

Preface

With progress in microprocessor, sensor and actuator technology, production of new composite materials, as well as with permanent progress of scientific knowledge in the field of Robotics, new trends in development of service and medical robots appear and push things strongly forward.

The increasing complexity of our society and economy places greater emphasis on artificial systems such as intelligent robotic systems, which can deal autonomously with our needs and with the peculiarities of the environments we inhabit and construct. This challenge is to extend systems engineering methods to deal with open-ended and frequently changing real-world environments. In order to meet this challenge, a mix of innovative scientific theory and technology is needed, based on natural and artificial cognition, in conjunction with new engineering principles and implementations for robots that are robust and versatile enough to deal with the real world. Artificial cognitive systems and intelligent robots can extend the capabilities of people to perform routine, dangerous or tiring tasks, especially in previously inaccessible, uncharted or remote indoor or outdoor environments.

The need to substitute humans working on delicate, tiresome and monotonous tasks, or working with potentially health-damaging toxic materials, requires intelligent, high-performance service robots with the ability to cooperate, advanced communication and sophisticated perception and cognitive capabilities. In particular, broad class of service robotic systems are expected to be involved in everyday life within the public domain, in applications as diverse as: security, flexible manufacturing, market, entertainment, delivery, nursing, home keeping or elderly assisted tasks accomplishing, etc. All of these demanding applications mean that the research community should consider robotic systems in a quite different way, in the sense of their integration and networking to bring them together into the so called multi-agent collaborative teams capable of performing a variety of complex tasks as required together or without humans.

The book also concerns with new trends in medical robotics in light of involving new technologies and use of scientific innovations to gain advanced, non-invasive medical practice. In particular, the book regards to innovations and improvements in design, development and implementation of sophisticated surgical, rehabilitation and bio robots. Surgical robots allow surgeons greater access to areas under operation using more precise and less-invasive methods. Rehabilitation robots

facilitate and support the lives of infirm, elderly people, or those with dysfunction of body parts effecting movement. These robots are also used for rehabilitation and related procedures, such as training and therapy. Bio robots are designed to imitate the cognition of humans and animals. Nowadays, medical robotic devices are used to replace missing limbs, perform delicate surgical procedures, deliver neurorehabilitation therapy to stroke patients, teach children with learning disabilities and perform a growing number of other health-related tasks.

This book represents the second one published in the Series of MeSRoB workshop proceedings to be printed annually beginning from 2013. The first workshop MeSRoB 2012 was organised by the TU Cluj-Napoca, Romania, in June 2012. The second MeSRoB 2013 was organised by Institute “Mihailo Pupin” in Belgrade, Serbia in July, 2013. The third MeSRoB 2014 is planned to be held in July, 2014, in Lausanne, Switzerland to be organised by EPFL. The chapters in this book represent the best selected papers from the workshop program “New Trends in Medical and Service Robotics (MeSRoB 2013)”. The book is published by support of the Swiss National Scientific Foundation, grant no. IZ74Z0_137361/1 and partially by support of the Ministry of Education, Science and Technology Development of Republic Serbia as official sponsors of the MeSRoB 2013.

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New Trends in Medical and Service Robots
Challenges and Solutions

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