machines

MDPI

Editorial

Selected Papers from MEDER 2024: Advances of Mechanism Design for Robotic Machines

Marco Ceccarelli [1,*] and Erwin Christian Lovasz [2,*]

[1] Department of Industrial Engineering, University of Rome Tor Vergata, 00133 Rome, Italy
[2] Department of Mechatronics, Faculty of Mechanics, Politehnica University of Timisoara, 300222 Timisoara, Romania
* Correspondence: marco.ceccarelli@uniroma2.it (M.C.); erwin.lovasz@upt.ro (E.C.L.)

Introduction

This Special Issue aims to promote and circulate the recent developments and achievements of the international community in the field of Robot Design within Mechanism and Machine Science, ranging from theoretical contributions to experimental and practical applications. It contains selected contributions that were accepted for presentation at the Sixth International Symposium on Mechanism Design for Robotics (MEDER 2024), held in Timisoara, Romania, on 27–29 June 2024 [1]. This MEDER 2024 conference is the sixth event of a series that was established in 2010 in Mexico City, Mexico, and continued in Beijing, China in 2012, in Aalborg, Denmark in 2015, in Cassino, Italy in 2018, and in Poitiers, France in 2021. The MEDER conference events were established to bring together researchers, industry professionals, and students from a broad range of disciplines related to mechanisms and robotics to share the latest developments and discuss future directions for mechanism and robotics research.

This Special Issue includes papers belonging to a broad range of disciplines covering several aspects of the wide field of Mechanism Design for Robotics, with challenging problems and innovative solutions from theoretical studies to practical applications including new robot designs and prototypes.

These contributions have been selected from the 45 papers from 18 countries across the globe that were presented at MEDER conference [1]. The authors have been invited to contribute extended revised versions of the works presented here, and these contributions have mostly been selected from those receiving award recognition in one of the three IFToMM categories of research, applications, and students. These papers were evaluated again via a blind peer-review process to confirm the high quality of the works. In particular, paper [2] presents design improvements to a L-CADEL v.3 Elbow-Assisting Device based on test results and design experiences. Manuscript [3] is 3-Degree-of-Freedom kinematic–biologically matched hip joint for a lower limb exoskeleton integrating IMU data for motor dynamic compensation to ultimately facilitate a more natural gait. In [4], the design of a rotational variable stiffness mechanism is offered together with its validation through simulations and hardware experiments. Paper [5] proposes a design methodology for a polycentric transfemoral knee prosthesis, whose validation is discussed through kinematic synthesis, numerical simulations, and visual analyses. Paper [6] presents the design and experimental characterization of two prototypes of a human knee joint exoskeleton, whose capabilities are discussed in terms of the motion trajectories of selected tibia/femur points and the calculated knee joint's flexion/extension angle.

We would like to thank the following members of the Scientific Committees for their solid support in the success of MEDER 2024:

Received: 25 February 2025
Accepted: 4 March 2025
Published: 5 March 2025

Citation: Ceccarelli, M.; Lovasz, E.C. Selected Papers from MEDER 2024: Advances of Mechanism Design for Robotic Machines. *Machines* **2025**, *13*, 208. https://doi.org/10.3390/machines13030208

The guest editors of this Special Issue thank the authors and reviewers for the effort and time spent on the valuable scientific contributions and useful feedback that have confirmed the high scientific quality of the MEDER 2024 papers. We also take this opportunity to welcome contributions for the next MEDER 2026 event that is scheduled to be held in Uberlândia at the Federal University of Uberlândia, Brazil, on 17–20 June 2026.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Lovasz, E.C.; Ceccarelli, M.; Ciupe, V. (Eds.) *Mechanism Design for Robotics. MEDER 2024*; Mechanisms and Machine Science; Springer: Cham, Switzerland, 2024; Volume 166. [CrossRef]
2. Ceccarelli, M.; Kotov, S.; Ofonaike, E.; Russo, M. Test Results and Considerations for Design Improvements of L-CADEL v.3 Elbow-Assisting Device. *Machines* **2024**, *12*, 808. [CrossRef]
3. Wang, Y.; Wu, X.; Fang, Y.; Osawa, K.; Nakagawa, K.; Yamasaki, S.; Tanaka, E. Design, Control, and Analysis of a 3-Degree-of-Freedom Kinematic–Biologically Matched Hip Joint Structure for Lower Limb Exoskeleton. *Machines* **2024**, *12*, 924. [CrossRef]
4. Nelson, C.; Moomau, K.; Li, Y. Design and Validation of an Improved Rotational Variable Stiffness Mechanism. *Machines* **2025**, *13*, 6. [CrossRef]
5. Koçak, M.; Gezgin, E. Unified Design Methodology for a Polycentric Transfemoral Knee Prosthesis Using Kinematic Synthesis. *Machines* **2025**, *13*, 20. [CrossRef]
6. Olinski, M. Design and Experimental Characterization of Developed Human Knee Joint Exoskeleton Prototypes. *Machines* **2025**, *13*, 70. [CrossRef]