Preface

The Summer Workshop on Interval Methods (SWIM) is an annual scientific meeting initiated in 2008 with a special focus on promoting interval analysis techniques and their applications to a broader community of researchers. Since 2008, SWIM has become a multi-disciplinary keystone event for researchers dealing with various aspects of interval and set-based methods.

In 2022 and 2023, the 13th and 14th editions in this workshop series were held at the Leibniz Universität Hannover (Germany) and at Polytech Angers (France), respectively. Both events had a focus on research topics in the fields of (control) engineering, computer science, and mathematics. A total of almost 50 talks were given during both workshops, covering the following areas:

- verified solution of initial value problems for dynamic system models,
- scientific computing with guaranteed error bounds,
- design of robust and fault-tolerant control systems,
- modeling and quantification of errors in engineering tasks,
- implementation of software libraries, and
- usage of the aforementioned approaches for system models in various fields of application such as control engineering, robotics, navigation, data analysis, machine learning, and signal processing.

After a peer-review process, 10 high-quality articles were selected for publication in this special issue. These contributions cover set-valued approaches for the online identification of battery systems, interval-based implementations of nonlinear model-predictive control, robust control and actuator fault detection based on linear matrix inequalities, verified bit and power allocation for MIMO systems, the implementation of software libraries for contractor-based modeling, constraint programming for the simulation of ordinary differential equations, GPU-accelerated interval-based parameter identification, hardware acceleration of interval contractor primitives, and the design of novel approaches for the implementation of complementary contractors as well as asymptotically minimal contractors based on centered form representations.

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Guest Editors

In memoriam of Nicolas Delanoue 1980–2023

This special issue is dedicated to the memory of Nicolas Delanoue, a brilliant mathematician and good friend, who was the first to propose the use of interval methods for topology with applications to robotics and more generally to the analysis and control of dynamical systems.

Many of us, in the interval community, had the privilege to work with him, to listen to his wonderful seminars and to have long and fruitful discussions with Nicolas.

His sudden departure leaves a void that will never be filled.

However, his availability and talent for explaining mathematical concepts and making them intuitive (using pictures and programs), his willing to formalize complex problems in a simple manner, the passion he shared for the beauty of mathematics, and his positive spirit, will remain a model for many of us.

May his legacy continue to inspire curiosity, creativity, and the promotion of interval tools to solve ambitious problems.