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ABSTRACT

RoCKIn is an European Union funded project (<http://rockinrobotchallenge.eu>) aiming to promote and improve scientific progress and innovation in robotics and cognitive systems by means of the design and implementation of robotics competitions, based on challenges concerning domestic service robots (RoCKIn@Home) and industrial robots in factories (RoCKIn@Work).

RoCKIn competitions take inspiration from the RoboCup counterparts, adding however a strong emphasis in the integration of benchmarking technology with the competition concept.

RoCKIn Camps should be considered as events in preparation of the RoCKIn competitions. The RoCKIn Camp 2015, primarily organized by Sapienza University (UNIROMA1), has taken place from 18th to 22nd March in the ECHORD++ facility of Peccioli (Italy) and it has been designed as a hands-on week long school, where teams improve the performance of their systems through working sessions in the RoCKIn competition task and functionality benchmarks. At the Camp, teams gained access to the state-of-the-art ECHORD++ domestic test bed and the RoCKIn industrial test bed, and had the chance to practice and improve their performance in the task and functionality benchmarks. The Camp was attended by 42 students and researchers from 7 countries around Europe that were all accommodated at the expense of the organization and granted with some travel support.

This report provides a description of the activities related to the organization, attendance and outcomes of the RoCKIn Camp 2015 Event, comprehensive of an analysis of the feedback gathered from participants.

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1 INTRODUCTION

RoCKIn is a three years EU-funded Coordinated Action consisting of robot competitions, symposiums, educational RoCKIn camps and technology transfer workshops. Robotics needs now an impetus that brings existing appealing prototypes from research laboratories to actual products in the mass market. One of the driving forces for such a significant and long-awaited technology transfer to happen is to focus the research in robotics on integrated systems that address and solve grand challenges. Obviously, the goal is not simply to realize a robotic system engineered to solve that particular challenge, but to develop formal methods that enable systematic approaches to building better and smarter robots in a given class of applications, benchmarked against building blocks common to most grand challenges for robots. It was on this basis that RoCKIn was formed.

RoCKIn major goals are:

- developing standardised test beds and benchmarks that will streamline R&D for the future;
- focusing on cognitive skills and networked robots;
- acting as a catalyst for smarter, more dependable robots.

RoCKIn pursues these goals by leveraging on different aspects:

- scientific dissemination, through the participation at conferences and major events;
- releasing a benchmarking framework;
- designing test beds adopted by the whole robotic community;
- organizing competition events to evaluate robotic teams through standard benchmarks and test beds;
- introducing teams to RoCKIn competitions through Camps.

This latter activity represents one of the main components inside the RoCKIn project. This report describes the RoCKIn Camp 2015, that followed the second RoCKIn event, the RoCKIn Camp 2014 held in Rome, and the first RoCKIn introductory Camp 2013, held in Eindhoven.

2 EVENT SUMMARY

The RoCKIn Camp 2015, organized by UNIROMA1 and held in Peccioli (Italy) from 18th to 22nd of March, has been designed as a consistent follow up of the previous Camp 2014, held in Rome from 26th to 30th January 2014. Many of the best teams that participated at the previous camp attended also the RoCKIn Camp 2015.

Differently from the RoCKIn Camp 2014, that has been structured as a week-long school with lectures and practical activities, the RoCKIn Camp 2015 put a special emphasis on the hands-on experience of the participants, encouraging each team to focus on specific RoCKIn task and functionality benchmarks in order to improve their performances during the camp and to achieve the best possible results.

The RoCKIn Camp 2015 has been organized at the ECHORD++¹ Robotics Innovation Facility (RIFs) of Peccioli (Italy). Teams gained access to the state-of-the-art ECHORD++ domestic test bed (Figure 1) and to the RoCKIn industrial test bed, and had the chance to practice and improve their performance in the task and functionality benchmarks. The domestic test bed was equipped with the RoCKIn ground truth system provided by Milan Polytechnic (POLIMI) for data gathering and allowed teams to get detailed feedback on their performance.



Figure 1 – The rooms of the "Casa domotica" (domotic home) inside the Peccioli RIF, used as @Home arena

The program was structured in two tracks, RoCKIn@Home and RoCKIn@Work, with joint sessions and specific activities in each track. The RoCKIn team assisted participants throughout the week, working with the teams and providing continuous technical support on the use of the framework developed to support the task and functionality benchmarks. At the end of each day, in a joint @Home/@Work

¹ ECHORD++ (European Clearing House for Open Robotics Development Plus Plus) is an European Union founded project that aims at promoting innovation by facilitating the cooperation between academia and industry.

sessions, teams presented the activities carried out. Below we provide a sketch of the event, detailed information about the Camp program and activities can be found in Section 4.

In the first day, after a welcome talk by the RoCKIn organization committee, the teams were engaged in the robot's hardware and software setup, followed by brief introductions about Semantic Mapping for the @Home track and about the User Story and the competition Arena for the @Work track.

The second day started with an introductory talk by Filippo Cavallo from the hosting institution, the BioRobotics Institute: he presented the state of robotics in the region and some of the initiatives they are working on. Afterwards, Matteo Matteucci from POLIMI presented the RoCKIn Benchmarking and Scoring framework. The rest of the day has been devoted on teams' hands-on activities and some tutorials about the Referee, Scoring and Benchmarking Box (RSBB, for the @Home track) and the Central Factory Hub (CFH, for the @Work track) employed in the RoCKIn competitions.

In the third day, Professor Oskar von Stryk from the Technische Universität Darmstadt, Germany, member of the project Advisory Board, was invited to give a talk on the technology transfer towards industrial applications. He reported on the experience, in terms of motivation and technological development, acquired through the development of the BioRob™ robotic arm from a scientific research project to a spin-off company and, eventually, to a successful commercial product on factory floors. The rest of the day has been devoted to the preparation for the final demonstration.

The fourth day has been fully devoted to the final demo preparation. As usual, preparations ended up late at night.

In the final day, the teams presented a demonstration of their accomplishments, performing one RoCKIn task benchmark and one functionality benchmark, showing very good performances and great improvements with respect to their initial capabilities. The demonstrations were also attended by the general public and the local media, while best performances were awarded during the final ceremony.

The teams attending the camp have been selected among the applicants that have responded to an open call issued at the end of the summer and closed at the end of January. Moreover, two teams from the RoCKIn partners and the two best teams from the previous RoCKIn Competition held in Toulouse (France) at the end of 2014 have been invited to participate to the camp.

In total RoCKIn Camp 2015 had 42 participants divided in 9 teams, 4 for the @Home track and 5 for the @Work track. All teams brought their own robots. The environmental elements for the @Work track arena was provided by Bonn-Rhein-Sieg University (BRSU) and KUKA, consisting of several service areas, wall elements, tools, a conveyor belt, a drilling machine and a force fitting machine, as well as the manipulation objects.

3 ROCKIN CAMP 2014 ORGANIZATION

This section describes the camp organizational issues, from the participant selection process to the logistics. The RoCKIn Camp organizing committee included the PI of each partner. Moreover, two committees have been appointed for the specific organization of each of the two tracks, @Home (chaired by Luca Iocchi, UNIROMA1) and @Work (chaired by Jakob Berghofer, KUKA). The local coordination of the event was jointly carried out by Daniele Nardi and Alberto Pretto, with the support of the members from BRSU, IST-ID, POLIMI and UNIROMA1: Emanuele Bastianelli, Roberto Capobianco, Rhama Dwiputra, Sven Schneider, Alexander Moriarty, Giulio Fontana, Pedro Miraldo and João Reis.

3.1 PARTICIPANTS

3.1.1 THE SELECTION PROCESS

An application form has been opened in the RoCKIn Camp 2015 web site, and shared in the major robotics mailing lists, where two application formats were accepted:

- Team applications, for teams of 5 or less people, not necessarily from the same university, but with an already established joint team and the possibility to bring a robot at the Camp.
- Individual applications by existing or prospective team members.

Each applicant had to include a Technical Report including team description (robot description, previous experience, role and competence of team members) or CV for individual applications, and a detailed technical presentation of the proposed solution for the Tasks or Functional Benchmarks to be addressed during the camp. The selection was based on the team submission material and, in particular, on the quality and maturity of the technical solutions proposed for the RoCKIn task and functionality benchmarks.

8 team applications and 4 individual applications have been received for the RoCKIn Camp 2015 event. In most cases applications included very good quality team descriptions and the curricula vitae of the candidates were adequate for the purposes of the Camp.

The RoCKIn Camp organization committee accepted 5 over 8 team and 2 over 4 individual applications. Two members of the non-accepted teams have been accepted as individual members, on the basis of their submitted material.

As already mentioned, the two best teams from the previous RoCKIn Competition held in Toulouse (France) at the end of 2014 and two teams from the RoCKIn consortium have been invited to participate to the camp.

The complete list of accepted participants for the camp includes 42 students and researchers from 7 countries, as reported in the tables of A.

3.2 VENUE, ACCOMMODATION AND SOCIAL EVENTS

All the Camp activity took place in the ECHORD++ RIF of Peccioli. As reported in the ECHORD++ website², the Peccioli RIF consists of outdoor and indoor settings, where different scenarios could be developed, tested and evaluated, such as (i) robotic worker (in rubbish dump), (ii) logistics robots (autonomous transport of goods and autonomous transport of people, in urban area), (iii) robot co-worker in domestic environment (robot companion, in the domestic house and in a nursing home), (iv) edutainment robot (robot guide and robot companion, in museum and in the domestic house) as well as agricultural robotics, (v) medical robotics (hospital and rehabilitation center) and (vi) agricultural robotics (biofarms in Peccioli area).



Figure 2 - Hotel's lunchroom

All participants have been accommodated at the expense of the organization in a hotel (Figure 2) close to the ECHORD++ RIF. Housing, lunches, a social dinner and other social events were provided to all the participants. In addition, teams received a travel support from 600 up to 1200 Euros (refunded after the event upon presentation of the receipts).

² <http://www.echord.eu/facilities-rifs/the-peccioli-rif/>

4 RoCKIN CAMP 2015 PROGRAM

This section describes the activities carried out before and during the camp, from the preparation activities to the final demonstration.

4.1 PRELIMINARY WORK

The RoCKIn organization committee had shared before the event important preparatory material through the RoCKIn wiki³. This material included:

- Updated rule books
- Maps of the @ Home/@ Work arenas
- Software tools used in the competitions (e.g., RSBB and CFH applications)
- Spoken language understanding dataset

All the teams were encouraged to get acquainted with this material before the camp, to get the best profit from the event.

4.2 CAMP PROGRAM DESCRIPTION

ROCKIN Camp 2015 Program at a Glance

	Wed, March 18th	Thu, March 19th	Fri, March 20th	Sat, March 21st	Sun, March 22nd
9:00 - 10:30	Welcome and Team Set-up (joint session)	Introduction to RoCKIn Benchmarking and Scoring (joint session) Speaker: Matteo Matteucci	@Home Mini TBM3 Speech, perception, manipulation @Work TBM / FBM Selection Hands on TBM / FBM	@Home FBM1 Object Recognition @Work Team's Goals & Targets Hands on TBM / FBM	
Break					FINAL DEMONSTRATION
11:00 - 12:30	Team Set-up (joint session)	@Home RefBox Tutorial @Work TBMs/FBMs introduction Introduction to CFH	@Home Mini TBM3 Speech, perception, manipulation @Work Hands on TBM / FBM h.12.00: The Journey of the BioRob(TM) Robotic Arm: From a Scientific Challenge to a Serial Product on the Shop Floor Speaker: Oskar von Stryk	@Home FBM1 Object Recognition @Work Hands on TBM / FBM	
Lunch					End
14:00-16:00	@Home Welcome meeting (Semantic) Mapping session @Work Welcome meeting Intro to ROAW (presentation)	@Home RefBox + Benchmark Tutorial @Work CFH, practical example and integration (Hands On)	@Home Demo Preparation @Work Hands on TBM / FBM	@Home Demo Preparation @Work Hands on TBM / FBM	
Break					
16:30 - 18:00	@Home (Semantic) Mapping session @Work General overview; User Story; Arena	@Home RefBox + Benchmark Tutorial @Work CFH Integration (Hands On) Status Report (Presentation+Demo)	@Home Demo Preparation @Work Rulebook Discussion	@Home Demo Preparation @Work Rehearsal Rulebook Discussion	
18:30 - 19:30	Summary of day (joint session)	Summary of day (joint session) and RoCKIn aperitif	Summary of day (joint session)	Summary of day (joint session) and RoCKIn aperitif	
19:30 - 20:30	Welcome reception				
20:00 - 22:30			Social Dinner		

Figure 3 - RoCKIn Camp 2015 program

³ <http://rm.isr.ist.utl.pt/projects/rockin-competitions-wiki/wiki>

The camp was organized around two parallel tracks, one for the @Home activities and one for the @Work activities, and with joint activities, meetings and talks: an outline of the Camp program can be found in Figure 3.

The remainder of this section is organized as a day-by-day description of the Camp activities.

4.2.1 DAY 1

The RoCKIn Camp 2015 started with a joint (@Home + @Work) welcome and kickoff meeting held by Daniele Nardi from UNIROMA1, as organizer of the event, and Pedro Lima from IST-ID, as project coordinator (Figure 4). Afterwards, the activities continued in parallel for the two tracks (@Home and @Work). UNIROMA1 supported the teams, by gathering small pieces of hardware needed. Some teams, in fact, could not transport their own batteries for the robot for flight security reasons, while others got some hardware broken during the transportation.



Figure 4 - Camp kickoff meeting

@Home

Each team prepared their workspace and started assembling their robots. POLIMI started setting up the motion capture system inside the @Home arena. The optimal position for the motion sensors has been evaluated, and the required scaffoldings have been placed accordingly. A preliminary test of the system has been carried out, in order to check that the whole infrastructure and communication worked. IST-ID started to setup of the @Home Referee box hardware/software framework. A specific Wi-Fi network has been set up, to allow direct communication between the teams and the Referee Box, avoiding conflicts with other network present in the environment.



Figure 5 - @Home arena during the robot setup

In the afternoon, most of the @Home teams completed the assembly of their robots (Figure 5) and performed an inspection of the arena. IST-ID terminated the setup of the Referee Box system, by placing all the hardware inside the arena and testing the dedicated network, while POLIMI performed a first calibration phase of the motion capture system (Figure 6). The area for the Object Recognition Functional Benchmark (FBM1) has been prepared inside the motion capture field of action, as the benchmark requires the system to be correctly performed. The correct position of the board used for benchmarking has been computed and tested.



Figure 6 - The motion capture system mounted on the sides of the kitchen of the @Home arena

Some journalists from on-line newspapers visited the facility (Figure 7).



Figure 7 - An interview held in the @Home arena

@Work

After a brief talk, in which a general overview of the hosting location and the camp was provided, the teams started to setup the robots. In the meanwhile, the @Work arena arrived in the hosting location and BRSU and UNIROMA1 started to configure the Central Factory Hub (CFH).

After lunch, BRSU and KUKA finished the assembly of the arena and tested the CFH and the wireless network. In the afternoon, Jakob Berghofer (KUKA) made a brief introduction to the competition and presented the @Work arena. After that, each team leader provided an informal description of his/her team and their expectations for the camp and the final demo. Rhama Dwiputra (BRSU) analyzed the relevance of the functionality benchmarks, as a tool for evaluating how single functionalities improve the task execution and the performance of the robots. KUKA and BRSU presented an introduction to the CFH with an overview on its interface, significance and the way it interacts with the arena elements (e.g. with the drilling machine, force fitting machine and the conveyor belt).

Each @Work task has been described in detail. Teams actively took part in the discussion by evaluating the difficulties and the feasibility of the tasks. The same activity has been performed for @Work functionalities. Teams gave feedback to the competition organizers. The RoCKIn team provided a set of suggestions and recommendations to the teams for a successful participation to the camp first and to the competition later. Once the discussion session was completed, the teams continued to setup their robots and their workstations.

At the end of the day, a joint (@Home + @Work) meeting was held: all teams summarized what they did during the day, asked for some questions to the RoCKIn team and exchanged opinions with them. After the meeting, a welcome presentation took place, where all the teams were welcomed and the aims of the Camp were presented, as well as a summary of the general schedule. At the end of the day, a welcome aperitif has been served to all the RoCKIn participants (Figure 8).



Figure 8 - Day 1 aperitif

4.2.2 DAY 2

The second day of the Camp started with a joint plenary session. Filippo Cavallo from the BioRobotics Institute of the local Sant’Anna University presented the hosting structure and gave a brief overview of the research projects in which they are involved. Various robotic platforms have been shown, from standard terrestrial platform to submarine ones, as well as the diverse application domains, from rescue robotics to bio-medical applications.

Matteo Matteucci (Figure 9) from POLIMI gave a talk with title “Introduction to RoCKIn Benchmarking and Scoring”. Matteucci presented a general overview about the benchmarking in international and European robotic competitions (Euroc, Eurathlon, DARPA Robotic Challenge, RoboCup). In the second part of the talk, he introduced the RoCKIn tasks and functionality benchmarks, describing also the scoring system of the competition.



Figure 9 - Matteo Matteucci talk

@Home

After the plenary session, João Reis, from IST-ID, organized a meeting with the @Home teams, in order to show them the functionalities of the Referee Box, and especially how to communicate with it. One of the aim of this camp was, in fact, to prepare the teams and teach them how to interact with the Referee Box, in order to avoid any problems in interacting with the competition software infrastructure during the next competition⁴.

In the second half of the day, the Referee Box has been made accessible to all the @Home teams. In the meantime, the teams finished also the acquisition of the geometric map of the arena. Some teams acquired also a semantic map of the environment, required for some of the task and functionality benchmarks.

@Work

After the plenary session, the teams continued with the robot setup, robot calibration and started to test their software modules.

In the afternoon, Alexander Moriarty, Rhama Dwiputra and Sven Schneider (BRSU) presented a detailed explanation on the Central Factory Hub (Figure 10). In particular, they gave instructions to the teams on how to install and compile it and on how to integrate in their code the communication with the CFH, which was one of the main goals of the camp. This session was very interactive, and all the teams actively participated. After some work, the teams had the possibility to test what they implemented in the afternoon, e.g. sending beacon signals to the CFH, moving the drilling machine and the conveyor belt.

⁴ The communication with the Referee Box has been one of the major issues during the RoCKIn Competition 2014 in Toulouse



Figure 10 - CFH description

At the end of the day, all teams of the @Home and @Work tracks participated to a joint meeting about the Functionality Benchmark 1, during which the rules have been clarified and explained. Moreover, a new module for logging the benchmark has been presented and described to the teams. This module has been provided by the organizers in order to facilitate the acquisition of all the data gathered and processed by the robots while performing the benchmarks, in order to easily log them. The acquisition of such data is, in fact, one of the main goals of the RoCKIn project, and a special effort has been devoted to ensure its deployment by the participating teams.

The day ended with the wrap up meeting, where again the teams explained the work done during the day. A short aperitif has been also offered to the teams at the end of the meeting.

At 19:30 a bus collected all the RoCKIn Camp attendees at the venue, and brought them to Pisa for a brief visit of the city and dinner.

4.2.3 DAY 3

@Home

In the third day, all the teams worked hard to make the new logging module work, in order to use it during the functionality and task benchmarks. The communication with the Referee Box were also tested and consolidated. Later, all teams try to perform the Task Benchmark 3 called “Gathering comforts for Granny Annie”. In rest of the day, teams started to prepare the final demos.

The BARC team started to prepare Task Benchmark 1, about welcoming visitors, adding to the robot some advanced behaviors, as implementing specific reactions to particular visitor behavior.

The SocRob team (Figure 11) performed Task Benchmark 3. They also worked on the Functionality Benchmarks 1 and 3, about Object Recognition and Spoken Language Understanding, respectively.



Figure 11 - The SOCR0B team robot

The HOMER team (Figure 12) also tested and performed the Task Benchmark 3, while other members of the team refined the system for the Functionality Benchmark 1.



Figure 12 - The HOMER team robot

Team WATERMELON encountered some hardware problem with their platform and had to fix it and later addressed the Functional Benchmarks 1 and 3.

At 11:30 AM, all the teams (@Home + @Work) attended the talk given by Oskar von Stryk from Technische Universität Darmstadt, with the title “The Journey of the BioRob(TM) - Robotic Arm: From a Scientific Challenge to a Serial Product on the Shop Floor”. During his talk, Prof. von Stryk gave participants an insight into what it required, in terms of motivation and technological development, to take the BioRob™ robotic arm from a scientific research project to a spin-off company and, eventually, to a commonplace commercial product on factory floors.

In the afternoon, UNIROMA1 acquired some benchmarking datasets inside the @Home arena: a 3D map of the environment, to be used as ground truth for the Semantic Mapping task, and a collection of audio files, recorded during a speech-based interaction between a user and a human teleoperated robot, that simulated the behavior as a response to the command uttered by the user.

@Work

The teams started working on the task benchmarks (TBMs) and functionality benchmarks (FBMs) they planned to show in the final demonstrations, followed by the Oskar von Stryk talk (see above).

In the afternoon the teams continued working on the selected TBMs and FBMs. At the end of the day, each team proposed a preview of the final demonstration and discussed their achievements of the day; the SPQR and RobOTTO teams proposed a demo on the navigation and localization sub-tasks, while the smARTLab team (Figure 13) performed the Task Benchmarks 3, showing some object pick&place actions.



Figure 13 - The smARTLab robot

At the end of the day, in a joint session each team analyzed the work done in the day and the next steps for preparing to the final demonstrations.

At 20:00 all the participants and organizers have been taken to the “Azienda Naturalistica La Vallata” in Lajatico, where the social dinner took place.

4.2.4 DAY 4

@Home

In the morning of the fourth day, the plan for @Home teams was to perform Functionality Benchmark 1, but it was decided to focus on the preparation of the demo.

Since the WATERMELON team had to leave the camp on Sunday in the early morning, they presented their platform and their research activities they are carrying in the afternoon. Other teams continued the preparation of the final demo for the day after.

Since no logs of Functional Benchmark 1 were collected, UNIROMA1 and POLIMI gathered data for the benchmark. Using a fixed camera, more than 10 images of each object from the @Home and @Work object batches have been taken, while logging everything with the motion capture system and the logging module. In the end, more than 200 images for both the @Home and the @Work track were gathered, building the ground truth for the Functionality Benchmark 1.

@Work

All the teams intensively worked on their final demonstrations. Several trials were done both in terms of task benchmarks and interaction with the Central Factory Hub. During the morning, in particular, some teams worked on object recognition (e.g., team UvA) and some others addressed the navigation and manipulation tasks (SPQR, RobOTTO, smARTLab) in order to complete the software modules needed for the final demo.

Teams started to log data while doing their experiments inside the arena and they collaborated in determining the right data and in producing the software required for this activity. In this collaborative environment, a big effort has been made, in particular by the team RobOTTO, which helped substantially the benchmarking by POLIMI.

After lunch, Jakob Berghofer and colleagues from BRSU organized a rehearsal session. Each team showed the results of the effort of the previous days, while logging data for the benchmarking. After that, everyone started again working and improving the robot behaviors.

The final joint meeting (@Home + @Work) took place at 18:30, followed by a short aperitif. In order to allow the teams to prepare the final demos properly, the access to the venue has been granted to the team members until midnight. So after dinner, all the teams went back to the venue and continued working.

4.2.5 DAY 5

In the last day of the camp, all teams showed their final demos in a joint @Home + @Work demo session. The demo session took place between 9:00 and 10:30. For each demo, teams had 15 minutes: 5 minutes to setup the robot, and 10 minutes to show the demo.

BARC team (Figure 14) demo then consisted in showing a system able to recognize structural changes in the environment. The robot, using laser scans, was able to detect if some parts of the environment had changed with respect to the original map, for example detecting that a couch was moved from one point to another.



Figure 14 - The BARC team during the e final demonstration

The SocRob team performed an extension of the Task Benchmark 3. A person ordered the robot to switch on and off the lights of one of the bedroom in the arena, and the robot performed correctly the command by interfacing with the home automation system the area was provided with. Moreover, they also showed an extension of the Functionality Benchmark 1: they implemented a system telling the robot to acquire multiple views of one object, when it was not possible to recognize it from a single view. By moving around the object, the robot could acquire views from different angles and recognize correctly the object.

The HOMER team performed also an extended version of the Task Benchmark 3. As before, their robot could understand the command spoken by a person about switching the lights of the bedroom, performing it through the home automation system. In addition, they simulated a fault of the lighting system of the house, by switching rapidly the lights on and off. The robot recognized the uncommon behavior of the lights with its sensors, and started a spoken interaction with a person to understand how to solve the problem. The lighting system was fixed as the robot found the electric panel as suggested by the user. Finally, they also showed a behavior of the robot to satisfy a person's request for food: the robot moved to the pantry and checked which food was present, and reported this information to the person.

After a short break, the @Work demos started, with almost all the teams showing a particular task benchmark.

The SQPR team showed Task Benchmark 1: unfortunately the robot, after moving toward the target object, could not complete the task due to a hardware problem.

The smARTLab team (Figure 15) proposed the Task Benchmark 3, with really good results. The robot was able to approach the loading area, to recognize and collect different types of objects, to carry them to the unloading area, where they have been disposed in the correct position.



Figure 15 - The smARTLab team during the final demonstration

The UvA team finally proposed a modified version of the Task Benchmark 1: the robot was able to safely move inside the arena toward a shelf, and to manipulate an object placed in a known position.

In the closing session the RoCKIn team awarded the teams that showed the best performances. In particular, for the @Home track, the HOMER team was awarded with the “Best Demo Award”, because their demo showed more interaction with the humans and more complex behavior with respect to other teams. The SocRob team was awarded instead for the “Best in Benchmarking Award”, as their logs for Task and Functional Benchmarks were more compliant with the required formats with respect to other teams. For the @Work track, “Best in Benchmarking Award” was given to the RobOTTO team, for their support to the creation of the infrastructure for functionality benchmarking in @Work, while the smARTLab team, received the “Best Demo Award”, for their successful performance in Task Benchmark 3 (Figure 16).



Figure 16 - The smARTLab team awarded by Jakob Berghofer

4.3 AWARDS

- Best @Home Demo
 - Winner: **Homer@UniKoblenz**
- Best @Work Demo
 - Winner: **smARTlab@Work**
- Best @Home Benchmark
 - Winner: **SocRob**
- Best @Work Benchmark
 - Winner: **RobOTTO**

5 ROCKIN CAMP 2015 EVALUATION

After the event, participants were asked to fill in a questionnaire to provide some feedback on the outcome of the camp. The full set of collected answers (about half of the participants) is reported in the . Below we provide some discussion and comments.

5.1 CAMP ORGANIZATION

The overall Camp's organization, in terms of facilities, location and services, has been highly appreciated.

Participants appreciated the readiness of the organization committee to solve problems and to help them before and during the camp. Participants also liked very much the chosen event location (the ECHORD++ RIF in Peccioli), particularly the @Home Arena (i.e., the RIF's "Casa domotica"). The only problem encountered by participants was some connection issue with the Wi-Fi network, during the first day. The problem has been solved at the end of the day, enabling two more Wi-Fi access points.

The social events and in particular the social dinner received an exceptional rating.

5.2 CAMP ACTIVITIES

The information provided in the RoCKIn Wiki have been generally appreciated, even if some participants pointed out some delay in some Wiki updates and some others recommended the organizer to include in the current camp Wiki all the information shared in the Moodle page prepared for the previous RoCKIn Camp 2014.

The Ref-box and the Central Factory Hub related activities and outcomes received very good ratings: teams with some previous experience did not have any problems to interface with these tools, while inexperienced teams asked for some more usage examples and demo applications.

The participants realized the importance of the benchmarking activities in the RoCKIn project: teams actively contributed to log data of their robots with the tools provided by the RoCKIn organizer. In order to make logging task easier, some participants suggested to maintain unchanged the specifications and the API of the logging tools until the end of the project.

Generally, the participants were satisfied of their outcomes in the RoCKIn Task and Functionality Benchmarks: only one participant found some proposed task too difficult while some teams, due to the lack of time, did not focus on any Functionality Benchmark.

6 APPENDIX A

6.1 TEAMS AND PARTICIPANTS LIST

@Home Track (Teams)

Team Name	Name	Surname	Main institution (University)
BARC	Lenka	Mudrova	University of Birmingham
BARC	Manolis	Chiou	University of Birmingham
BARC	Sean	Bastable	University of Birmingham
BARC	Joshua	Smith	University of Birmingham
BARC	Marco Antonio	Becerra Pedraza	University of Birmingham
Homer@UniKoblenz	Viktor	Seib	University of Koblenz and Landau
Homer@UniKoblenz	Raphael	Memmesheimer	University of Koblenz and Landau
Homer@UniKoblenz	Arne	Peters	University of Koblenz and Landau
Homer@UniKoblenz	Markus	Bonse	University of Koblenz and Landau
Watermelon	Francisco J.	Rodríguez Lera	University of León
Watermelon	Victor	Rodríguez Mendez	University of León
Watermelon	Fernando	Casado García	University of León
Watermelon	Ruben	Rodríguez Fernández	University of León
SocRob	Rodrigo	Ventura	Instituto Superior Técnico university
SocRob	André	Mateus	Instituto Superior Técnico university
SocRob	Pedro	Resende	Instituto Superior Técnico university
SocRob	Maria	Braga	Instituto Superior Técnico university

@Work Track (Teams)

smARTLab@Work	Daniel	Claes	University of Liverpool
smARTLab@Work	Bastian	Broecker	University of Liverpool
smARTLab@Work	Karl	Tuyls	University of Liverpool
UvA@Work	Celeste	Kettler	Universiteit van Amsterdam
UvA@Work	Tessa	Bouzidi	Universiteit van Amsterdam
UvA@Work	Victor	Milewski	Universiteit van Amsterdam
UvA@Work	Valerie	Scholten	Universiteit van Amsterdam
UvA@Work	Arnoud	Visser	Universiteit van Amsterdam
RobOTTO	Kai	Seidensticker	Otto-von-Guericke Magdeburg
RobOTTO	Juliane	Höbel	Otto-von-Guericke Magdeburg
RobOTTO	Nils	Harder	Otto-von-Guericke Magdeburg
RobOTTO	Hauke	Petersen	Otto-von-Guericke Magdeburg
RobOTTO	Stefan	Wilske	Otto-von-Guericke Magdeburg
wits@Work	Iryna	Ivanovska	Bonn-Rhein-Sieg University of Applied Sciences
wits@Work	Azin	Ghaheri Sharghi	Bonn-Rhein-Sieg University of Applied Sciences
wits@Work	Maryam	Matin	Bonn-Rhein-Sieg University of Applied Sciences
wits@Work	Nour	Soufi	Bonn-Rhein-Sieg University of Applied Sciences
wits@Work	Padmaja	Kulkarni	Bonn-Rhein-Sieg University of Applied Sciences
SPQR@Work	Marco	Imperoli	University of Rome "Sapienza"
SPQR@Work	Roberto	Capobianco	University of Rome "Sapienza"
SPQR@Work	Jacopo	Serafin	University of Rome "Sapienza"
SPQR@Work	Emanuele	Bastianelli	University of Rome "Sapienza"

@Home Track (individuals)

(Individual)	Conor	McGinn	Trinity College Dublin
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@Work Track (individuals)

(Individual)	Mark	Culleton	Trinity College Dublin
(Individual)	Alireza	Saeidi Shahrivar	Amirkabir University of Technology

7 APPENDIX B

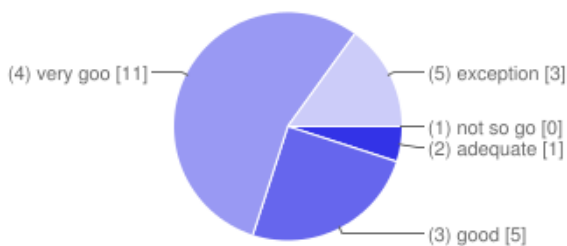
7.1 ROCKIN CAMP 2015 FEEDBACK SURVEY

Part of the tasks related to the Camp management involves assessing the quality of the activities related to the Camp. A satisfaction questionnaire has been designed, covering every aspect of the camp.

Below is reported a set of tables comprehensive of all the questionnaire's questions and the feedback provided by the participants.

Organization

Web site, help in case of problems, travel arrangements, ...



(1) not so good	0	0%
(2) adequate	1	5%
(3) good	5	25%
(4) very good	11	55%
(5) exceptional	3	15%

Comments

All fine, but still waiting on the reimbursement.

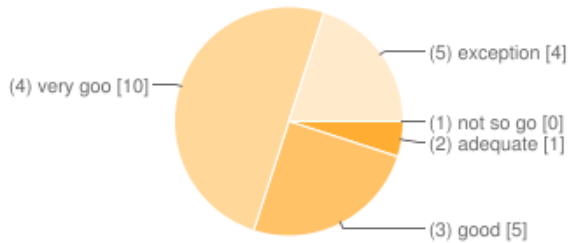
It is worth to mention that the numerous e-mails were of a great help.

Organisation made up for the "middle of nowhere" camp location.

The general schedule was given in advance, but it would have been nice if the details would have been filled in the weeks before the event (name of presenters, abstract of the talks, dependencies and overview of the general hub and logging tasks, etc). With this information the camp could have been more efficiently prepared.

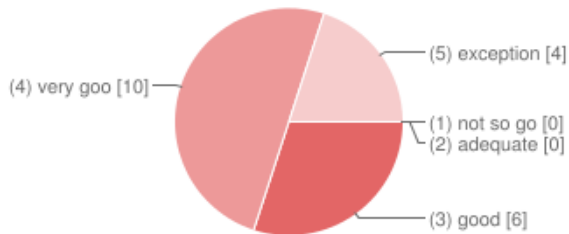
Website was slow to be updated prior to the camp. For example there was no materials uploaded to @work section in the 2015 wiki until the camp had begun.

Camp location at the ECHORD++ RIF facility



(1) not so good	0	0%
(2) adequate	1	5%
(3) good	5	25%
(4) very good	10	50%
(5) exceptional	4	20%

Camp schedule, @Home/@Work arenas, team areas, ...



(1) not so good	0	0%
(2) adequate	0	0%
(3) good	6	30%
(4) very good	10	50%
(5) exceptional	4	20%

Comments

The poor wifi was a big problem the first day, and prolonged the setup times of our robot. After that the wifi was ok, but could have been faster. The @work arena was good, but towards the end of the week got very busy which made it difficult to run tests. Would be preferable to have access to the facility earlier / later

The internet connection was so bad

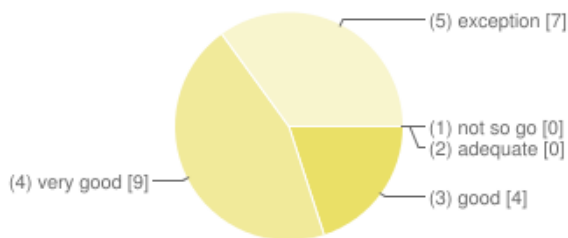
I liked that we got more freedom to do, what we need to do. We weren't pushed to code specific things.

Facility good, but quite far away from other cities

I would have preferred if there was more time available in the Facility, as the forced 2 hour lunch breaks and the early closing time strongly limited the productivity of our team.

@Home team area was not so nice. However, it was great to be allowed to work inside the arena which was very good.

Localities: quality of accommodation, meals, ease of access, social dinner, ...



(1) not so good	0	0%
(2) adequate	0	0%
(3) good	4	20%
(4) very good	9	45%
(5) exceptional	7	35%

Comments

accommodation was ok, meals and social dinner was exceptional

I liked the hotel next to the venue. The social dinner was really perfect! And the trip to Pisa as well!

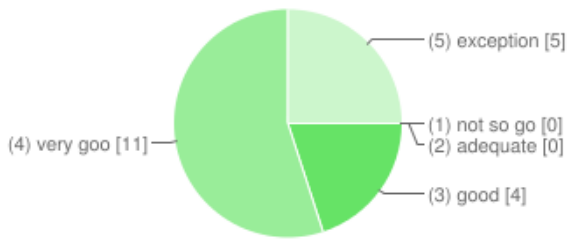
The shower in our room (215) messed a lot, and it was difficult to have a fixed temperature, or even any hot water at all.

Quality of accommodation - problem with hot water in the morning. Social dinner was exceptional!

Lunch was very good, a bit more hearty options for breakfast would have been nice.

Accommodation and meals were great throughout the week. I would suggest that allergies / food preferences be acquired before people arrive so that they can be relayed to the cooks. This would save food being sent back. Social Dinner was a great experience.

Organization overall



(1) not so good **0** 0%
 (2) adequate **0** 0%
 (3) good **4** 20%
 (4) very good **11** 55%
 (5) exceptional **5** 25%

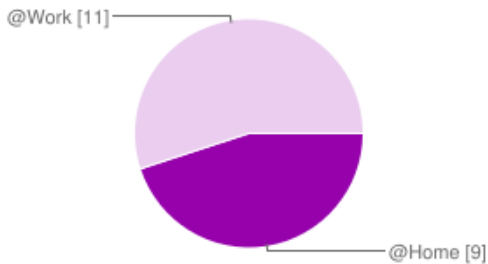
Comments

Organisation was great, although there was a few hiccups on the first day which delayed progress.

You made a great effort hosting the event and providing us with all the facilities to work on our robots. Thank you very much!

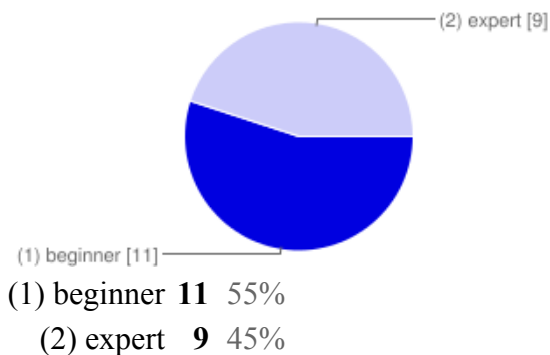
Camp activities

Selected track

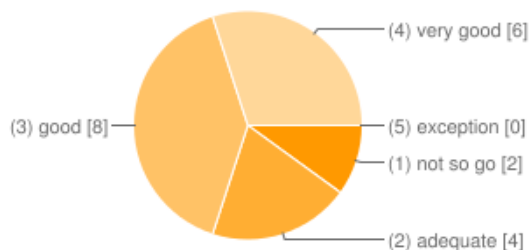


@Home **9** 45%
 @Work **11** 55%

Participant level



Information included in the RoCKIn Wiki



(1) not so good **2** 10%
 (2) adequate **4** 20%
 (3) good **8** 40%
 (4) very good **6** 30%
 (5) exceptional **0** 0%

Comments

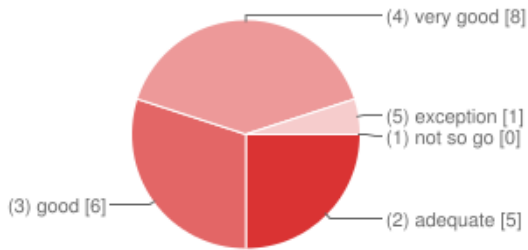
Gave my bachelor students access to the topics of 2014 camp. For a long time it was on the wiki not even clear if we should concentrate on the 2014 competition tasks, or that new challenges would be presented

There was no information on the changes between 2014 and 2015 until the very last moment which caused us to prepare for the deprecated rules/tasks. A Big red warning that the rules were still subject to change would've been nice.

The camp had a schedule that was not followed, and the slots for the TBMs and FBMs were strange.

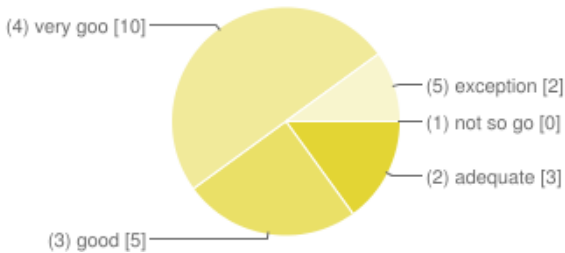
As noted earlier, could have been updated sooner, which would have allowed me to better prepare.

Ref-box/Central Factory Hub: introduction and practice



(1) not so good **0** 0%
 (2) adequate **5** 25%
 (3) good **6** 30%
 (4) very good **8** 40%
 (5) exceptional **1** 5%

Ref-box/Central Factory Hub: outcome of the camp



(1) not so good **0** 0%
 (2) adequate **3** 15%
 (3) good **5** 25%
 (4) very good **10** 50%
 (5) exceptional **2** 10%

Comments

The interface was nicely presented, but it would have been nice if an example was given how to use it (maybe in a second round, after the teams themselves have tried to access the hub).

Still some work in progress, not everything worked.

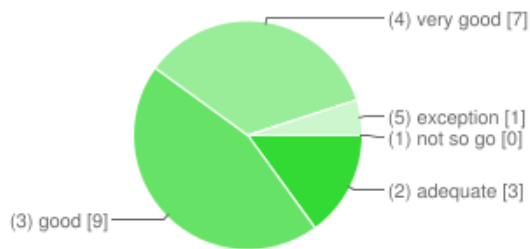
The CFH introduction was a bit bumpy, as it was the first time this year. But since we already knew the system as the refbox from logistics the implementation didn't take all too long.

The basic connection (beacon message) was introduced in a group session, but other CFH communication was not stressed until the second last day. These were left to each individual team, but I think it would have been better to discuss in the group session.

Our system was working since Toulouse, so nothing has changed in the camp for us

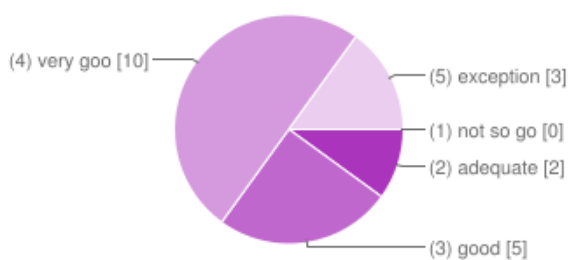
The info described about it was not helpful to communicate with the ref box.

Benchmarking and logging: introduction and practice



(1) not so good **0** 0%
(2) adequate **3** 15%
(3) good **9** 45%
(4) very good **7** 35%
(5) exceptional **1** 5%

Benchmarking and logging: outcome of the camp



(1) not so good **0** 0%
(2) adequate **2** 10%
(3) good **5** 25%
(4) very good **10** 50%
(5) exceptional **3** 15%

Comments

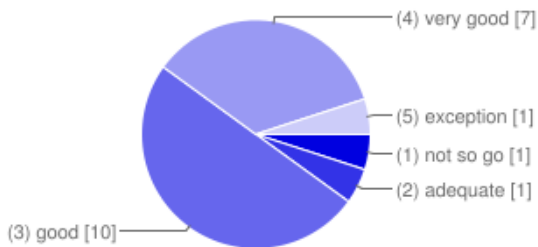
it will be nice to have documentation at one time, and not changing during implementation :) :)

Packages were not compatible in Hydro, but this wasn't too difficult to overcome. Took a long time to modify the tf frames, so perhaps this part could be improved.

I think that one of the problems was that the specification was not clear before the November event, and now seems that this has been solved. Hopefully this will be maintained for the ext event.

The example code was not really optimal as nearly everything was hardcoded for @Home, we essentially had to rewrite most of it. As already mentioned before a warning/message on the Wiki regarding the changes was missing causing us to implement the wrong system, as the content of the Wiki regarding Logging wasn't updated when Mateo introduced the Logging and referred to the wiki for more information.

Task benchmarks: outcome of the camp



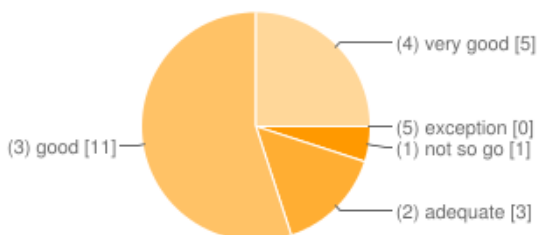
(1) not so good	1	5%
(2) adequate	1	5%
(3) good	10	50%
(4) very good	7	35%
(5) exceptional	1	5%

Comments

Task benchmarks are very difficult and require a combination of a lot of different subsystems. I believe this needs to be the case, but it meant that most teams could not complete / attempt the majority of the tasks.

Nothing has changed to us

Functionality benchmarks: outcome of the camp



- (1) not so good **1** 5%
- (2) adequate **3** 15%
- (3) good **11** 55%
- (4) very good **5** 25%
- (5) exceptional **0** 0%

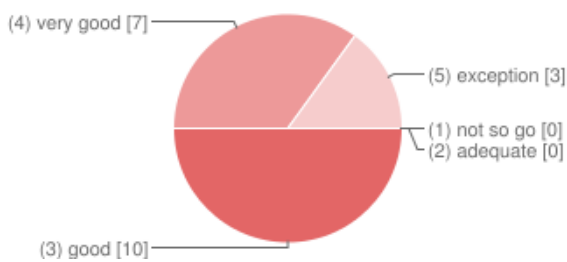
Comments

Not participated

There was some confusion regarding the rules of FBM1 and FBM3.

We didn't focus on this.

Overall camp outcome



- (1) not so good **0** 0%
- (2) adequate **0** 0%
- (3) good **10** 50%
- (4) very good **7** 35%
- (5) exceptional **3** 15%

Comments

Thank you for everything! We had a great time in Peccioli, and we will be working hard these months to prepare for Lisbon.

Found the camp hugely beneficial both in terms of knowledge development and networking. I learnt a lot and have a much clearer idea of the competition which will hopefully stand to me in Lisbon. Therefore, thanks for accepting my application, and for a well organised, thoroughly enjoyable week.