



# The Robotics Flagship

Proposal for a Preparatory Action for a FET-Flagship on Robotics

In the rapid progress and wide spreading of robotics, Europe is playing a leading role and is in a forefront position for its competitiveness at both industrial and scientific level. Together with the impressive technological advances in ICT and AI, robotics is today bringing an impact on economy and society by enabling the materialization of a new generation of machines intended to perform tasks at the service of human beings and in many aspects of our lives.

Intelligent Robots hold the promise of improving the quality of human life and of our planet by making it safer, more just, and more sustainable. After the second world war, robot-driven automation led to the third industrial revolution in making better goods at lower price in higher numbers. Today, the European society faces new challenges such as an aging population, increasing social contrasts, stagnant productivity, and environmental strains. ICT and Communication technologies have changed the way we interact and communicate and Robotics is expected to bring significant additional benefits.

We believe that a new generation of robots, intelligent machines with advanced abilities, will significantly help addressing European challenges. Future robots will have to understand, communicate, and safely blend with humans in unprecedented ways. We believe that these capabilities will require a drastic rethinking of robot bodies, minds, and human interaction. Blending with, and supporting, living systems like humans, animals and plants, will require life-like capabilities that go beyond current achievements of robotics and artificial intelligence.

Future robots will be life-like machines capable of evolution, growth and self-healing. Their flexible and adaptable bodies will be perfused of sensors. Future robots will grow and learn with humans and other robots. Future robots will learn from experience, inventive steps, and teaching from experienced humans and robots.

Intelligent robots will take different forms that will make them wearable, mobile, protective and supportive. They will allow us to live longer active life, improve productivity and reduce societal contrast, change education, and prevent and mitigate disasters. The long-term success of the Robotics Flagship will make robots gradually disappear as they become closer, more dependable, and more engaging.

The **grand S&T challenges** for the Robotics Flagship revolve around **robot abilities**, the ultimate goal in robotics research. We envisage disruptively new advanced robot abilities, enabling robots to adapt to environment and tasks, not only their behaviour but possibly also their morphology, not just at the design stage but during the robot existence, improving task performance by intelligent adaptation during practice and experience. Those new abilities would be fundamental blocks to enable robot **application** in our environments, on the humans' side. On the other hand, reaching such abilities presents new **scientific and technological challenges**, requiring interdisciplinary knowledge and research for proving new principles and for developing new solutions, in an open and technologically neutral way, and for ultimately transforming new science in new technology.

The Robotics Flagship will bring together at an unprecedented scale different research areas, such as engineering, computer science, life science, material science, and the humanities to invent the next generation of intelligent robots. In the Robotics Flagship multidisciplinary approach, biology is the inspiration for simplifying principles to deal with a complex world, materials science is the foundation for giving the body its proper role in shaping behaviour, AI is the way to develop new forms of cognitive functions, ICT keeps all this in a connected world, and humanities are the way to advance the knowledge on the relation between humans and robots and to steer the impact of new machines on the Society.