Springer Proceedings in Advanced Robotics 18

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The Springer Proceedings in Advanced Robotics (SPAR) publishes new developments and advances in the fields of robotics research, rapidly and informally but with a high quality.

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The publications within the "Springer Proceedings in Advanced Robotics" are primarily proceedings and post-proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. Also considered for publication are edited monographs, contributed volumes and lecture notes of exceptionally high quality and interest.

An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

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Human-Friendly Robotics 2020

13th International Workshop

Springer

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Foreword

At the dawn of the century's third decade, robotics is reaching an elevated level of maturity and continues to benefit from the advances and innovations in its enabling technologies. These all are contributing to an unprecedented effort to bringing robots to the human environment in hospitals, homes, factories, and schools, in the field for robots fighting fires, making goods and products, picking fruits and watering the farmland, saving time and lives. Robots today hold the promise for making a considerable impact in a wide range of real-world applications from industrial manufacturing to health care, transportation, and exploration of the deep space and sea. Tomorrow, robots will become pervasive and touch upon many aspects of modern life.

The *Springer Tracts in Advanced Robotics (STAR)* was launched in 2002 with the goal of bringing to the research community the latest advances in the robotics field based on their significance and quality. During the latest fifteen years, the STAR series has featured publication of both monographs and edited collections. Among the latter, the proceedings of thematic symposia devoted to excellence in robotics research, such as ISRR, ISER, FSR, and WAFR, has been regularly included in STAR.

The expansion of our field as well as the emergence of new research areas has motivated us to enlarge the pool of proceedings in the STAR series in the past few years. This has ultimately led to launching a sister series in parallel to STAR. The *Springer Proceedings in Advanced Robotics (SPAR)* is dedicated to the timely dissemination of the latest research results presented in selected symposia and workshops.

This volume of the SPAR series brings a selection of the papers presented at the thirteenth edition of the International Workshop on Human-Friendly Robotics (HFR). This symposium took place online from Innsbruck, Austria, from October 22 to 23, 2020. The volume edited by Matteo Saveriano, Erwan Renaudo, Antonio Rodríguez-Sánchez, and Justus Piater is a collection of ten contributions on human–robot coexistence including theories, methodologies, technologies, empirical, and experimental studies.

From its classical program with presentations by young scholars, the thirteenth edition of HFR culminates with this valuable reference on the current developments and new directions of human-friendly robotics—a genuine tribute to its contributors and organizers!

January 2021

Bruno Siciliano
Oussama Khatib
SPAR Editors

Preface

This book describes the newest and original achievements in the fields of human–robot interaction and coexistence deriving from the ideas and the work of young researchers.

The contributions describe theories, methodologies, and technologies developed for human–robot interaction and discuss empirical and experimental studies in the field.

The book contains a selection of papers presented at the 13th International Workshop on Human-Friendly Robotics (HFR).

The workshop is an annual meeting where general problems related to human–robot coexistence, like robot interaction control, robot learning, and human–robot co-working, are discussed by young researchers.

Every year, HFR brings together academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects related to the introduction of robots into everyday life.

The 13th edition of HFR was organized by the University of Innsbruck and took place in Innsbruck, Austria.

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