

**Project title:** Safe and Autonomous Physical Human-Aware Robot Interaction

**Starting date:** 01/10/2011

**Duration in months:** 48

**Call:** FP7-ICT-2011-7

### **Abstract**

Recent progress in physical Human-Robot Interaction (pHRI) showed that active and safe workspace sharing becomes possible in principle. Inspired by these results, SAPHARI will perform a fundamental paradigm shift in robot development in the sense that we place the human as the centre of the entire design. We address all essential aspects of safe, intuitive physical interaction between humans and complex, human-like robotic systems in a strongly interconnected manner. While encompassing safety issues based on biomechanical analysis, human-friendly hardware design, and interaction control strategies, the project will develop and validate perceptive and cognitive key components that enable robots to track, understand and predict human motions in a weakly structured dynamic environment in real-time. Apart from developing the necessary capabilities for interactive autonomy, we will tightly incorporate the human safety also at the cognitive level. This will enable the robots to react or physically interact with humans in a safe and autonomous way. Biomechanical knowledge and biologically motivated variable compliance actuators will be used to design bimanual manipulation systems close to human properties and performance. Planning motions and tasks of such complex systems in real-time require new concepts, including tight coupling of control and planning, that lead to new reactive action generation behaviours. Moreover, self explaining interaction and communication frameworks will be developed to enhance the system usability. The project focuses on two industrial use cases that explicitly require contacts and force exchange in human-robot co-work, as well as on professional service scenarios in hospitals, in which a medical staff and an assisting robot interact closely during daily work. Results of this project are expected to strongly impact all applications where interactive robots can assist humans and release them from dangerous or routine tasks.

### **Beneficiaries:**

- UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA UNIROMA1 Italy
- DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV DLR Germany
- EUROPEAN AERONAUTIC DEFENCE AND SPACE COMPANY EADS FRANCE SAS EADS France
- FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA IIT Italy
- FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V IOSB Germany
- KUKA Laboratories GmbH KUKA Germany
- CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS-LAAS France
- TECHNISCHE UNIVERSITAET MUENCHEN TUM Germany
- UNIVERSITA DEGLI STUDI DI NAPOLI FEDERICO II. UNINA Italy
- UNIVERSITA DI PISA Italy