H2020 – The EU framework programme for Research and Innovation (2014-2020)

Robotics projects resulting from H2020 – LEIT ICT 24 2015 and FoF 2015

Project Summaries

January 2016

Results of the Call for Proposals: H2020 – LEIT ICT 24 & FoF 2015

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Project summaries may be edited for space reasons. First-named participant is the Co-ordinator and funding amounts are approximate.
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Robotics in Workprogramme 2015 – LEIT ICT 24

H2020-ICT-2015: Robotics Opening date: 15th October 2014 Deadline: 14th April 2015	**Funding Scheme / Funding rate**	**Budget (M€)**
a. Research & Innovation Actions Priority domains: healthcare, consumer, transport b. Innovation Actions: Technology transfer - Industry-academia cross-fertilisation Priority domains (see WP text) c. Innovation Actions: Technology transfer - Robotics use cases Priority domains (see WP text) d. Pre-commercial procurement in robotics Priority domain: healthcare e. Coordination Actions: Community	a. Small & Large contributions/100% b. Large contributions/70% c. Small & Large contributions/70% d. Large contribution/70% e. Coordination & Support Actions/100%	a. 50 b. 12 c. 12 d. 5 e. 4

AEROBI

Title: AErial RObotic System for In-Depth Bridge Inspection by Contact
Funding scheme: Innovation action **Proposal number:** 687384
Duration: 36 months **Maximum grant awarded: €** 3,084,949.25

Summary:
The latest developments in low flying unmanned robots with arms and the associated fields of intelligent control, computer vision and sensors open the floor for robotic solutions, exploitable in the near term, in the field of inspection of difficult-to access areas of the civil infrastructure in general and bridges in particular. The latter infrastructure is ageing requiring inspection and assessment. Presently, bridge inspection is primarily done through visual observations by inspectors. It relies upon the inspector having access to bridge components via access equipment (ladders, rigging and scaffolds) and vehicular lifts (manlifts, bucket trucks and under-bridge inspection vehicles). This is uncomfortable and potentially dangerous for the inspectors, while it interferes with the traffic contributing to bottlenecks and congestion. The results of the inspection are used to structurally assess the bridge in a following step. AEROBI, driven by the bridge inspection industry, adapts and integrates recent research results in low flying unmanned robots with arms, intelligent control in robotics, computer vision and sensing, in an innovative, integrated, low flying, robotic system with a specialised multi-joint arm that will scan concrete beams and piers in a bridge for potential cracks on the surface or concrete swelling or spalling. In case the width of the above cracks exceeds given limits, it will measure distance between parallel cracks, while it will contact the bridge to non-destructively measure the depth of cracks and deformation. In case of concrete swelling or spalling it will also contact the bridge to non-destructively measure delamination and the diameter of the reinforcing steel bars. The above will provide input for a structural bridge assessment that will be automatically performed by the proposed robotic system. The latter system, which is expected to be exploitable in the short term, will be field evaluated and demonstrated at two actual bridges.

Participants:

AIRBUS DS SAS	FR
FUNDACION ANDALUZA PARA EL DESARROLLO AEROESPACIAL	ES
UNIVERSIDAD DE SEVILLA	ES
STIFTUNG FRANKFURT INSTITUTE FOR ADVANCED STUDIES	DE
CONSIGLIO NAZIONALE DELLE RICERCHE	IT
EGNATIA ODOS AE	EL
RISA SICHERHEITSANALYSEN GMBH	DE
T.E.C.N.I.C. TECNICHE E CONSULENZENELL'INGEGNERIA CIVILE-CONSULTING ENGINEERS-SPA	IT
D. MPAIRAKTARIS KAI SYNERGATES-GRAFEION TECHNIKON MELETON ETAIREIA PERIORISMENIS EFTHYNIS	EL
FORUM DES LABORATOIRES NATIONAUX EUROPEENS DE RECHERCHE ROUTIERE FEHRL	BE
NETIVEI ISRAEL - NATIONAL TRANSPORT INFRASTRUCTURE COMPANY LTD	IL

BabyRobot

Title: Child-Robot Communication and Collaboration: Edutainment, Behavioural Modelling and Cognitive Development in Typically Developing and Autistic Spectrum Children
Funding scheme: Research and Innovation action **Proposal number:** 687831
Duration: 36 months **Maximum grant awarded: €** 3,995,741.25

Summary:
The crowning achievement of human communication is our unique ability to share intentionality, create and execute on joint plans. Using this paradigm we model human-robot communication as a three step process: sharing attention, establishing common ground and forming shared goals. Prerequisites for successful communication are being able to decode the cognitive state of people around us (mindreading) and building trust. Our main goal is to create robots that analyse and track human behaviour over time in the context of their surroundings (situational) using audio-visual monitoring in order to establish common ground and mind-reading capabilities. On BabyRobot we focus on the typically developing and autistic spectrum children user population. Children have unique communication skills, are quick and adaptive learners, eager to embrace new robotic technologies. This is especially relevant for special education where the development of social skills is delayed or never fully develops without intervention or therapy. Thus our second goal is to define, implement and evaluate child-robot interaction application scenarios for developing specific socio-affective, communication and collaboration skills in typically developing and autistic spectrum children. We will support not supplant the therapist or educator, working hand-in-hand to create a low risk environment for learning and cognitive development. Breakthroughs in core robotic technologies are needed to support this research mainly in the areas of motion planning and control in constrained spaces, gestural kinematics, sensorimotor learning and adaptation. Our third goal is to push beyond the state-of-the-art in core robotic technologies to support natural human-robot interaction and collaboration for edutainment and healthcare applications. Creating robots that can establish communication protocols and form collaboration plans on the fly will have impact beyond the application scenarios investigated here.

Participants:

INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	EL
ATHENA RESEARCH AND INNOVATION CENTER IN INFORMATION COMMUNICATION & KNOWLEDGE TECHNOLOGIES	EL
THE UNIVERSITY OF HERTFORDSHIRE HIGHER EDUCATION CORPORATION	UK
UNIVERSITAET BIELEFELD	DE
KUNGLIGA TEKNISKA HOEGSKOLAN	SE
BLUE OCEAN ROBOTICS APS	DK
UNIVERSITE DES SCIENCES ET TECHNOLOGIES DE LILLE - LILLE I	FR
FURHAT ROBOTICS AB	SE

Bots2ReC

Title: Robots to Re-Construction
Funding scheme: Innovation action **Proposal number:** 687593
Duration: 42 months **Maximum grant awarded: €** 3,964,162.50

Summary:
Despite the high degree of industrial automation, robotic solutions are not yet prevalent in construction and demolition industry due to the complex environment and demanding requirements. For hazardous tasks, like the removal of asbestos contamination from a flat (rehabilitation site), manual performance is very inefficient, due to the intense safety measures. This leads to the main objective of Bots2ReC: "Introducing, testing and validating an operational process for the automated removal of asbestos contamination at a real world rehabilitation site using a robotic system. After the necessary clearing from furniture and containment, the site is less complex and separated from human workers. In this environment safe automated robotic operations can be realized with current state of the art technology. The proposed robotic system will consist of multiple robotic units (lightweight robotic arms with abrasive tools and aspiration on a mobile platform) and a central process control system. Optical and radar sensors will allow environmental perception and navigation and local monitoring of the asbestos-removal, even in dusty conditions. The developed control system allows the user to specify and supervise automated tasks (e.g. disk grinding of contaminated paint from a wall), supported by a virtual representation of the site. The process and robotic system will be developed and enhanced in several iterations, supported by permanent testing on a test rehabilitation site benchmarked on a real life rehabilitation site at project end.Bots2ReC will have strong impacts to the robotics industry and society in Europe: It provides a step change towards a system prototype demonstrated in the operational environment of the demolition and construction industry and will strengthen the European robotic industry by later commercialisation of the system. Avoiding exposure to highly dangerous asbestos fibres will sustainably help protect the health of humans in Europe and worldwide.

Participants:

RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN	DE
BOUYGUES CONSTRUCTION	FR
FUNDACIO EURECAT	ES
TELEROBOT LABS S.R.L.	IT
ROBOTNIK AUTOMATION SLL	ES
INSTITUT FRANCAIS DE MECANIQUE AVANCEE	FR
INDURAD GMBH	DE

ColRobot

Title: Collaborative Robotics for Assembly and Kitting in Smart Manufacturing
Funding scheme: Innovation action **Proposal number:** 688807
Duration: 36 months **Maximum grant awarded: €** 3,914,493.38

Summary:
Manufacturing competitiveness depends largely on its productivity, flexibility and agility to react to market demands. Robots are a key element to achieve such competitiveness, especially if they are able to collaborate with humans in a shared workspace in the shop-floor, creating a co-working partnership. The paradigm for robot usage has changed from an idea in which robots work with complete autonomy to a scenario in which robots collaborate with humans. This means taking the best of each partner, human and robot, by exploring the cognitive and dexterity capabilities of humans (focus on value-added tasks) and the capacity of robots to produce repetitive work and provide assistance. ColRobot combines cutting-edge European robot technology and end-user requirements for assembly processes to create an integrated system for collaborative robotics in which a mobile manipulator acts as a "third hand" by delivering kits, tools, parts, and holding work pieces while the operator works on it. Humans will cognitively and physically interact with ColRobot robots using gestures, touch commands and demonstrations. The robot will be able to navigate autonomously in the factory floor to pick up the required parts and tools, and prepare kits for assembly. A safety system that pushes the limits of standardization in collaborative robotics supervises the process. The technology readiness level (TRL) will be increased by means of continuous iterative real world testing (performance, usability, relevance in manufacturing), validation and improvement. Two use cases in automobile and aerospace industry will be implemented and validated in real world operational environments. The ColRobot vision and the consortium competences in technology transfer will allow to reduce the technological innovation gap that halts the transition from science to economic and social impact.

Participants:

ECOLE NATIONALE SUPERIEURE D'ARTS ET METIERS	FR
UNIVERSIDADE DE COIMBRA	PT
UNIVERSITA DEGLI STUDI DI MODENA E REGGIO EMILIA	IT
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
ASOCIACION DE INVESTIGACION METALURGICA DEL NOROESTE AIMEN	ES
INESC TEC – INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA	PT
TECHNAID SL	ES
CENTRE D'INNOVATION DES TECHNOLOGIES SANS CONTACT-EURARFID (CITCEURARFID) ASSOCIATION	FR
AKEO PLUS	FR
RENAULT SAS	FR
THALES ALENIA SPACE FRANCE	FR

DeTOP

Title: Dexterous Transradial Osseointegrated Prosthesis with neural control and sensory feedback
Funding scheme: Research and Innovation action **Proposal number:** 687905
Duration: 48 months **Maximum grant awarded: €** 4,260,521.25

Summary:
This project addresses the scientific, technological and clinical problem of recovery of hand function after amputation. Despite decades of research and development on artificial limbs and neural interfaces, amputees continue to use technology for powered prostheses developed over 40 years ago, namely myoelectric prostheses controlled via superficial electrodes. These devices do not purposely provide sensory feedback and are known for their poor functionality, controllability and sensory feedback, mainly due to the use of surface electrodes. The consortium has pioneered the use of osseointegration as a long-term stable solution for the direct skeletal attachment of limb prostheses. This technology aside from providing an efficient mechanical coupling, which on its own has shown to improve prosthesis functionality and the patient's quality of life, can also be used as a bidirectional communication interface between implanted electrodes and the prosthetic arm. This is today the most advanced and unique technique for bidirectional neuromuscular interfacing, suited for the upper limb amputees, which was proven functional in the long term. The goal of the DeTOP project is to push the boundaries of this technology –made in Europe– to the next TRL and to make it clinically available to the largest population of upper limb amputees, namely transradial amputees. This objective will be targeted by developing a novel prosthetic hand with improved functionality, smart mechatronic devices for safe implantable technology, and by studying and assessing paradigms for natural control (action) and sensory feedback (perception) of the prosthesis through the implant. The novel technologies and findings will be assessed by three selected patients, implanted in a clinical centre. DeTOP bridges several currently disjointed scientific fields and is therefore critically dependent on the collaboration of engineers, neuroscientists and clinicians.

Participants:

SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA	IT
GOETEBORGS UNIVERSITET	SE
PRENSILIA SRL	IT
INTEGRUM AB	SE
LUNDS UNIVERSITET	SE
CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT	CH
UNIVERSITY OF ESSEX	UK

EDEN2020

Title: Enhanced Delivery Ecosystem for Neurosurgery in 2020
Funding scheme: Research and Innovation action **Proposal number:** 688279
Duration: 48 months **Maximum grant awarded: €** 8,361,446.25

Summary:
Due to an aging population and the spiralling cost of brain disease in Europe and beyond, EDEN2020 aims to develop the gold standard for one-stop diagnosis and minimally invasive treatment in neurosurgery. Supported by a clear business case, it will exploit the unique track record of leading research institutions and key industrial players in the field of surgical robotics to overcome the current technological barriers that stand in the way of real clinical impact. EDEN2020 will provide a step change in the modelling, planning and delivery of diagnostic sensors and therapies to the brain via flexible surgical access, with an initial focus on cancer therapy. It will engineer a family of steerable catheters for chronic disease management that can be robotically deployed and kept in situ for extended periods. The system will feature enhanced autonomy, surgeon cooperation, targeting proficiency and fault tolerance with a suite of technologies that are commensurate to the unique challenges of neurosurgery. Amongst these, the system will be able to sense and perceive intraoperative, continuously deforming, brain anatomy at unmatched accuracy, precision and update rates, and deploy a range of diagnostic optical sensors with the potential to revolutionise today's approach to brain disease management. By modelling and predicting drug diffusion within the brain with unprecedented fidelity, EDEN2020 will contribute to the wider clinical challenge of extending and enhancing the quality of life of cancer patients – with the ability to plan therapies around delicate tissue structures and with unparalleled delivery accuracy.EDEN2020 is strengthened by a significant industrial presence, which is embedded within the entire R&D process to enforce best practices and maximise translation and the exploitation of project outputs. As it aspires to impact the state of the art and consolidate the position of European industrial robotics, it will directly support the Europe 2020 Strategy.

Participants:

IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE	UK
UNIVERSITA DEGLI STUDI DI MILANO	IT
UNIVERSITA VITA-SALUTE SAN RAFFAELE	IT
TECHNISCHE UNIVERSITAET MUENCHEN	DE
XOGRAPH TECHNOLOGIES LIMITED	UK
ACADEMISCH ZIEKENHUIS GRONINGEN	NL
POLITECNICO DI MILANO	IT
RENISHAW PLC	UK

EndoVESPA

Title: Endoscopic Versatile robotic guidancE, diagnoSis and theraPy of magnetic-driven soft-tethered endoluminAl robots
Funding scheme: Innovation action **Proposal number:** 688592
Duration: 36 months **Maximum grant awarded: €** 2,735,937.50

Summary:
The EndoVESPA project aims at developing an integrated robotic platform for the navigation of a soft-tethered colonoscope capable of performing painless diagnosis and treatment. Colorectal cancer is one of the major causes of mortality but survival rate dramatically increase in case of early diagnosis. Current screening colonoscopy is limited due to a variety of factors including invasiveness, patient discomfort, fear of pain, and the need for sedation; these factors consistently limit the pervasiveness of mass screening campaigns. Built around a novel robotic colonoscope and designed to make its use straightforward for the endoscopist and ideal for mass screening, the EndoVESPA system has the potential to introduce in the clinical practice a disruptive new paradigm for painless colonoscopy. EndoVESPA combines a "front-wheel" magnetic–driven approach for active and smooth navigation with diagnostic and therapeutic capabilities for overcoming the limitations of current colonoscopy in terms of patient discomfort, dependence on operator skills, costs and outcomes for the healthcare systems. The acceptance and consolidation of robotics in the medical domain and the ever–growing development of endoscopic–driven technologies are the fundamental building blocks for the realization of the EndoVESPA platform which can take advantage of solid and IPR protected technologies provided by the Project Partners. Aim of the EndoVESPA Project is to bring the system to the market for an extensive clinical use. The EndoVESPA Consortium is a unique blend of internationally recognized European pioneers (in all the involved disciplines), which will guarantee a dramatic leap forward in the current technology through successful implementation in terms of scientific innovation, industrial engineering, certification, market analysis, and ultimately clinical deployment.

Participants:

SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA	IT
UNIVERSITY COLLEGE LONDON	UK
EKYMED SPA	IT
OVESCO ENDOSCOPY AG	DE
UNIVERSITA DEGLI STUDI DI TORINO	IT
THE UNIVERSITY OF EDINBURGH	UK

INPUT

Title: Intuitive Natural Prosthesis UTilization
Funding scheme: Innovation action **Proposal number:** 687795
Duration: 48 months **Maximum grant awarded: €** 2,706,246.13

Summary:
INPUT will strive to make the control of complex upper limb prostheses simple, natural and to be used on a daily basis by amputees effortlessly after donning -"don and play". Currently, the most advanced routine prosthetic control on the market is more than 4 decades old, outdated and constitutes the bottle neck to introducing highly dexterous prostheses. The project builds on achievements reached in the EU FP7 IAPP projects AMYO (Grant No. 251555, 2011-2014) and MYOSENS (Grant No. 286208, 2012-2015), which were targeting improved signal acquisition and signal processing for advanced upper limb prosthetic control. The projects were very successful and received high recognitions national and international recognitions. In INPUT, the main goal will be to transfer the obtained results from laboratory settings further towards a clinically and commercially viable medical product. The enabling concepts on which INPUT builds upon are:

- Reliable, easy to apply, cost-effective signal acquisition
- Reliable, powerful real-time signal processing
- Quantifying true patient benefit
- Optimized end-user training
- Iterative clinical tests throughout the entire project

In order to keep a realistic focus, the project will rely on well-known principles of advanced prosthesis control. Existing upper limb prosthetic hardware will be reused to minimize development time and costs. Improved electronics, algorithms and training will be the main innovations. INPUT will build on frequent end-user testing with amputees throughout the entire project. These will ensure targeted prototype development and market viability for advancing the technology from laboratory conditions to a high technology readiness level (TRL) of 8. The project relies on the cooperation between academic research, industry and clinical partners - thus representing the entire value chain of cutting edge upper limb prosthetics. This will ensure the development of stable, wearable and practical prototypes.

Participants:

OTTO BOCK HEALTHCARE PRODUCTS GMBH	AU
OTTO BOCK HEALTHCARE GMBH	DE
UNIVERSITAETSMEDIZIN GOETTINGEN - GEORGAUGUST- UNIVERSITAET GOETTINGEN – STIFTUNG OEFFENTLICHEN RECHTS	DE
ORTOPADISCHES SPITAL SPEISING GMBH	AU
ACADEMISCH ZIEKENHUIS GRONINGEN	NL
SCUOLA UNIVERSITARIA PROFESSIONALE DELLA SVIZZERA ITALIANA (SUPSI)	CH

MuMMER

Title: MultiModal Mall Entertainment Robot
Funding scheme: Research and Innovation action **Proposal number:** 688147
Duration: 48 months **Maximum grant awarded: €** 4,297,835.00

Summary:
In MuMMER we propose to address the important and growing market of consumer entertainment robotics by advancing the technologies needed to support this area of robotics, and also by explicitly addressing issues of consumer acceptance, thus creating new European business and employment opportunities in consumer robotics. Specifically, we will develop a humanoid robot (based on Aldebaran's Pepper platform) able to engage and interact autonomously and naturally in the dynamic environments of a public shopping mall, providing an engaging and entertaining experience to the general public. Using co-design methods, we will work together with stakeholders including customers, retailers, and business managers, to develop truly engaging robot behaviours, including telling jokes or playing games, as well as providing guidance, information, and collecting customer feedback. Crucially, our robot will exhibit behaviour that is socially appropriate, combining speech-based interaction with non-verbal communication and human-aware navigation. To support this behaviour, we will develop and integrate new methods from audio-visual scene processing, social-signal processing, high-level action selection, and human-aware robot navigation. Throughout the project, the robot will be deployed in a large public shopping mall in Finland: initially for short visits to aid in collaborative scenario development, co-design, and system evaluation, and later for a long-term field study in the 4th year of the project. Through our co-design approach, we will both study and foster acceptance of consumer robots and thus positively influence the consumer markets of service robots.

Participants:

UNIVERSITY OF GLASGOW	UK
HERIOT-WATT UNIVERSITY	UK
FONDATION DE L'INSTITUT DE RECHERCHE IDIAP	CH
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FR
ALDEBARAN ROBOTICS SAS	FR
TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	FI
KIINTEISTO OY IDEAPARK AB	FI

MURAB

Title: MRI and Ultrasound Robotic Assisted Biopsy
Funding scheme: Research and Innovation action **Proposal number:** 688188
Duration: 48 months **Maximum grant awarded: €** 3,982,307.50

Summary:
The MURAB project has the ambition to revolutionise the way cancer screening and muscle diseases are researched for patients and has the potential to save lives by early detection and treatment. The project intends to create a new paradigm in which, the precision of great medical imaging modalities like MRI and Ultrasound are combined with the precision of robotics in order to target the right place in the body. This will be achieved by identifying a target using Magnetic Resonance Imaging (MRI) and then use a robot with an ultrasound (US) probe to match the images and navigate to the right location. This will be done thanks to a new innovative technique, which will be developed in the project and called Tissue Active Slam (TAS) which will use different techniques and modalities, like elastography, in order to cope with the deformation of the tissues. Such a procedure has the potential to drastically improve the clinical workflow and save lives by ensuring an exact targeting of (small) lesions, which are visible under MRI and not under US. Technologies developed within MURAB also have the potential to improve other clinical procedures. Clinically, two applications will be targeted and validated in the project: breast cancer diagnostics (MUW and ZGT) and muscle disease diagnostics (UMCN). Considering the potential for the market, industrial partners are involved with expertise in the delivery of safe robotics components and applications (KUKA), as well as with great knowledge and ambition in pushing innovation to the medical market (SIEMENS).

Participants:

UNIVERSITEIT TWENTE	NL
UNIVERSITA DEGLI STUDI DI VERONA	IT
STICHTING KATHOLIEKE UNIVERSITEIT	NL
KUKA ROBOTER GMBH	DE
SIEMENS NEDERLAND NV	NL
STICHTING ZIEKENHUISGROEP TWENTE	NL
MEDIZINISCHE UNIVERSITAET WIEN	AU

RAMPup

Title: Robotic Automation Modules for Production
Funding scheme: Innovation action **Proposal number:** 688642
Duration: 48 months **Maximum grant awarded: €** 3,995,511.25

Summary:
RAMPup aims to improve European SME production competitiveness by effectively decreasing the integration effort needed for automating small production lines. A framework and infrastructure for modular industrial automation systems will be developed and applied to eight use-cases from four European end users, carefully selected to require a broad range of processes. Technologies for automating these processes exist, but are too inflexible and expensive for the business case for automation to be viable, certainly in SME contexts. Four demonstrators will be realized and brought to TRL7 proving their performance in real operational environments at end user sites. The methodology involves creating manufacturer-independent process modules which are self-contained: hardware, software and process functionality; wrapped to be "plug-n-play" with all other modules in the set and with the framework platform. We anticipate that many modules will be based on existing technologies, completed and wrapped to become RAMPup modules. A repository of process modules at this level, accepted as usable by SIs, will greatly reduce the customization needed for new automation installations, thus reducing the cost to end-users. Modularisation also allows physical reconfiguration of the workcell and re-use of component modules across very different product variants. Beyond the technical realization of the modular automation framework, RAMPup aims to open a new market allowing developers of automation solutions to deploy, distribute and commercialize their products. RAMPup will demonstrate the business perspectives within the project and thus convince module developers and system integrators to enter the new market. The ambition in RAMPup is thus not only to create eight functioning robot workcells at end-user sites but also to provide a fast-track for SME robot developers to get their technologies to market.

Participants:

TEKNOLOGISK INSTITUT	DK
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
KJV AS	DK
TECHNICON APS	DK
MRK - SYSTEME GMBH	DE
GIBAS AUTOMATION BV	NL
ELOS MEDTECH PINOL AS	DK
VESTAS MANUFACTURING AS	DK
ROTO FRANK BAUELEMENTE GMBH	DE
To be announced	

RockEU2

Title: Robotics Coordination Action for Europe Two
Funding scheme: Coordination and Support Action **Proposal number:** 688441
Duration: 24 months **Maximum grant awarded: €** 2,499,463.75

Summary:
The FP7 coordination action RockEU has been extremely successful in building a strong European robotics community, leading to the creation of euRobotics aisbl - the private partner of the SPARC PPP and development of the Strategic Research Agenda and the Multi-Annual Roadmap, which are the main guidelines for shaping European robotics R&D&I. RockEU2 builds on and extends this successful community integration by providing analysis of innovation and skills and by developing major outreach activities. This extension is achieved by intensifying and strengthening collaboration within the community and by taking a leading role in the development of strategy. This includes activities in market observation, technology watch, innovation support, analysis of funded proposals, regulations assessment, and standardisation support.RockEU2 aims to intensifying cooperation with international funding agencies (e.g. for joint calls), policy makers, and end-users as key enablers in the R&D&I process that contribute to the outreach and innovation themes. Outreach to the cognitive science community is another key part of this proposal. Improving the uptake of cognitive science's results by the robotics community is an important target, leading to more innovative robotics products and applications, boosting innovation. Integration of activities started by the FP7-funded CAs euRathlon and RoCKIn on using robot competitions to foster research and innovation has great potential for improved public awareness of European robotics. Participation in robot competitions is attractive for young researchers and develops excellent engineering skills. The impact of robot competitions both for public awareness as well as for industry will be analysed and its results will influence the roadmap for future European robot competitions and outreach campaigns. The consortium consists of partners playing key roles in their respective communities and contributing unique competences to the consortium.

Participants:

EUROBOTICS AISBL	BE
ITECHNIC LIMITED	UK
R.U.Robots Limited	UK
TECHNISCHE UNIVERSITAET WIEN	AU
ASSOCIACAO DO INSTITUTO SUPERIOR TECNICO PARA A INVESTIGACAO E DESENVOLVIMENTO	PT
HOGSKOLAN I SKOVDE	SE
UNIVERSITY OF THE WEST OF ENGLAND, BRISTOL	UK
POLITECNICO DI MILANO	IT
HOCHSCHULE BONN-RHEIN-SIEG	DE
KUKA ROBOTER GMBH	DE
NATO SCIENCE AND TECHNOLOGY ORGANISATION	BE
C.R.E.A.T.E. CONSORZIO DI RICERCA PER L'ENERGIA E LE APPLICAZIONI TECHNOLOGICHE DELL'ELETTROMAGNETISMO	IT
FUNDACION ANDALUZA PARA EL DESARROLLO AEROESPACIAL	ES
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA	IT
OULUN YLIOPISTO	FI

SafeLog

Title: Safe human-robot interaction in logistic applications for highly flexible warehouses
Funding scheme: Research and Innovation action **Proposal number:** 688117
Duration: 48 months **Maximum grant awarded: €** 4,618,462.50

Summary:
The European market for e-commerce is growing rapidly, with more than 16% just in the year 2014. With the internationalization of distribution chains, the key for success lies within efficient logistics. In such facilities, goods for the end-user or products in the B2B sector are stored, commissioned and shipped. To manage the supply chains, many new warehouses have been erected and more will follow. With the growing markets, the need for larger warehouses and their automation increases. To advance the position of the European trade sector, technical restrictions on the size of warehouses should be avoided and new automation paradigm should be implemented to ensure their efficient operation. Therefore the European robotic and automation companies should be able to provide appropriate solutions, making scalable systems and scalable software mandatory. Current automation solutions based on strict separation of humans and robots cannot provide such efficient operation of large warehouses. SafeLog aims to overcome this issue by enabling much more efficient warehouse concepts joining human and robot workforce. Given that, the overall objective of SafeLog is the conception and implementation of a large-scale flexible warehouse system which enables safe and efficient collaboration of humans and robots in the same area and at the same time. On the way to reach this objective SafeLog will develop, integrate and test: (1) a holistic and certifiable safety concept based on the safety vest, which allows the collaboration of robots and humans in a flexible warehouse system, (2) planning and scheduling algorithms for a heterogeneous fleet manager, which allow the adhoc reactive planning and scheduling for human and robot workforce in a flexible warehouse system, and (3) augmented reality based interaction strategies to support workers in a robotized warehouse system with information about their current task and environment.

Participants:

KARLSRUHER INSTITUT FUER TECHNOLOGIE	DE
SWISSLOG AUTOMATION GMBH	DE
CESKE VYSOKE UCENI TECHNICKE V PRAZE	CZ
SVEUCILISTE U ZAGREBU FAKULTET ELEKTROTEHNIKE I RACUNARSTVA UNIZGFER	HR
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
KONCAR INSTITUT ZA ELEKTROTEHNIKU D.D.	HR

SoftPro

Title: Synergy-based Open-source Foundations and Technologies for Prosthetics and RehabilitatiOn
Funding scheme: Research and Innovation action **Proposal number:** 688857
Duration: 48 months **Maximum grant awarded: €** 7,440,026.25

Summary:
Although much has been done for developing technologies to bear upon problems of individuals with sensorimotor impairments, the impact of robotic aids on people with real needs in the real world is still very limited. Our main goal is to increase the cumulative benefits of assistive robotic technologies to society by enhancing their effectiveness AND the number of beneficiaries. The challenge is to increase both multipliers in the "performance times accessibility" product, subverting the traditional situation where one factor can only be increased at the expense of the other. We believe this is possible by investigating how the artificial can physically interact and effectively "talk to" the natural. Understanding such a "language" is crucial not only to improve performance of rehab technology, but also to tackle the most difficult problem of making it "simple enough" to be effective and accessible. We possess good clues about such a language, whose words we believe are sensorimotor synergies, and have the scientific competence to further its understanding and the technological prowess to translate it into a new generation of robotic assistive devices. We know that a central ingredient for the applicability of synergy-based models to physical human-machine interaction is impedance adaptability, i.e. soft robotics technologies. We will develop soft synergy-based robotics technologies to produce new prostheses, exoskeletons, and assistive devices for upper limb rehabilitation. Building on solid methodological bases, this project will have a significant social impact in promoting advanced robot prosthetic and assistive technology, while introducing disruptively new, admittedly risky, but potentially high-impact ideas and paradigms, such as the proposed pioneering work on supernumerary limbs for assistance and rehabilitation to motor impairments of the upper limb.

Participants:

FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	IT
UNIVERSITEIT TWENTE	NL
UNIVERSITA DI PISA	IT
GOTTFRIED WILHELM LEIBNIZ UNIVERSITAET HANNOVER	DE
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	CH
UNIVERSITA' DEGLI STUDI DI SIENA	IT
MEDIZINISCHE HOCHSCHULE HANNOVER	DE
TWENTE MEDICAL SYSTEMS INTERNATIONAL B.V.	NL
HANKAMP REHAB BV	NL
BIOSERVO TECHNOLOGIES AB	SE
QBROBOTICS SRL	IT
UNIVERSITAET ZUERICH	CH

SPEXOR

Title: Spinal Exoskeletal Robot for Low Back Pain Prevention and Vocational Reintegration
Funding scheme: Research and Innovation action **Proposal number:** 687662
Duration: 48 months **Maximum grant awarded:** € 3,989,025.00

Summary:
Low-back pain is the leading cause of worker absenteeism after the common cold, accounting for 15% of sick leaves and hundreds of millions of lost work days annually [Walking 2.0, Nature, 2015].Most of today's robotic assistive devices are in forms of exoskeletons that augment the motion of legs and arms and neglect the role of spinal column in transferring load from the upper body and arms to the legs. In SPEXOR we will fill this gap and design a novel and revolutionary spinal exoskeleton to prevent low-back pain in able bodied workers and to support workers with low-back pain in vocational rehabilitation. The concept to realize the objectives of SPEXOR is driven by several interdisciplinary ideas that push current understanding of low-back pain intervention through several innovative research and technological stages. First, robot-centred requirements for low-back pain prevention are determined and a musculoskeletal stress monitoring system is developed to unobtrusively measure the associated key variables. Then, optimal design parameters and sensorimotor strategies are provided with respect to the robot-centred requirements and their associated key variables. Based on these aspects, a spinal exoskeleton mechanism and its actuation is developed and adaptive control architecture is employed. Such research and development cycle is enclosed by multi-phase end-user evaluation, usability and satisfaction studies. The project builds upon the partner's extensive experience with work ergonomics, modelling and optimization of human movement, design, control and evaluation of exoskeletons. Several beyond-the-state-of-art scientific approaches and technologies will be employed through a colourful mixture of research, industrial, SME and end-user partners of the consortium. Ultimately, the results of SPEXOR will have a significant impact well beyond the current scientific understanding and technological capabilities of assistive robots used in daily life and health care.

Participants:

INSTITUT JOZEF STEFAN	SI
RUPRECHT-KARLSUNIVERSITAET HEIDELBERG	DE
VRIJE UNIVERSITEIT BRUSSEL	BE
STICHTING VU-VUMC	NL
OTTO BOCK HEALTHCARE GMBH	DE
OTTO BOCK HEALTHCARE PRODUCTS GMBH	AU
S2P DOO	SI
STICHTING HELIOMARE	NL

TrimBot2020

Title: A gardening robot for rose, hedge and topiary trimming
Funding scheme: Research and Innovation action **Proposal number:** 688007
Duration: 48 months **Maximum grant awarded:** € 5,420,607.50

Summary:
The TrimBot2020 project will research the robotics and vision technologies to prototype the first outdoor garden trimming robot. The robot will navigate over varying terrain, approach rose bushes, hedges and boxwood topiary, to trim them to an ideal shape. The robot will be based on a modified Bosch Indego robot lawnmower, which will navigate using a user-defined garden map and 3D scene analysis, and then visually servo a novel electric plant cutter. Achieving this will require a combination of robotics and 3D computer vision research and innovation activities. Original developments will be required for 3D sensing of semi-regular surfaces with physical texture (overgrown plant surfaces), coping with outdoor lighting variations, self-localising and navigating over real terrain and around obstacles, visual servoing to align the vehicle with potentially moving target plants, visual servoing to align leaf and branch cutters to a compliant surface, and innovative engineering to deliver all this on a small battery-powered consumer-grade vehicle. Development of these capabilities aligns closely with the Robotics Strategic Research Agenda and Multi-Annual Roadmap aspirations. This project falls clearly in the consumer market domain. It will develop service robotics, advanced perceptual capabilities, mobile manipulation, and flexible and reactive autonomy. As a novel robotics application, the current TRL is 1/2, but the project aims to achieve TRL 5/6. Bosch expects to exploit the project's results to extend its current automated lawnmower product. This exciting project will extend generic robotics and computer vision technologies, explore a new robot application, has an explicit route to market exploitation by an experienced manufacturer, and has a great team with experienced plant roboticists and world leading computer vision researchers, led by an experienced EC project coordinator.

Participants:

THE UNIVERSITY OF EDINBURGH	UK
WAGENINGEN UNIVERSITY	NL
ALBERT-LUDWIGSUNIVERSITAET FREIBURG	DE
UNIVERSITEIT VAN AMSTERDAM	NL
RIJKSUNIVERSITEIT GRONINGEN	NL
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	CH
STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	NL
ROBERT BOSCH GMBH	DE

TT-NET

Title: TT-Net - A shared infrastructure to sustainably optimise technology transfer throughout Europe
Funding scheme: Innovation action **Proposal number:** 688217
Duration: 48 months **Maximum grant awarded: €** 7,564,337.50

Summary:
The main objective of the TT-Net initiative is to create a sustainable European infrastructure to support novel robotic technologies on their path to market. TT-Net will develop and test mechanisms for sharing expertise and physical research infrastructures, and a unique multidisciplinary approach that enhances cross-fertilisation of ideas between academia and industry. We transform successful national structures and mechanisms used by Research and Technology Organisations (RTOs) in Denmark, Germany, Spain and the UK; merging them into a Europe wide, composite, technology transfer system. Together we will test and improve a four-stage process to accelerate the path to market for new robotic technologies. The first stage involves promoting state-of-the-art industrial and professional service robot technologies to over 1,200 end-users and robot developers (from industry and academia) in a bidirectional exchange of views and opinions about robotic research trends, needs and technology developments, and soliciting participation in TT-Net. The second stage involves technical and business feasibility studies for both end-users and robot developers at about TRL 5. The third stage implements first field trials at TRL 6 for a novel technology and then produces complete TRL 7+ robotic automation solutions at end-user sites. The fourth stage is the completion to TRL 9, facilitated within TT-Net but happening outside project control. Accelerating the path to market of new robot technologies will increase Europe's market share in both industrial and professional service robotics. Installing European-standard robotic automation at end-user sites instead of the present national-standard automation will contribute substantially to increasing the competitiveness of Europe's manufacturing sector and in particular SMEs.

Participants:

OGISK INSTITUT	DK
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	DE
FUNDACION TECNALIA RESEARCH & INNOVATION	ES
THE MANUFACTURING TECHNOLOGY CENTRE LIMITED LBG	UK

UP-Drive

Title: Automated Urban Parking and Driving
Funding scheme: Research and Innovation action **Proposal number:** 688652
Duration: 48 months **Maximum grant awarded:** € 4,671,896.25

Summary:
Automation of individual transport systems is considered an up-and-coming prospect with the potential of greatly mitigating many of the challenges associated with intensified urbanization, while at the same time offering additional benefits for the citizens and drastically increasing overall street safety. However, due to the lack of maturity of involved key technologies and persisting legal limitations, full automation of on-road driving remains a longer-term vision, particularly in urban environments. The goal and ambition of UP-Drive is to address these technological challenges through the development of an automated valet parking service for city environments, aimed at relieving a car driver from the burden of finding a parking space in city centres. Instead, the fully automated car navigates on its own through urban neighbourhoods, finds a parking space and returns on-demand. Creating such a system requires mastering all key technologies essential to automated urban driving beyond the current state-of-the-art: complete round-view perception of the vehicle environment, robust lifelong localization and mapping, sophisticated understanding of complex scenes as well as aggregation and integration of long-term semantic data over a cloud-based infrastructure. With this, we ensure that the research and development carried out in this project will directly be applicable to other urban driving use-cases such as driver assistance and safety systems on the one hand, and on the other hand to the transportation for elderly and citizens with handicaps, last-mile delivery of goods - and ultimately fully automated urban driving in general. The consortium will continuously integrate the research and development from all partners into a fully functional vehicle platform and will showcase the end-product in its full extent to the general public.

Participants:

VOLKSWAGEN AG	DE
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	CH
IBM RESEARCH GMBH	CH
UNIVERSITATEA TEHNICA CLUJ-NAPOCA	RO
CESKE VYSOKE UCENI TECHNICKE V PRAZE	CZ

XoSoft

Title: Soft modular biomimetic exoskeleton to assist people with mobility impairments
Funding scheme: Research and Innovation action **Proposal number:** 688175
Duration: 36 months **Maximum grant awarded:** € 3,680,028.75

Summary:
The XoSoft project will develop a modular soft lower-limb exoskeleton to assist people with mobility impairments. The consortium includes 5 research groups and 3 companies each with EU project experience in exoskeleton/assistive orthotics development. XoSoft, a class I medical device, assists people with low to moderate levels of reduced mobility, enabling them to remain active performing tasks of daily living, which they would otherwise either refrain from doing or could not do. It can also be used in clinics by people with disabilities such as muscle weakness or partial loss of sensory functions. Being a modular system, it comprises an ankle, knee and hip which can be use individually or combined and used unilaterally or bilaterally. XoSoft is revolutionary: Soft robotics sensors and actuators will be developed using existing basis science concepts and integrated with connected health functionality. It will be the first commercially orientated soft exoskeleton for the mainstream mobility assistance market. XoSoft is a user centred design achieved by involving primary, secondary and tertiary end users throughout the project. It is easy and comfortable to wear, has a significant impact on the persons mobility and health, on their independence and quality of life. Advanced textiles and smart materials will be developed to create sensing, variable stiffness joints and actuation using technologies such as electro rheological fluids, flexible tactile sensors based on polymeric films with carbon nanotubes and nanowires. Control is through biomimetics to identify the user's motion and intention and to determine and provide the appropriate level of assistance. Connected health connectivity and analysis enable the wearer and their clinicians/therapist to review activity information. The concept is tested extensively in the lab, is subject to trials in clinical settings and home environments.

Participants:

FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	IT
AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	ES
STICHTING SAXION	NL
UNIVERSITY OF LIMERICK	IE
ZURCHER HOCHSCHULE FUR ANGEWANDTE WISSENSCHAFTEN	CH
ROESSINGH RESEARCH AND DEVELOPMENT BV	NL
ACCELOPMENT AG	CH
WALDKRANKENHAUS ST MARIEN GGMBH	DE
ÖSSUR HF	IS

Robotics in Workprogramme 2015 – FoF 2015

H2020-FoF-2014-2015: ICT Innovation for Manufacturing SMEs (I4MS) FoF 9a Opening date: 22nd October 2014 Deadline: 4th February 2015	**Funding Scheme / Funding rate**	**Budget (M€)**
a. Innovation Actions: Highly flexible and near-autonomous robotics systems (application experiments). Priority domains: none specified	a. Small & Large contributions/70%	a. 13.5

HORSE

Title: Smart integrated Robotics system for SMEs controlled by Internet of Things based on dynamic manufacturing processes
Funding scheme: Innovation action **Proposal number:** 680734
Duration: 54 months **Maximum grant awarded:** € 7,945,601.00

Summary:
HORSE aims to bring a leap forward in the manufacturing industry proposing a new flexible model of smart factory involving collaboration of humans, robots, AGV's (Autonomous Guided Vehicles) and machinery to realize industrial tasks in an efficient manner. HORSE proposes to foster technology deployment towards SMEs by developing a methodological and technical framework for easy adaptation of robotic solutions and by setting up infrastructures and environments that will act as clustering points for selected application areas in manufacturing and for product life cycle management (production and/or maintenance and/or product end of life). The main strategy builds on existing technology and research results in robotics and smart factories and integrates them in a coherent framework. The suitability of the resulting framework is not only driven by but will be validated with end-users – manufacturing companies - in two steps: In the first, the joint iterative development of the framework together with selected end-users will take place (Pilot Experiments). In the second, its suitability and transferability to further applications will be validated with new end users, which are recruited by an Open Call mechanism. The novel approaches of HORSE are the integration of concepts such as (physical) human-robot interaction, intuitive human-machine interfaces, and interaction between different robots and machines into an integrated environment with pre-existing machines and workflows. Safety of the human worker as well as reduction of health risks through physical support by the robotized equipment will contribute to better overall manufacturing processes. In these, pre-defined workflows to be customized are the basis for servitisation, for the entire value chain that allow rapid reconfiguration of the robots based collaborative production processes. HORSE aims to foster advanced manufacturing technology deployment by industries and especially SMEs.

Participants:

ADVANCED SYSTEMS OF TELECOMMUNICATIONS INFORMATICS AND TELEMATICS SA	EL
COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	FR
STIFTUNG FZI FORSCHUNGSZENTRUM INFORMATIK AM KARLSRUHER INSTITUT FUR TECHNOLOGIE	DE
PROSYST SOFTWARE GmbH	DE
TECHNISCHE UNIVERSITEIT EINDHOVEN	NL
ASOCIACION NACIONAL DE FABRICANTES DE BIENES DE EQUIPO	ES
HAROKOPIO UNIVERSITY	EL
SPOLKA AKCYJNA ODLEWNIE POLSKIE	PL
KUKA AUTOMATISME ROBOTIQUE	FR
ROBERT BOSCH ESPANA FABRICA CASTELLET SA	ES
TECHNISCHE UNIVERSITAET MUENCHEN	DE
ZAVOD-CENTER SLOVENSKEGA ORODJARSKEGA GROZDA CELJE	SI
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	NL
CENTRE TECHNIQUE DES INDUSTRIES MECANIQUES	FR
THOMAS REGOUT INTERNATIONAL BV	NL

ReconCell

Title: A Reconfigurable robot workCell for fast set-up of automated assembly processes in SMEs
Funding scheme: Innovation action **Proposal number:** 680431
Duration: 36 months **Maximum grant awarded:** €5,561,569.00

Summary:
ReconCell develops a new type of robot workcell, its required process infrastructures and the economic framework for automated robot assembly, especially designed for the needs of SMEs. SMEs would benefit from robotic automation, but often cannot use it due to set-up & maintenance complexity. This requires expert knowledge and time for configuration and programming, which is too costly for them. Robotic automation is, thus, normally economically infeasible for SMEs, especially for small batch sizes. ReconCell develops an easy to (re-)configure and (re-)program workcell, making robot solutions commercially viable even for small batch sizes (~1000 units) by reducing set-up & maintenance effort substantially. Specifically, the ReconCell System is based on a layered concept where we start together with the customer with business modelling the planned product assembly based on the ReconCell System to assess its economic viability and provide decisive Key Performance Indicators (KPIs). On approval, the next layer of the ReconCell System implements assembly with automated testing in simulation. Here we use reconfigurable hardware elements to design the required workcell layout and assembly processes. After verification, product assembly takes place in the real workcell under machine vision-based monitoring and novel force-based control of execution to assure product quality using the KPIs. We demonstrate the capabilities of the layered ReconCell System on three real use cases provided by the SMEs of our consortium and two more use cases, established through an open call. In addition, the consortium has started to establish a network of potential ReconCell users to disseminate information about ReconCell technologies to all actors in the value chain, and to raise awareness about the possibilities of automated robot assembly in SMEs. The final aim is to establish a company that commercializes the workcell and associated technologies developed in the ReconCell project.

Participants:

INSTITUT JOZEF STEFAN	SI
SYDDANSK UNIVERSITET	DK
RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE	DE
GEORG-AUGUSTUNIVERSITAET GOETTINGEN STIFTUNG OEFFENTLICHEN RECHTS	DE
BLUE OCEAN ROBOTICS APS	DK
INNOVAATION OY UUSI TEHDAS	FI
ELVEZ, PROIZVODNJA KABELSKE KONFEKCIJE IN PREDELAVA PLASTICNIH MAS DOO	SI
UAB PRECIZIKA METAL	LT
LOGICDATA ELECTRONIC & SOFTWARE ENTWICKLUNGS GMBH	AU