

R5-COP

Reconfigurable ROS-based Resilient Reasoning Robotic Cooperating
Systems

R5-COP series of annual workshops

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1 Introduction

1.1 Summary (abstract)

This document presents the organized series of annual R5-COP one-day summer schools at BUT in years 2014 - 2016. The purpose of the workshops was to introduce R5-COP project, its actual results and ROS technologies to undergraduate students, junior researchers, academic staff and also for interested development team members of local industry partners.

1.2 Purpose of document

The purpose of the document is to present a short summary of the series of the annual R5-COP workshops.

Partners and Contribution	
Short Name	Contribution
BUT	report authoring and workshops organizer

2 Series of annual R5-COP workshops

R5-COP planned to organize a hands-on summer school for junior researchers attached to a suitable event. Rather than organizing a single summer-school event, we headed for annual topic-based workshops as part of our established line of annual robot workshops.

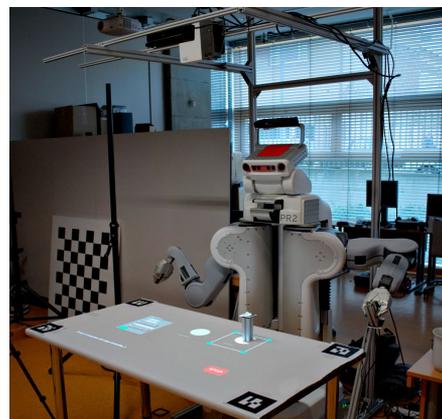
The workshops are practically focused so the participants learn by solving robotic tasks, from very basic ROS utilization to very focused tasks on particular dedicated robotic platform (Toad, Ed, PR2 and arTable, see Figure 1).



Ed



Toad



PR2 + arTable

Figure 1: Various mobile robotic platforms for R5-COP project in laboratory.

The workshop schedule is usually as follows. Firstly, the Robo@FIT laboratory equipped by various mobile robotic platforms and sensors is introduced together with R5-COP project. The members of the robotic research group supervised the participants to become familiar with the basic principles and tools of ROS and with robotic platforms in the laboratory. As part of the morning session, students defined and learned basic knowledge of ROS, which virtually tried on the example application. During a hands-on session the participants tried to create a ROS node controlling robot based on sensor data.

The second half of the workshop was dedicated to implement a sample application focused on robot control. Students were grouped by their interests in different mobile platforms and tasks, including also a simulation environment for PR2, and jointly worked on both basic and advanced tasks and practical problems. The last part of the workshop was dedicated to an open discussion with researchers. Students joined various discussions based on the topic (research problem, robotic platform available at the lab). Probably the most discussed topic in 2016 was experimental setup utilized in R5-COP use-case and BUT's "Teaching by Interaction" module (see Figure 3, described in more detail in D42.30).

The topics of the workshops includes:

- basic principles and tools: Rviz, gazebo, MoveIt!, rosbag etc.
- particular advanced concepts and technologies for: object segmentation in image and depth data, object recognition, localization and mapping, planning and navigation etc.

Every year at the seminar were presented the latest results of R5-COP project:

- 2014 [1] - developed or acquired mobile robotic platforms connected to R5-COP project, namely Ed, Toad and PR2. Their basic functionality, sensory data processing and utilization for existing ROS packages (see Figure 2 for an attendance illustration).
- 2015 [2] - designed and prepared testbed for robotic tasks experiments and evaluation. Also platform models to Gazebo were introduced to use simulation environment for development and junior researchers cooperation (see Figure 3 for an attendance illustration).
- 2016 [3] - designed and developed "teaching by interaction" technology based on projective visual feedback on the table and touch-sensitive desktop (see Figure 4 - PR2 + arTable).

Every year the workshop is attended by cca 25 undergraduate students, PhD students and junior and senior researchers. Further, usually cca 2-3 qualified representatives of local industrial partners (e.g. Bender robotics¹, RCE systems², Quanti³, Camea⁴, 3DIM laboratory⁵) visited the event to meet the students and the researchers and briefly discuss the actual project results and possibilities of further cooperation.

¹ <https://www.advee.eu/index-en.html>

² <http://www.rcesystems.cz/>

³ <https://www.quanti.cz/technology?groupName=best>

⁴ <http://www.camea.cz/en/>

⁵ <http://www.3dim-laboratory.cz/en/about/hist/>



Figure 2: Workshop participants in 2014.



Figure 3: Workshop participants in 2015, used for leaflet for 2016.

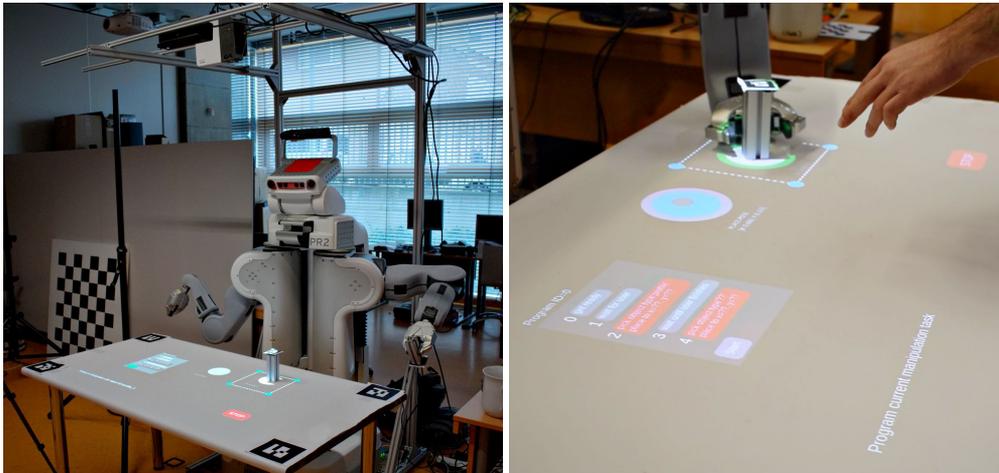


Figure 4: “Teaching by interaction” technology based on projective visual feedback and touch-sensitive desktop.

3 Summary

The workshop was appreciated by students, they got motivated for their diploma and doctoral thesis. Moreover, they got in touch with the top-edge technologies in service robotics and actual results of R5-COP project.

References

- [1] Getting started with robotics and ROS (2014), http://www.fit.vutbr.cz/events/view_event.php.en?id=3165
- [2] Getting started in ROS 2015, http://www.fit.vutbr.cz/events/view_event.php.en?id=3446
- [3] Getting started in ROS 2016, http://www.fit.vutbr.cz/events/view_event.php.en?id=3728