

Volume 40 Part 11

# ROBOTICA



[cambridge.org/rob](https://www.cambridge.org/rob)

International Journal of Information, Education and Research  
in Robotics and Artificial Intelligence

EDITORS

Professor Jian S. Dai, *Centre for Robotics Research, King's College London, United Kingdom*

*E-mail: jian.dai@kcl.ac.uk*

Professor Giuseppe Carbone, *Department of Mechanical, Energy and Management Engineering, University of Calabria, Rende, Italy*

*E-mail: giuseppe.carbone@unical.it*

FOUNDING EDITOR

Professor J. Rose, (UK)

EDITORIAL BOARD

Dr Panos Artemiadis, *University of Delaware, USA*

Professor Fernando A. Aut Cheein, *Department of Electronic Engineering, Federico Santa Maria Technical University, Valparaíso, Chile*

Professor Eduardo Bayro-Corrochano, *CINVESTAV, Campus Guadalajara, Jalisco, Mexico*

Professor Mehmet İsmet Can Dede, *Izmir Institute of Technology, Turkey*

Professor Angelo Cangelosi, *University of Manchester, UK*

Juan Antonio Carretero, *Department of Mechanical Engineering, University of New Brunswick, Canada*

Professor Elena De Momi, *Department of Electronics, Information and Bioengineering, Politecnico di Milano, Italy*

Professor Raffaele Di Gregorio, *LaMaViP, Department of Engineering, University of Ferrara, Italy*

Professor Jorge Manuel Miranda Dias, *Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates*

Professor Xilun Ding, *Beihang University, China*

Professor Ioan Doroftei, *Mechanical Engineering, Mechatronics and Robotics Department, "Gheorghe Asachi" Technical University of Iasi, Romania*

Dr Dongming Gan, *Purdue University, USA*

Professor Feng Gao, *Shanghai Jiao Tong University, China*

Professor Alessandro Gasparetto, *Polytechnic Department of Engineering and Architecture, University of Udine, Italy*

Professor Victor Glazunov, *Blagonravov Mechanical Engineering Research Institute of the Russian Academy of Sciences, Moscow, Russia*

Dr Giorgio Grioli, *Soft Robotics for Human Cooperation and Rehabilitation lab, Fondazione Istituto Italiano di Tecnologia, Italy*

Dr Quang Ha, *UTS, Australia*

Professor Kenji Hashimoto, *Meiji University, Japan*

Professor Tamas Kalmar-Nagy, *Northeastern University, Boston, USA, Budapest University of Technology and Economics, Budapest, Hungary*

Associate Professor Hung La, *University of Nevada Reno, USA*

Professor Daniel Martins, *Federal University of Santa Catarina, Brazil*  
Professor Carl Nelson, *Department of Mechanical and Materials Engineering, University of Nebraska-Lincoln, USA*

Professor Georg Rauter, *BIROMED-Lab, University of Basel, Switzerland*

Professor Lotfi Romdhane, *American University of Sharjah, United Arab Emirates*  
Professor Roberto Sabatini, *Khalifa University, Aerospace Engineering, P O Box 127788, Abu Dhabi, UAE*

Professor Andrey V. Savkin, *University of New South Wales, Australia*  
Professor Tao Sun, *Tianjin University, China*

Professor Daniela Tarnita, *Dept. of Applied Mechanics, University of Craiova, Romania*

Professor Qining Wang, *Peking University, China*

Dr Gouwu Wei, *University of Salford, UK*

Dr Jingshan Zhao, *Department of Mechanical Engineering, Tsinghua University, Beijing 100084, China*

*Robotica* aims to be an outlet for publication of original papers of the highest quality in the field of Robotics and closely related areas. This includes: novel robotic mechanism and actuator design; robot kinematics, dynamics and control; computer vision; sensor fusion; teleoperation and haptic interfaces; robot motion planning; and artificial intelligence. In addition, papers that apply techniques from Robotics to other fields are also welcome. Examples include dynamics and control models applied to biological systems, the description of implementations of robots in factories, service and agricultural settings, and general mechatronic design. Works may be theoretical, computational or experimental, or some combination. Both short papers (rapid communications), and longer archival papers are welcome. Proposals for special issues on topics of current interest are welcome, and can be submitted via email to the editor.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information.

SUBSCRIPTIONS

*Robotica* (ISSN 0263-5747) is published as twelve issues per Volume in January, February, March, April, May, June, July, August, September, October, November and December. The electronic-only price for Volume 40, 2022 available to institutional subscribers is £1420 (US \$2507 in USA, Canada and Mexico). EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. Orders, which must be accompanied by payment, may be sent to a bookseller,

subscription agent or direct to the publishers: Cambridge University Press, University Printing House, Shaftesbury Road, Cambridge CB2 8RU, UK. Orders from the USA, Canada and Mexico should be sent to Cambridge University Press, Journals Fulfillment Department, 1 Liberty Plaza, Floor 20, New York, NY 10006, USA. Japanese prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan. Prices include delivery by air.

Periodicals postage paid at New York, NY and additional mailing offices. POSTMASTER: send address changes in USA, Canada and Mexico to *Robotica*, Cambridge University Press, 1 Liberty Plaza, Floor 20, New York, NY 10006, USA.

COPYING

This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. Organizations in the USA who are also registered with CCC may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to CCC of the per-copy fee of \$16.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0263-5747/2021/\$16.00.

ISI Tear Sheet Service, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA, is authorised to supply single copies of separate articles for private use only.

Organizations authorized by the Copyright Licensing Agency may also copy material subject to the usual conditions.

For all other use, permission should be sought from Cambridge or the American Branch of Cambridge University Press.

Information on *Robotica* and all other Cambridge journals can be accessed via [cambridge.org/core](http://cambridge.org/core).

Cover Image: Figure 6.a. Bao, J., Zhang, G., Peng, Y., Shao, Z., & Song, A. (2022). Learn multi-step object sorting tasks through deep reinforcement learning. *Robotica*, 1-17. doi:10.1017/S0263574722000650