutionary humanoid robotics **Springer, 2015, ISBN 978-3-662-44598-3**

Jürgen Leitner¹

Published online: 8 December 2015
© Springer Science+Business Media New York 2015

I had the joy of reading Malachy Eaton’s *Evolutionary Humanoid Robotics*. It sheds light at the intersection of evolutionary search and robotics, with a special focus on humanoid or human-like robots. It is a skill to hit the right spot between introducing newcomers to a concept while also informing researchers already in the field. Eaton manages to do just that by delivering a nice flowing, quick to read book (with its 151 pages).

The reader is given an introduction of the relevant principles and ideas in evolutionary computing and its applications in robotics. I can recommend this book to starting graduate students in the fields of computer science and/or robotics, or researchers looking to get started with evolutionary robotics. With its focus on humanoid robots it might seem like a niche book but the discussion about current evolutionary approaches and their limitations has wider implications.

Eaton asks questions that are interesting for the whole area of robotics not just humanoid robots. Such as “How can we close the reality gap?”, that is, reduce the difference between simulated robots and real robots. And how can we create, i.e. program, learn or evolve, interesting behaviours for complex robots? And, a question also very important in my research, how can we perform evolution and/or learning on real robots safely? As a researcher in evolutionary humanoid robotics (EHR) I particularly liked these questions and how EHR can make a difference. The book also discusses the different approaches for evolving robotic “brains”. I.e. evolving decision making or control systems for a robot, in contrast to evolving the robot’s body. It also explains different approaches for the evolutionary process

✉ Jürgen Leitner
j.leitner@qut.edu.au

¹ ARC Centre of Excellence for Robotic Vision (ACRV), Science and Engineering Faculty, Queensland University of Technology (QUT), 2 George Street, Brisbane, QLD 4000, Australia

when operating in simulation and when dealing with real hardware. For people that are starting in the field Chapters 5 and 6 provide a really nice overview of the foundations of the research in evolutionary humanoid robotics from 1990 to 2000 (what Eaton refers to as “prehistory”) and the state of the art from 2000 to 2014. I particularly liked reading the comprehensive tables detailing the published research over the last decade in both simulated and real-world environments.

The book’s gaze is on humanoid robotics and Eaton does a good job at defining the terminology. Such as, describing the various graduations of distinction between evolutionary robotics and evolutionary humanoid robotics. Thus leading the reader to a more fundamental understanding of the levels of humanoid robots. He also discusses ethics in robotics research a few times throughout the book and even dedicates Chapter 8 to philosophical and moral considerations. I think Chapter 8 is relevant to a much broader audience than just colleagues in the EHR field.

My only criticism would be that Eaton missed an opportunity by not provoking a discussion on what currently are the big challenges in EHR and what will they be in future. I would have liked to see him trying to answer the question, what is the next challenge after evolving bipedal walking? For example, important issues such as, the benchmarking of algorithms (beyond the current approach of just creating robotic competitions), the definition of interesting behaviours and the long-term deployment of autonomous robots are only hinted at but no opinion on how to tackle these are provided. To be fair these are fundamental questions for all of robotics, not just evolutionary humanoid robotics.

To conclude, “Evolutionary Humanoid Robotics” is a well-written, thoroughly researched introduction to what might seem like a very specialist topic but shows that it has wider implications. It lists the research outcomes over the last two decades and hints at the how these might continue in the next few years. On top of that it is a wonderful guide for finding relevant references in the field. I highly recommend it for young researchers starting out in the field of EHR, as well as, people interested in the general idea of evolving robotic systems, both for humanoids and non-humanoid robots.