

# ROBO-PARTNER Project Newsletter Issue 5

May, 2016

## MOTIVATION

## COVER OF ROBO-PARTNER PROJECT FIFTH SEMESTER

Human skills are the main driver that enables producing high added value products in Europe. Thus the manufacturing processes are based on utilizing these skills. ROBO-PARTNER aspires the integration of the latest

industrial automation systems for assembly operations in combination with human capabilities, combining robot strength, velocity, predictability, repeatability and precision with human intelligence and skills.

## Message from the Coordinator

Dear Readers,

In our last version of the newsletter the project targets for the period after the end of its second year have been outlined. It is with great pleasure that we can share with a wider audience the first results of ROBO-PARTNER.

After the successful 2nd year review meeting, the consortium partners rolled up their sleeves to achieve the first integration of the pilot cases and the outcome is beyond encouraging. In the following pages you will have the opportunity to review actual footage of the developed demonstrators for the white goods and automotive industrial sectors. The majority of the human robot interaction mechanisms has been integrated and tested while significant steps for the final deployment of the safety related systems have been undertaken.

A series of demonstration videos have also been produced to visualize the ROBO-PARTNER approach of integrating humans and robots under a common, safe, ergonomic production environment.

The current activities are focused on the final integration of the overhead robot for the large parts handling scenario and the construction of the updated Mobile Assistant

Units for intralogistics process. The developing partners are in close loop with the end users in order to ensure the industrial relevance of the outputs and their viability after the end of the project.

In the last year of the project, the milestone will be to fine tune and exhibit the project development in the factory environment and acquire feedback from the people that either already work in the shop floor or are in charge of the production engineering teams. The success of ROBO-PARTNER will heavily rely on their approval and thus special emphasis is given by the consortium in this last year.

Last but not least, the consortium has been very active in raising awareness of the project around the EU and as a result a rich agenda of dissemination events has been fulfilled. Nonetheless this has only been the beginning for us, so we invite you to review our next events and witness by first-hand the experience of human robot collaboration under the ROBO-PARTNER paradigm.

Best Regards,

ROBO-PARTNER Coordinator



### ROBO-PARTNER 7<sup>th</sup> GA Meeting & Integration Workshop

On November 3<sup>rd</sup>, 2015, UNINNOVA, hosted a two-day gathering of the ROBO-PARTNER consortium for the project's 7<sup>th</sup> General Assembly meeting. After a first day to present and discuss the project's developments and future directions, the second day was dedicated to a workshop on the cross-modal integration among all parallel developments from various partners to the ROBO-PARTNER's framework. It was a good opportunity to settle some implementation issues regarding the interface between each case scenario's approaches to the central ROBO-PARTNER system.



### ROBO-PARTNER 2<sup>nd</sup> Review Meeting

On December 15<sup>th</sup>, COMAU hosted the project's 2<sup>nd</sup> review meeting where partners demonstrated the prototypes of the individual technologies that are being developed in ROBO-PARTNER. The project's technical advisor participated in the meeting, reviewed the progress and provided valuable feedback to advance the maturity of the results before the project end.



### ROBO-PARTNER 8<sup>th</sup> GA Meeting

The 8<sup>th</sup> ROBO-PARTNER general assembly meeting took place in Patras, Greece, on the 26<sup>th</sup> of May. During this meeting, the project partners were guided to LMS premises where the automotive and white good pilot case initial set ups are hosted. Some days before, several partners held a technical workshop that allowed the first version of the integrated prototypes to be deployed on the two project pilots.

### ROBOT FORUM ASSEMBLY 2016

## ROBOT FORUM ASSEMBLY

This year's edition of the ROBOT Forum Assembly, held in Parma, Italy, has featured a presentation of the developments of our project. It was a fantastic opportunity to disseminate what has been devised so far to turn the three application scenarios, white goods, automotive and large part inspection, more flexible and efficient, but also aware of human factors. LMS has presented the concepts and the benefits of the solutions in ROBO-PARTNER, as a step closer to a true factory of the future.

### ERF 2016, Ljubljana, Slovenia

## european Robotics Forum 2016

From March 21<sup>st</sup> to the 23<sup>rd</sup>, 2016, Ljubljana played host to the European Robotics Forum. LMS has attended the event, presenting a poster about our project, advertising the enhanced flexibility, efficiency inventory availability, the reduction of programming efforts, and the overall product quality the H-R technologies propose to achieve.

### CIRP CATS 2016, Gothenburg, Sweden



The CIRP Conference on Computer Aided Tolerancing had its 14th edition in Gothenburg, Sweden, from March 18th to the 20th. LMS has presented the papers *A Decision Making Framework for Human Robot Collaborative Workplace Generation* and *Short-term planning for part supply in assembly lines using mobile robots* respectively in the sessions *Levels of Automation in Assembly Systems* and *Assembly Systems*.

## Progress

The 3<sup>rd</sup> year brought further ROBO-PARTNER's developments:

- Following the plan set out by the consortium for the start of the third year, a first integration of the automotive pilot case has been performed at LMS facilities. The technologies for supporting human robot interaction have been brought together to the project's integration and communication architecture and tested in laboratory environment. With respect to human-robot interaction, functionalities such as the provision of assembly instructions and visual alerts as well as visualization of 3D models and safe working volumes through Augmented Reality (AR) applications have been successfully deployed and tested. To further enhance the user experience, a Smartwatch application has been introduced in the system, allowing the operator to provide feedback to the integration platform while enabling him to interact with the AR application for requesting support in an interactive way. In order to simplify the interaction between the human and the robot, two applications were introduced in the system providing the operator the ability to guide the robot: 1) using voice commands and 2) manually, using an integrated force/torque sensor. For more details and a video explaining all functionalities included in the automotive assembly scenario has been uploaded to the ROBO-PARTNER YouTube channel ([link](#)).



Automotive Demonstrator



- Respectively, the white goods pilot prototype has also been set up and tested. The main emphasis was given in integrating the technologies for supporting the human operator while including him in the process workflow through the AR and the Smartwatch applications. Additionally, the mechanisms for enabling human-robot direct interaction including manual guidance were also demonstrated. The close proximity of human and robots in this pilot demanded the integration of a safety skin covering the robot surface. This sensor is able to trigger an emergency stop upon contact, monitoring air pressure. The ROBO-PARTNER platform allowed also the integration of a vision system which detects the location where the sealing operations of this pilot need to be performed by the robot. A full overview of the demonstrator prototype is also available ([link](#)) on the project YouTube channel.

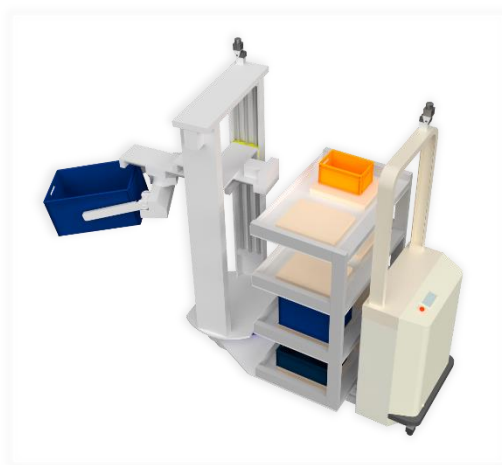


White Goods Demonstrator



- UNINOVA took over the design and construction stages of the mobile robot for the automotive logistics scenario. The new design contemplated the optimization of the manipulation system weight/force distribution and of the available storage space, at the expense of minor adjustments to the hardware and the software modules already projected, acquired, implemented and tested so far. Thus, the base platform initially provided by ROBOSOFT, has undertaken major alterations to have a more robust and stable traction system. Also, the Cartesian system was substituted by a more versatile and lighter manipulation system, and the 4-slot structure made way to a more compact, 8-slot storage area.

- On the large part inspection scenario, TEKNIKER has three software blocks nearing their deployment stages: the gantry's navigation, pick and place, and "come to me" functionality modules. Meanwhile, JATORMAN is finishing the construction of the gantry system to be deployed on TRIMEK's facilities.



The coming year will see all implementations and simulation brought to real world testing as the hardware ends its final assembly and deployment on the use case scenarios. Of pivotal importance will be PILZ's continuous risk assessment and performance evaluation throughout next year's testing, as each solution's implementation-test loop phases are likely to promote some little design deviations.

## The Project's Consortium

Project coordinator:

Project Manager:



**Electrolux**



**TRIMEK**  
METROLOGICAL ENGINEERING



IK4 **TEKNIKER**  
Research Alliance



**CENTRO  
RICERCH  
FIAT**



**Fraunhofer**



ISMA 2015, Sharjah, UAE

## ISMA'15

The 10th edition of the International Symposium on Mechatronics, held at Sharjah, United Arab Emirates, featured a UNINOVA presentation on the participation on successful European projects entitled "Successful H2020 Projects or How to Get Involved".

Dr. José Barata introduced the ROBO-PARTNER's current developments and concepts for the future vision of Europe's manufacturing industry. A special focus on the mechatronic baseline for the mobile robots responsible for intra-factory logistics proposed on this project.



The conference paper entitled *A Health and Usage Monitoring System for ROS-based Service Robots* was presented by Eduardo Pinto, on the design of a health and usage monitoring system which will be part of ROBO-PARTNER's mobile robots' dynamic hardware management.

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