ECER 2017 PROCEEDINGS AND REPORT [DELIVERABLE 3.2]

ER4STEM - EDUCATIONAL ROBOTICS FOR STEM

The ER4STEM project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 665972

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1 EXECUTIVE SUMMARY

1.1 ROLE/PURPOSE/OBJECTIVE OF THE DELIVERABLE

This document presents the preparations, description and proceedings of the European Conference on Educational Robotics (ECER) 2017, which took place from 24th to 28th April in Sofia, Bulgaria.

1.2 RELATIONSHIP TO OTHER ER4STEM DELIVERABLES

This document will be followed by one further deliverable (D3.3) in WP3 that contain the proceedings of the ECER issues of 2018. Furthermore, it is connected with D3.4, which will contain the final conference plan as outcome of the project ER4STEM.

1.3 STRUCTURE OF THE DOCUMENT

Section 2 describes the preparations for ECER 2017. Section 3 reports on the schedule and lists the participating teams. The results as well as talk topics of ECER 2017 are presented in Section 4. The remaining sections give a summary and conclusion and provide a glossary as well as references. The Call for Papers for ECER 2017 is attached in Section 9. Furthermore, the printed conference proceedings are attached in Section 10.

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2 PREPARATION FOR ECER 2017

The preparation phase was split into two phases: Phase 1 from September to December 2016 and Phase 2 from January to April 2017.

Performed tasks in Phase 1:

- Setup of ECER Website: A website was set up within the PRIA website for informing about the conference. It also included a form for allowing the registration of participants. Later, the Call for Papers was added and a link to a paper submission tool (Open conference tool) was provided.
- Finding sponsors: As ECER itself was covered by ER4STEM, the intention was to find sponsors that would support hiring an equipped place for holding the conference and material costs of participating teams. Each participating country and the teams searched for sponsors on their own.
- Organization of venue: The team of ESI CEE made a research for an appropriate venue in Sofia. The teams of ESI CEE and PRIA decided that the most appropriate place is a hall in the new built "Experimentarium museum" in Sofia Tech Park, a technology and innovation park, built with the financial support of ERDF and Bulgarian government. Sofia Tech Park provided a large hall (850 m^2) that was used for the tournaments as well as for the working places of the participants. The same hall was used for the talks by the students and by researchers.
- Advertise participation: E - Mails were sent out to participants of previous issues of ECER. Also ER4STEM partners contacted their school partners to advertise for participation.
- Link to WP2: First planning of Botball workshop.

Performed tasks of Phase 2:

- Participation at Botball Instructors' Summit at the KISS Institute of Practical Robotics (KIPR), Oklahoma, USA: Dr. Gottried Koppensteiner of PRIA participated at the Botball Instructors' Summit to obtain information about the season's rules as well as about the current Botball set. Furthermore, details regarding the registration process and shipment of robotic sets to the participants were clarified.
- Delivery of Botball sets: PRIA arranged the delivery of Botball sets for all Austrian Botball teams and supported the delivery process for the teams of other countries if demanded. Botball sets are required if a team wants to participate in the official Botball tournament. Each set comprises two robotics controllers, an iRobot by Create, as well as metal and Lego parts.
- Contact with participants: PRIA, ESI CEE and other country organizers were in regular contact with the participants of ECER for supporting in various matters ranging from the writing of papers to technical issues with the robotics sets.
- Link to WP2: One Botball workshop at PRIA and one at ESI CEE were prepared and carried out. Information from the Botball Instructors' Summit was passed on to the Austrian and Bulgarian teams. The Bulgarian teams as well as Maltese team received this information from PRIA using a skype connection.
- Planning of tournaments: Four tournaments were envisaged for ECER 2017:
    - Botball tournament: Botball is an educational robotics program that focuses on engaging middle and high school aged students in team - oriented robotics

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competitions. The Botball program has been active since 1998 and features a robotics curriculum which focuses on designing, building and programming a pair of autonomous robots. Teams use a standardized kit of materials and document the process. All materials in the kits are exactly the same for every team around the world, so there is no unfair advantages. Only Botball sets are allowed in this tournament and the game rules are provided by KIPR during the Botball Instructors' Summit. KIPR develops the annual rules in the time before this summit. The tournament at ECER represents the official European Championship in Botball.

  - Open tournament: The Open tournament uses the same rules and game table as in the Botball tournament. However, teams with any robotics set are allowed to participate.
  - Aerial tournament: This tournament does not require a game table but a setting for using drones. Aim of this year's tournament was to land the drone at different zones in the game area. Specific rules applied for the robot construction.
  - Underwater tournament: This trial workshop/tournament used a small 3D-printed submarine developed by a student employed by PRIA. The Hedgehog controller (further developed in ER4STEM WP5) was used for controlling the vessel. Aim of the tournament was to have the submarine collect small balls and avoid obstacles while doing so.

- Organisation of material for ECER: Three game tables and underpinning for them were planned for ECER. Two of them were provided by PRIA (using ER4STEM funding) and one was provided by ESI CEE (using ER4STEM funding). A cage for the aerial tournament was assembled by ESI CEE team using materials financed within the budget of the ER4STEM project. Name tags and printed handouts for the ECER participants were prepared. Spare parts for Botball (in case material of participants breaks) were organised. T-shirts were designed that could be obtained by the participants. EU funding was promoted and visualized in advertising and information materials.
- Organization of invited talks: ECER was carried out in accordance with this year's issue of the International Conference on Robotics in Education (RiE). The RiE is a conference for researchers being active in the field of educational robotics. The RiE was established in 2010 in the frame of the EU project Centrobot and has been organised every year since then. As RiE 2017 was carried out in parallel to ECER 2017, the high school students were able to visit the sessions of RiE. Besides, two talks by researchers were organised specifically for ECER 2017. Also the Hedgehog controller further developed within ER4STEM was presented in a talk at ECER 2017.
- Submission and review of student papers: 19 papers were submitted by high school students with some of them having sole authors and others by groups of authors. All papers were reviewed by at least two researchers and 12 papers were selected to be presented. The best 4 of these 12 papers were chosen to be presented in a special session at RiE in order to have also the actual researchers as audience.
- Detailed planning of ECER schedule: According to the accepted papers, the invited talks and the planned tournaments, the ECER schedule was created (see Section 3.1).
- Planning of staff: PRIA staff was planned for manning the registration desk as well as a support desk. Moreover, PRIA employees acted as judges and fulfilled various other tasks during ECER. ESI CEE staff and Bulgarian participants in the conference organized the logistics and materials provision for the conference.

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- Preparation of invitation letters: The participants from Iran and Kuwait needed Visa for entering Bulgaria, which required invitation letters. Also invitation letters were issued for other participants when required.

3 DESCRIPTION OF ECER 2017

3.1 SCHEDULE

Monday, April 24th		
13:00 - 14:00	Registration	
14:00 - 16:30	Open Practice: all tournaments	
16:30 - 17:00	Opening Ceremony by Dr. Gottfried Koppensteiner Opening Talk by Georgi Gerginov, Naxex	
Tuesday, April 25th		
08:00 - 11:00	Open Practice: all tournaments	Onsite Presentations
11:00 - 12:00	Student Talks: Robotics technology & methods	
12:00 - 13:00	Lunch Break	
13:00 - 17:00	Seeding Rounds: all tournaments	
17:00 - 18:00	Invited Talk by Prof. David Miller	
Wednesday, April 26th		
08:00 - 11:00	Open Practice: all tournaments	Onsite Presentations
11:00 - 12:00	Student Talks: Botball components/Robots in agriculture	
12:00 - 13:00	Lunch Break	
13:00 - 17:00	Botball + Open: Double Elimination	Open Practice: Aerial, Underwater
17:00 - 18:00	Invited Talk by Prof. Anthony J. Lattanze	
Thursday, April 27th		
08:00 - 12:00	Finals: Open, Aerial, Underwater	Open Practice: Botball
12:00 - 13:00	Lunch Break	
13:00 - 14:00	Student Talks: ECER Students at RiE	
14:00 - 17:00	Open Practice: Botball	
17:00 - 18:00	Dinner Break	
18:00 - 20:00	Open Practice Disco	
Friday, April 28th		
08:00 - 11:00	Botball Finals & Alliances	
11:30 - 13:00	Awards Ceremony: Underwater, Aerial, Open, Botball	
13:00 - 14:00	Lunch	

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3.1 PARTICIPANTS

ECER 2017 had participants from the following countries:

- Albania
- Austria
- Belgium
- Bulgaria
- Malta
- Kuwait
- Poland

Also participants from Iran registered for the conference but did not show up.

21 teams participated in the Botball competition having the following team names:

Country	Tournament / Participation	Team Name	School / Organization
Albania	Botball® Tournament & Paper Submission	**Team Albania**	HTL Shkoder
Austria	Botball® Tournament & Paper Submission	**Talentehaus**	Amt der NÖ Landesregierung
Austria	Botball® Tournament & Paper Submission	**Team Curiosity**	HTBLVA Spengergasse
Austria	Botball® Tournament & Paper Submission	**Wuggei's Buam**	HTL Saalfelden
Austria	Botball® Tournament & Paper Submission	**Bad Grades, But Smart!**	HTL Saalfelden
Austria	Botball® Tournament & Paper Submission	**HTL Saalfelden 4E**	HTL Saalfelden
Austria	Botball® Tournament & Paper Submission	**robot0nfire**	HTL Wiener Neustadt
Austria	Botball® Tournament & Paper Submission	**items**	HTL Wiener Neustadt
Austria	Botball® Tournament & Paper Submission	**Private Void**	HTL Wiener Neustadt
Austria	Botball® Tournament & Paper Submission	**DarudeSalzsturm**	TGM
Austria	Botball® Tournament & Paper Submission	**SimpleX**	TGM
Austria	Botball® Tournament & Paper Submission	**roboSpabs**	TGM
Belgium	Botball® Tournament & Paper Submission	**AIS**	Antwerp International School
Bulgaria	Botball® Tournament & Paper Submission	**TUES Bulgaria**	TUES
Bulgaria	Botball® Tournament & Paper Submission	**Vendom Genezis**	Vocational High School of Electronics "John Atanasoff"!
Kuwait	Botball® Tournament & Paper Submission	**Al ru'ya Bilingual School**	Al ru'ya Bilingual school
Malta	Botball® Tournament & Paper Submission	**AloyBotics**	St Aloysius College, Malta/Across Limits
Poland	Botball® Tournament & Paper Submission	**GG Robot Team**	Franciszek Leja State School
Poland	Botball® Tournament & Paper Submission	**Power Control**	Gimnazjum im. ks. Jana Twardowskiego w Chwiramie
Poland	Botball® Tournament & Paper Submission	**Mechanical Unicorns**	Lower Secondary School of Władysław Jagiello in Leżajsk
Kuwait	Botball® Tournament & Paper Submission	**RBS girls**	Al-Ru'ya Billingual School

13 teams registered for the Open tournament (but only 11 then participated):

Country	Tournament / Participation	Team Name	School / Organization
Austria	Open Tournament	**s0urce**	HTBLuVA Wiener Neustadt
Austria	Open Tournament	**robotX++;**	TGM
Austria	Open Tournament	**Project**	TGM
Austria	Open Tournament	**unic**	HTL Wiener Neustadt
Bulgaria	Open Tournament	**Atelier4Robotics**	Atelier4Robotics
Malta	Open Tournament	**AloyBotics 2**	St Aloysiuc Colle, Malta/Across Limits
Poland	Open Tournament	**Optimus**	Lower Secondary School of Władysław Jagiełło in Leżajsk
Poland	Open Tournament	**Extreme**	Lower Secondary School of Władysław Jagiełło in Leżajsk
Poland	Open Tournament	**Assasin of Robots**	Lower Secondary School of Władysław Jagiełło in Leżajsk
Poland	Open Tournament	**GG Open**	Franciszek Leja State School
Albania	Open Tournament	**AlbaniaRoboticsTeam**	HTL Shkoder
Kuwait	Open Tournament	**Al ru'ya Bilingual school**	Al ru'ya Bilingual school of kuwait
Austria	Open Tournament	**TLB**	tgm

8 teams registered for the Aerial tournament (but only 4 then participated):

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Country	Tournament / Participation	Team Name	School / Organization
Austria	Aerial Tournament	**3DHIT Areal**	TGM
Austria	Aerial Tournament	**Toxic Engineers**	TGM
Austria	Aerial Tournament	**Talentehaus Aircrafts**	Talentehaus NÖ
Kuwait	Aerial Tournament	**CTS Kuwait**	College of technological studies, PAAET, KUWAIt
Iran	Aerial Tournament	**ARURA**	Islamic Azad University
Iran	Aerial Tournament	**Horizon**	Islamic Azad University, Khomeini Shahr Branch
Poland	Aerial Tournament	**I can fly!**	Lower Secondary School of Władysław Jagiełło in Leżajsk
Poland	Aerial Tournament	**GG Aerial**	Franciszek Leja State School

2 teams participated in the Underwater tournament:

- Talentehaus from Austria
- Team Albania from Albania

Furthermore, as the International Conference on Robotics in Education (RiE) was hosted in parallel to ECER, the attendants of RiE had the chance to visit ECER. As a consequence, more than 55 international visitors from the following countries were present at ECER:

- Austria
- Bulgaria
- Belgium
- Croatia
- Czech Republic
- Finland
- Germany
- Greece
- Israel
- Italy
- Malta
- Netherlands
- Poland
- Russia
- Slovakia
- Slovenia
- Spain
- Turkey
- UK
- USA

Furthermore, several classes from middle and primary schools of Sofia took the chance of visiting ECER. This allowed the young pupils to see possibilities of engagement in STEM and robotics in particular.

4 PROCEEDINGS OF ECER 2017

4.1 STUDENT PAPERS

19 papers were submitted by the Botball teams. They were reviewed by researchers (mostly PRIA staff) and 12 papers were chosen to be presented at ECER. The best 4 papers were chosen to be presented in a special session at RiE so that the high school students had the possibility to show their work also to

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the international researchers attending RiE. The other 8 papers were chosen to be presented during the student paper sessions at ECER.

Papers in Session 1: Robotics technology & methods (April 25th 11:00 - 12:00)

Title	Authors
Sensor based one-way communication in multiple mobile robot systems: an experiment	Ida Hönigmann, Manuel Eiwen, Matthias Guzmits, Cornelius Kahofer, Peter Kain, Christoph Schnabl
Mathematics Tools in Analysing Indication of the Sensors	Joanna Upchurch, Tymoteusz Typrowicz
Referencing your robot on the gameboard	Michael Eder, Florian Russegger
Software implementation: Software usage for sensor, motor and camera optimisation	Sarah Breit, Julia Pöschl, Kacper Urbaniec, Barbara Wiedermann

Papers in Session 2: Botball components/Robots in agriculture (April 26th 11:00 - 12:00)

Title	Authors
Component limits – Evaluations on sensor reliability and overall accuracy	Samuel Vergeiner
Safety Measurements and Quality Issues in Botball	Bernd Veidinger, Linda Maschek, Matthias Grill, Joel Klimont, Alexander Lampalzer, Konstantin Lampalzer
How robots will revolutionize agriculture	Simon Feichter, Karl Heinz Pilz
The Use of Hydroponic Robots to Promote Sustainable Agriculture	Abueljebain Hiba Hisham, Sara Hani

Papers in Session: ECER Students at RiE (April 27th 13:00 - 14:00)

Title	Authors
fl0w - a development environment for the KIPR Wallaby	Philip Trauner, Christoph Heiss, Sebastian Schaffler, Nico Kratky, Nico Leidenfrost, Christine Zeh, Sascha Zemann
MissionEDU - Expanding Educational Robotics	Daniel M Swoboda, Markus Pinter
BOTBALL REVOLUTION - Print your own Parts	Viktoria Zach
Robotics for Sustainable Agriculture in Aquaponics	Dahi Al-Khatib, Hazem Al beltaji

4.2 TALKS GIVEN BY RESEARCHERS

Speaker: Anthony Lattanze, Director of the Masters of Software Engineering programs for the Institute for Software Research (ISR) at Carnegie Mellon University (CMU), Pittsburgh, USA

Talk: So you want to be a Robotics Engineer?

Duration: 60 minutes

Abstract: So, you want to be a robotics engineer? Do you think you know what a robot is? Do you know what a robotics engineer does? What does a robotics engineer know and what training do they need?

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Do you know the answers to these questions? Don't be so sure… the answers to these questions may surprise you! There is a certain romantic, Hollywood image associated with the solo robotics engineer working a basement laboratory building fantastic machines. But building real industrial robots is a challenging endeavor, performed by teams of engineers with highly diverse skill sets.

The modern robotics engineering discipline is in high demand and robotics is considered a growth industry in its early infancy stages. Robotics engineers may work in a variety of domains such as agricultural, military, medical, and manufacturing industries, among others. They will spend time designing and building new robots, improving existing robots, installing, repairing, and maintaining robots and the associated support infrastructure.

Before you build your first Iron Man suit and fly through the air, you might want to listen to this talk. I will attempt to bring some clarity to the robotics engineering discipline based upon my own industry experience. I will attempt to clarify…

- What is considered a robot today – it's not as obvious as it may seem
- The roles and specializations that a robotics engineer may have in industry
- What a kind of background and training a robotics engineer needs
- What a robotics engineer can expect to work on in the future

Speaker: David Miller, Director of the Masters of Software Engineering programs for the Institute for Software Research (ISR) at Carnegie Mellon University (CMU), Pittsburgh, USA

Talk: Student Built Planetary Rovers for Tournaments & Research

Duration: 60 minutes

Abstract: Starting in Fall 2015, a dozen undergraduate engineering students: designed, built and fielded a tele-operated rover to compete in the NIA/NASA Robo-Ops Competition held at the Johnson Space Center in Houston Texas in May of 2016. Controlling the robot from Norman OK, the team won the competition and set a new course record. The robot has since been modified and is now being used for fundamental research in teleoperation. This talk will describe the robot and how it was used at Robo-Op, the research questions for the current study, and the work the student team is doing for this June's Mars Society University Rover Contest.

4.3 TOURNAMENT RESULTS

4.3.1 BOTBALL

A team's overall score for the Botball tournament was composed of three equal parts:

- Score achieved in the seeding rounds
- Score of the documentation (including the paper)
- Achieved rank in Double Elimination

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Tournament	Team ID	Team Name	Seeding 1	Seeding 2	Seeding 3	Seeding Rank	Seeding Score	Doc P1	Doc P2	Doc P3	Onsite	Doc Score	Doc Rank	Paper	Paper Score	Paper Rank	DE Rank	DE Score	Overall Score	Overall Rank
BOTBALL	17-0188	Private Void	0	35	7	12	0.3453947	100	99	100	97.0	0.98788	3	85.0	0.850	7	8	0.65	1.91433474	8
	17-0239	TUES Bulgaria	2	5	0	18	0.1138158	100	96.9	100	95.0	0.97576	6	43.5	0.435	18	16	0.25	1.06919579	15
	17-0243	DarudeSalzsturm	2	44	49	7	0.5424812	0	72.4	50	74.0	0.48920	18		0.000	19	20	0.05	0.8370812	18
	17-0262	Talentehaus	6	181	16	4	0.6745301	100	100	100	####	1.00000	1	99.0	0.990	1	6	0.75	2.41953008	3
	17-0361	Vendom Genezis	0	0	24	14	0.2670113	100	61	100	78.0	0.81700	15		0.000	19	16	0.25	0.92551128	17
	17-0368	Mechanical Unicorns	0	1	0	19	0.0751880	100	87.9	100	92.0	0.93964	12	69.7	0.697	11	20	0.05	0.94350797	16
	17-0379	AIS	0	0	1	19	0.0751880	0	0	0	67.0	0.20100	20		0.000	19	16	0.25	0.42568797	19
	17-0381	AloyBotics	0	8	0	17	0.1515038	0	0	50	82.0	0.29600	19		0.000	19	20	0.05	0.34950376	20
	17-0385	Team Curiosity	0	12	9	15	0.2289474	100	100	100	94.0	0.98200	4	62.5	0.625	13	12	0.45	1.48244737	10
	17-0536	Al ru'ya Bilingual School	6	5	23	13	0.3054511	100	100	100	94.0	0.98200	4	88.0	0.880	5	20	0.05	1.28645113	11
	17-0538	RBS girls	33	50	40	8	0.5044173	100	100	100	88.0	0.96400	8	84.0	0.840	9	12	0.45	1.85641729	9
	17-0596	Wuggei's Buam	100	6	10	6	0.5831767	100	100	100	88.0	0.96400	8	83.0	0.830	10	4	0.85	2.33017669	5
	17-0597	HTL Saalfelden 4E	0	1	80	10	0.4277256	93	93.4	50	94.0	0.89126	14	85.0	0.850	7	8	0.65	1.94835556	7
	17-0598	Bad Grades But Smart!	0	149	10	5	0.6298872	100	100	50	96.0	0.93800	13	85.3	0.853	6	6	0.75	2.27538722	6
	17-0602	items	4	372	503	3	0.8394737	100	100	100	####	1.00000	1	99.0	0.990	1	3	0.9	2.73447368	2
	17-0603	robot0nfire	475	665	465	1	0.9642857	100	95.5	100	96.0	0.97450	7	99.0	0.990	1	2	0.95	2.89653571	1
	17-0604	Team Albania	15	36	47	9	0.4656015	100	45	50	69.0	0.69200	16		0.000	19	12	0.45	1.2616015	12
	17-0605	SimpleX	37	37	13	11	0.3889098	0	83.9	100	82.0	0.59776	17		0.000	19	12	0.45	1.13778977	14
	17-0617	roboSpabs	0	6	3	16	0.1891917	92	100	100	90.0	0.94600	11	61.0	0.610	14	16	0.25	1.21719173	13
	17-0647	GG Robot Team	485	201	400	2	0.8788534	100	100	100	88.0	0.96400	8		0.000	19	1	1	2.36085338	4

4.3.2 OPEN

A team's overall score for the Open tournament was composed of two equal parts:

- Score achieved in the seeding rounds
- Achieved rank in Double Elimination

Tournament	Team ID	Team Name	Seeding 1	Seeding 2	Seeding 3	Seeding Rank	Seeding Score	Doc P1	Doc P2	Doc P3	Onsite	Doc Score	Doc Rank	Paper	Paper Score	Paper Rank	DE Rank	DE Score	Overall Score	Overall Rank
OPEN	OP-0001	s0urce	10	54	15	3	0.6659091							49.0	0.490	17	11	0.09090909	1.24681818	4
	OP-0002	robotX++;	0	0	0	7	0.3409091							58.0	0.580	15	11	0.09090909	1.01181818	8
	OP-0003	Project	0	0	0	7	0.3409091							63.0	0.630	12	11	0.09090909	1.06181818	7
	OP-0004	unic	1	75	93	2	0.8090909							95.7	0.957	4	2	0.90909091	2.67518182	1
	OP-0007	Optimus	-1	0	0	7	0.3409091								0.000	19	3	0.81818182	1.15909091	6
	OP-0008	Extreme	0	0	-1	7	0.3409091								0.000	19	8	0.36363636	0.70454545	11
	OP-0009	Assasin of Robots	12	0	25	4	0.5734848								0.000	19	8	0.36363636	0.93712121	10
	OP-0010	GG Open	33	105	165	1	0.9545455								0.000	19	1	1	1.95454545	2
	OP-0011	AlbaniaRoboticsTeam	0	6	3	6	0.4159091								0.000	19	6	0.54545455	0.96136364	9
	OP-0012	Al ru'ya Bilingual school	0	0	0	7	0.3409091							57.0	0.570	16	6	0.54545455	1.45636364	3
	OP-0013	TLB	24	9	1	5	0.5022727								0.000	19	4	0.72727273	1.22954545	5

4.3.3 AERIAL

A team's overall score was calculated as the mean value of the scores of the best three rounds of that team

Tournament	Team ID	Team Name	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Total Score	Rank
			Day1								
AERIAL	AE-0002	Toxic Engineers	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10	2
	AE-0003	Talentehaus Aircrafts	14.00	0.00	0.00	0.00	60.00	0.00	1.00	37	1
	AE-0004	CTS Kuwait	8.00	1.00	0.00	0.00	0.00	0.00	3.00	5.5	3
	AE-0008	GG Aerial	0.00	1.00	2.00	6.00	1.00	0.00	1.00	4	4

4.3.4 UNDERWATER

Both participating teams (Talentehaus and Team Albania) achieved the same amount of points. This tie lead to a shared first place.

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5 SUMMARY

This deliverable describes activities during preparation and organization of the ECER 2017. Also it presents the results and outcomes of ECER 2017.

More than 200 students in 37 teams from 7 countries participated in ECER 2017 in Sofia, Bulgaria.

6 CONCLUSION / OUTLOOK – ECER 2017

This deliverable reports on the preparation and implementation of ECER 2017. In this context, it is also usable as a guidance for future issues of ECER as well as other conferences that take the ECER concept as basis.

7 GLOSSARY / ABBREVIATIONS

EC	European Commission
ECER	European Conference on Educational Robotics
ER4STEM	Educational Robotics for STEM
REA	Research Executive Agency
STEM	Science, Technology, Engineering, and Mathematics

8 BIBLIOGRAPHY

No references in this document.

9 CALL FOR PAPERS

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Practical Robotics Institute Austria | KISS Institute for Practical Robotics | eR4stem | ESI European Software Institute Center Eastern Europe | Botball WWW.BOTBALL.ORG

ECER 2017

6th European Conference on Educational Robotics

CALL FOR PAPERS

TOPICS

Help to improve Botball and Hedgehog

Autonomous Projects: Have you done a technology related (research) project? Maybe a Diploma-Project or a project based on our Hedgehog Controller? Do you have good ideas how to organize Botball at your school? Tell us about it!

Mechanical Engineering: Do you have good ideas for new parts for the Botball Kit, made of metal or 3D-printed? Explain us your ideas and underline them with 3D CAD Models in your paper!

Software Development: How to effectively use the camera? Which algorithm do you use for path planning? How do you calculate the position of robots on the table? Do you have other good ideas or implemented some good functions?

Robotics for Sustainable Agriculture: How could robots be used to promote sustainable agriculture and optimize organic farming? What problems are we facing in food production? Document your ideas!

Structure Papers as follows

- Abstract
- Introduction

(• State-of-the-Art/Literature Review)

- Concept/Design
- Implementation
- Results/Conclusion

PAPERS

Templates and submission

Submitted papers must follow the two-column format with single-spaced, ten-point font in the text according to the templates. The length of submitted papers can be at most of 5 pages including figures and references. Submit your papers as PDF here:

>> **submission17.pria.at** <<

Submission Deadline:
Apr 1, 2017 (11:59 p.m., UTC+1)
Notification of Acceptance: **Apr 13, 2017**
Final Submission Deadline: **Apr 21, 2017**

Templates: http://www.ieee.org/conferences_events/conferences/publishing/templates.html

- Authors using Microsoft Word should use the A4 template
- Authors using LaTex should include the \documentclass [conference,a4paper]{IEEEtran} option in their latex file

Follow the instructions in the HOWTO (pdf) document.

All papers undergo a review process. A selected number of papers will be carefully chosen by the program committee for interactive multimedia presentation. The presentation should be up to 10 minutes long and will be followed by a 5 min Q&A. The accepted papers will be available on the conference website. **The achieved paper score will be counted in the Botball and Open Tournament.**

Score Calculation:

(partial scores between 0 and 1)

BotballOverall = Seeding + DE + [DocScore + PaperScore] / 2
OpenOverall = Seeding + DE + PaperScore

Practical Robotics Institute Austria

PRIA im Web
www.pria.at

Alles über Botball
www.botball.org

10 PRINTED PROCEEDINGS

The ER4STEM project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 665972

CONFERENCE PROCEEDINGS

ECER 2017

6th European Conference on Educational Robotics

Sofia, Bulgaria

April 24th - 28th

Tech-Park Sofia

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Overview

Botball

The Botball Educational Robotics Program engages middle and high school aged students in a team-oriented robotics competition based on American education standards. By designing, building, programming, and documenting their robots, students reinforce their learning skills.

For more information about the American Botball Season see the Botball Webpage (www.botball.org).

ECER

The ECER is also the venue of the official regional tournament for all teams of the European Botball region. Student teams pit their robots head-to-head in a fast paced, non-destructive regional tournament. Students as well as their teachers give talks about robots, their experience with Botball and can listen to interesting talks of researchers. The tournament likewise to the official Botball tournament in the USA. The Open Tournament will be a different one.

GCER

The GCER features the International Botball Tournament. Each year students, teachers, robotics enthusiasts, and professionals from around the world gather for the annual Global Conference on Educational Robotics. Students and teachers give presentations and exchange ideas on topics that range from curriculum integration to technical aspects of robotics. Professional speakers provide inspiration and insight into their robotics-related topics of expertise. The Global Conference features the International Botball Tournament, as well as the Beyond Botball Challenge for adults.

Botball Workshop at TGM, Austria

In season 2017, the European Botball Workshop was held in tgm (Vienna Institute of Technology) in Austria.
9 teams and 83 participants attended a three day workshop and learned a lot about robotics and programming.

The European Botball Season

The Botball season starts with the PRIA-Season Kick-Off in Vienna. This event is followed by team building and registration for participating activities.

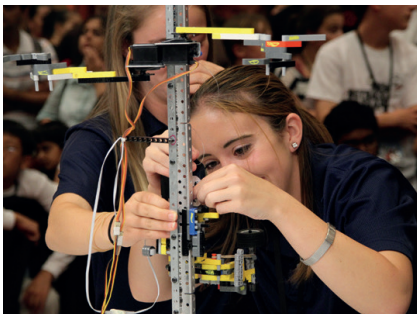
During the three-day development workshop, which is held after the winter holidays, teams will receive their complete reusable Botball® robotics kit. Teams will also learn about current tobotics technology by participating in a variety of interactive exercises and activities. the hands-on workshop covers basic robotic elements, processors, sensors, motors, programming, feedback and control, robot construction and Botball® game rules for the current season.

No previous expirience with robots or programming is requiered!

After the workshop teams have about ten weeks to develope their robots for tournament. In this time, they also need to document their development in English and submit three seperate reports for review.

About ECER

The European Conference on Educational Robotics (ECER) is an international scientific conference for students. Researchers present their findings in engaging talks, show their robots live, and partake as judges in exciting robot competitions, including the official European Regional Botball Competition and the PRIA Open. Participating teams give scientific talks about their robots, projects and experiences in English.



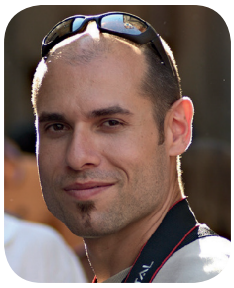
About RiE

The 8th International Conference on Robotics in Education (RiE) is aimed at the presentation and discussion of the latest results and methods in the fields of research and development in Educational Robotics. Researchers are brought together that work on new applications, the latest products, or systems and components for using robotics in schools, in universities and in informal education. The objective is to provide an insight into the state-of-the-art of Educational Robotics to participants from both academic and school education.

Committees

General Chair
Gottfried Koppensteiner

Publication Chair
Wilfried Lepuschitz

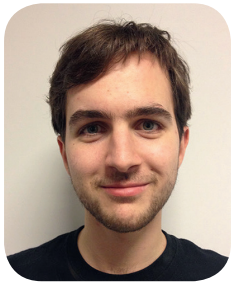


Local Organisation Chair
Christina Todorova

Infrastructure Chair
Pavel Varbanov

Educational Chair
Lisa Vittori

Competition Chair
Clemens Koza



Programm Committees

Daniel Frank
Reinhard Grabler
Christoph Hackenberger
Timon Höbert
Markus Klein
Goffried Koppensteiner
Clemens Koza
Wilfried Lepuschitz
Munir Merdan
Lisamarie Schuster
Nicole Weinert
Martin Wolff
Pavel Varbanov
Christina Todorovaa
Ivaylo Georgiev

ECER - Scheduling

Monday, April 24th		
13:00 - 14:00	Registration	
14:00 - 16:30	Open Practice: all tournaments	
16:30 - 17:00	Opening Ceremony by Dr. Gottfried Koppensteiner Opening Talk by Georgi Gerginov, Naxex	
Tuesday, April 25th		
08:00 - 11:00	Open Practice: all tournaments	Onsite Presentations
11:00 - 12:00	Student Talks: Robotics technology & methods	
12:00 - 13:00	Lunch Break	
13:00 - 17:00	Seeding Rounds: all tournaments	
17:00 - 18:00	Invited Talk by Prof. David Miller	
Wednesday, April 26th		
08:00 - 11:00	Open Practice: all tournaments	Onsite Presentations
11:00 - 12:00	Student Talks: Botball components/Robots in agriculture	
12:00 - 13:00	Lunch Break	
13:00 - 17:00	Botball + Open: Double Elimination	Open Practice: Aerial, Underwater
17:00 - 18:00	Invited Talk by Prof. Anthony J. Lattanze	
Thursday, April 27th		
08:00 - 12:00	Finals: Open, Aerial, Underwater	Open Practice: Botball
12:00 - 13:00	Lunch Break	
13:00 - 14:00	Student Talks: ECER Students at RiE	
14:00 - 17:00	Open Practice: Botball	
17:00 - 18:00	Dinner Break	
18:00 - 20:00	Open Practice Disco	
Friday, April 28th		
08:00 - 11:00	Botball Finals & Alliances	
11:30 - 13:00	Awards Ceremony: Underwater, Aerial, Open, Botball	
13:00 - 14:00	Lunch	

RiE - Scheduling

Wednesday, April 26th	
08:00-09:00	Registration
09:00-10:30	**Opening Session:** Welcome, Keynote: Prof. Anthony J. Lattanze
10:30-10:45	Coffee break
10:45-12:00	**Technical Session 1:** Artificial Intelligence, Virtual Environments and Cloud Tools
12:00-13:00	Lunch break
13:00-14:00	**Technical Session 6:** Robots as Teachers
14:00-15:40	**Technical Session 2:** Project-based Learning Approaches
15:40-16:00	Coffee break
16:00-18:00	**Technical Session 3:** Workshops, Curricula and Related Aspects #1
From 19:00	**Conference Dinner**
Thursday, April 27th	
09:00-10:10	**Invited Talks:** Keynote: Prof. Igor Verner
10:10-10:30	Coffee break
10:30-12:10	**Technical Session 4:** Comprehensive Educational Robotics Activities
12:10-13:00	Lunch break
13:00-14:00	**ECER Session:** Four talks by high school students
14:00-14:50	**Technical Session 5:** Workshops, Curricula and Related Aspects #2
14:50-15:30	**Poster Session**
15:30-16:00	Poster coffee break
16:00-18:00	**Technical Session 7:** Technologies for Educational Robotics
18:00-18:10	**Closing Session**
Friday, April 28th	
08:00-11:00	**ECER Finals**
11:30-13:00	**Award ceremony**

Prof. David Miller

Student Built Planetary Rovers for Tournaments & Research

Starting in Fall 2015, a dozen undergraduate engineering students: designed, built and fielded a tele-operated rover to compete in the NIA/NASA Robo-Ops Competition held at the Johnson Space Center in Houston Texas in May of 2016. Controlling the robot from Norman OK, the team won the competition and set a new course record. The robot has since been modified and is now being used for fundamental research in teleoperation. This talk will describe the robot and how it was used at Robo-Op, the research questions for the current study, and the work the student team is doing for this June's Mars Society University Rover Contest.

Invited Talk

April 25th 2017

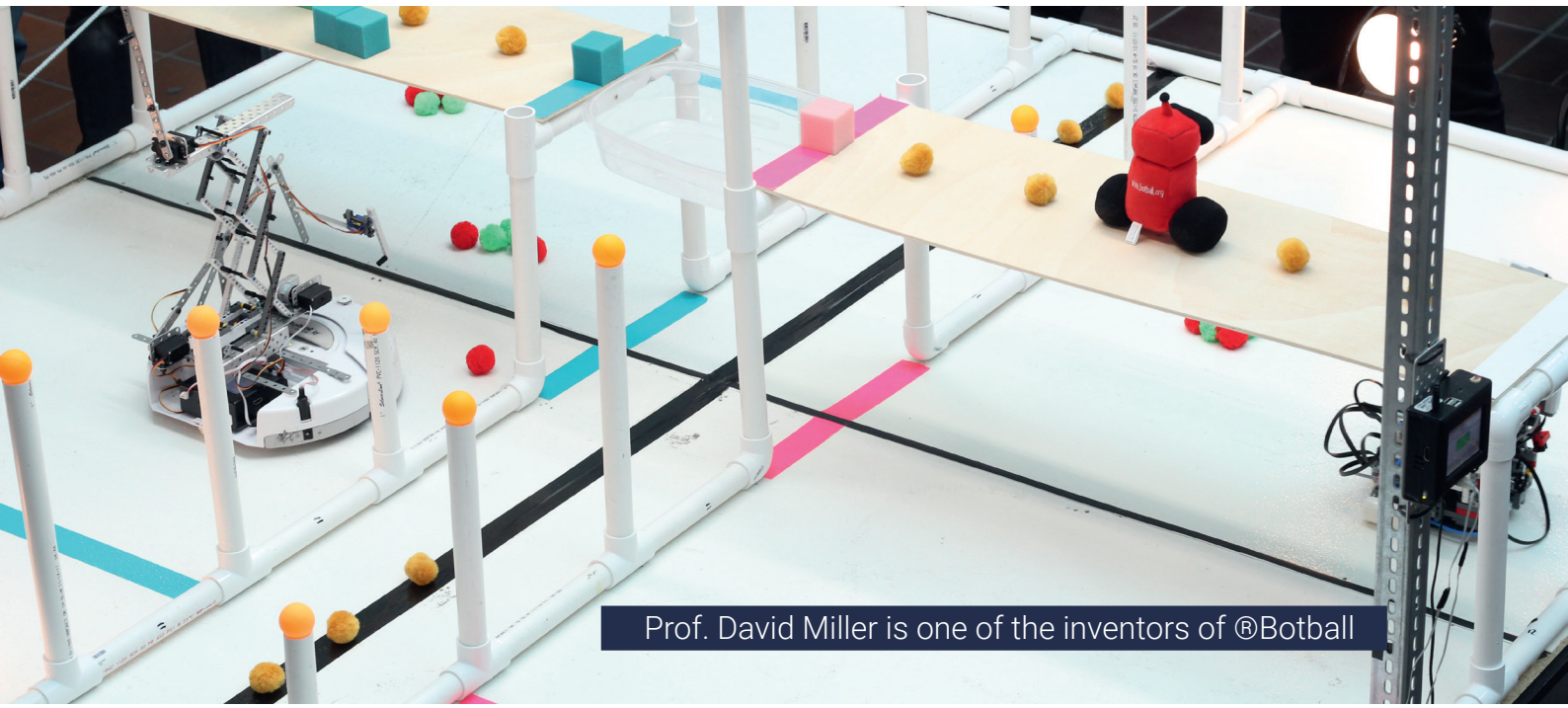
5:00pm - 6:00pm

Short Biography

Dr. David P. Miller is the Wilkonson Chair Professor at the University of Oklahoma with appoint- ments in Aerospace & Mechanical Engineering, Computer Science and Bioengineering.

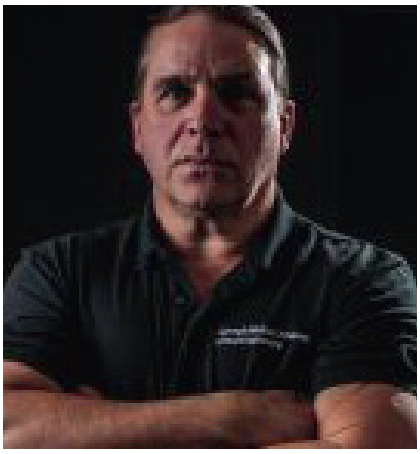
Prior to joining the University of Oklahoma, Miller was a technical group manager at NASA's Jet Propulsion Laboratory where he led the team developing rovers for the Mars Pathfinder Mission which land- ed on Mars in 1997.

He was also one of the founders of iRobot Corporation and co-founded KISS Institute for Practical Robotics (KIPR) in 1994. At KIPR he helped develop the Botball Educational Robotics Program and continues on as a Director and technical advisor.



Prof. David Miller is one of the inventors of ®Botball

Prof. Anthony J. Lattanze



Invited Talk

April 26th 2017

5:00pm - 6:00pm

So you want to be a Robotics Engineer?

Target Audience: Students interested in robotics careers.
Duration: 45 minutes (ideal)
So, you want to be a robotics engineer? Do you think you know what a robot is? Do you know what a robotics engineer does? What does a robotics engineer know and what training do they need?

Do you know the answers to these questions? Don't be so sure… the answers to these questions may surprise you! There is a certain romantic, Hollywood image associated with the solo robotics engineer working a basement laboratory building fantastic machines. But building real industrial robots is a challenging endeavor, performed by teams of engineers with highly diverse skill sets.

The modern robotics engineering discipline is in high demand and robotics is considered a growth industry in its early infancy stages. Robotics engineers may work in a variety of domains such as agricultural, military, medical, and manufacturing industries, among others. They will spend time designing and building new robots, improving existing robots, installing, repairing, and maintaining robots and the associated support infrastructure.

Before you build your first Iron Man suit and fly through the air, you might want to listen to this talk. I will attempt to bring some clarity to the robotics engineering discipline based upon my own industry experience. I will attempt to clarify…

- What is considered a robot today – it's not as obvious as it may seem
- The roles and specializations that a robotics engineer may have in industry
- What a kind of background and training a robotics engineer needs
- What a robotics engineer can expect to work on in the future

Short Biography

Anthony J. Lattanze is currently the director of the Masters of Software Engineering programs for the Institute for Software Research (ISR) at Carnegie Mellon University (CMU). He is the founder of the Masters of Embedded Software Engineering Program and was its first director for 11 years. Anthony was also a member of the Software Engineering Institute's (SEI) senior technical staff at CMU, where he led the development the Architecture Tradeoff Analysis Method (ATAM) and the Quality Attribute Workshop (QAW). He led the development of the SEI's Software Architecture Training Program and transitioned architecture design and evaluation methods into industry organizations around the world.

Anthony has spent many years as an industry consultant. His expertise is in the design and development of complex embedded software intensive systems. In addition to his work at CMU, he continues to work with organizations around the world as an architecture and systems design consultant. Much of his consultation work involves helping organizations with system designs, developing technology prototypes, providing design coaching, and evaluating designs. He has provided extensive services in the aerospace, automotive, medical, and commercial electronics domains.

Prior to Carnegie Mellon University, Mr. Lattanze was the Chief of Software Engineering for the Technology Development Group at the United States Flight Test Center at Edwards Air Force Base, CA. During his 15 year tenure at the Flight Test Center, he was involved with numerous projects as a software engineer, software and systems architect, and project manager. Anthony was involved with development and test of aircraft such as the B-2 Stealth Bomber, F-22 Advanced Tactical Fighter, Air Borne Laser Test Bed, among other projects.

Anthony's primary research interest is in the area of software and systems design – especially as it applies to embedded, software intensive systems. He is the author of numerous articles, journal papers, and textbook contributions. Anthony is the inventor of the Architecture Centric Design Method (ACDM) described in his textbook "Architecting Software Intensive Systems: A Practitioners Handbook." The ACDM has been adopted as a best design practice by numerous industry and government organizations in various domains around the world.

Student Paper Presentations

Papers in Session 1: Robotics technology & methods (April 25th 11:00 - 12:00)

Title	Authors
Sensor based one-way communication in multiple mobile robot systems: an experiment	Ida Hönigmann, Manuel Eiwen, Matthias Guzmits, Cornelius Kahofer, Peter Kain, Christoph Schnabl
Mathematics Tools in Analysing Indication of the Sensors	Joanna Upchurch, Tymoteusz Typrowicz
Referencing your robot on the gameboard	Michael Eder, Florian Russegger
Software implementation: Software usage for sensor, motor and camera optimisation	Sarah Breit, Julia Pöschl, Kacper Urbaniec, Barbara Wiedermann

Papers in Session 2: Botball components/Robots in agriculture (April 26th 11:00 - 12:00)

Title	Authors
Component limits – Evaluations on sensor reliability and overall accuracy	Samuel Vergeiner
Safety Measurements and Quality Issues in Botball	Bernd Veidinger, Linda Maschek, Matthias Grill, Joel Klimont, Alexander Lampalzer, Konstantin Lampalzer
How robots will revolutionize agriculture	Simon Feichter, Karl Heinz Pilz
The Use of Hydroponic Robots to Promote Sustainable Agriculture	Abueljebain Hiba Hisham, Sara Hani

Papers in Session: ECER Students at RiE (April 27th 13:00 - 14:00)

Title	Authors
fl0w - a development environment for the KIPR Wallaby	Philip Trauner, Christoph Heiss, Sebastian Schaffler, Nico Kratky, Nico Leidenfrost, Christine Zeh, Sascha Zemann
MissionEDU - Expanding Educational Robotics	Daniel M Swoboda, Markus Pinter
BOTBALL REVOLUTION - Print your own Parts	Viktoria Zach
Robotics for Sustainable Agriculture in Aquaponics	Dahi Al-Khatib, Hazem Al beltaji

List of Participating Teams

	Team Name	Country	Institution
Botball	Team Albania	Albania	HTL Shkoder
	Talentehaus	Austria	Amt der NÖ Landesregierung
	Team Curiosity	Austria	HTBLVA Spengergasse
	Wuggei's Buam	Austria	HTL Saalfelden
	Bad Grades, But Smart!	Austria	HTL Saalfelden
	HTL Saalfelden 4E	Austria	HTL Saalfelden
	robot0nfire	Austria	HTL Wiener Neustadt
	items	Austria	HTL Wiener Neustadt
	Private Void	Austria	HTL Wiener Neustadt
	DarudeSalzsturm	Austria	TGM
	SimpleX	Austria	TGM
	roboSpabs	Austria	TGM
	AIS	Belgium	Antwerp International School
	TUES Bulgaria	Bulgaria	TUES
	Vendom Genezis	Bulgaria	Vocational High School of Electronics „John Atanasoff"!
	Al ru'ya Bilingual School	Kuwait	Al ru'ya Bilingual school
	AloyBotics	Malta	St Aloysius College, Malta/Across Limits
	GG Robot Team	Poland	Franciszek Leja State School
	Power Control	Poland	Gimnazjum im. ks. Jana Twardowskiego w Chwiramie
	Mechanical Unicorns	Poland	Lower Secondary School of Władysław Jagiello in Leżajsk
	RBS Girls	Kuwait	Al-Ru'ya Billingual School
Open	s0urce	Austria	HTBLuVA Wiener Neustadt
	robotX++;	Austria	TGM
	Project	Austria	TGM
	unic	Austria	HTL Wiener Neustadt
	Atelier4Robotics	Bulgaria	Atelier4Robotics
	AloyBotics 2	Malta	St Aloysiuc Colle, Malta/Across Limits
	Optimus	Poland	Lower Secondary School of Władysław Jagiełło in Leżajsk
	Extreme	Poland	Lower Secondary School of Władysław Jagiełło in Leżajsk
	Assasin of Robots	Poland	Lower Secondary School of Władysław Jagiełło in Leżajsk
	GG Open	Poland	Franciszek Leja State School
	AlbaniaRoboticsTeam	Albania	HTL Shkoder
	Al ru'ya Bilingual school	Kuwait	Al ru'ya Bilingual school of kuwait
	TLB	Austria	TGM
Aerial	3DHIT Areal	Austria	TGM
	Toxic Engineers	Austria	TGM
	Talentehaus Aircrafts	Austria	Talentehaus NÖ
	CTS Kuwait	Kuwait	College of technological studies, PAAET, Kuwait
	ARURA	IRAN	Islamic Azad University
	Horizon	IRAN	Islamic Azad University, Khomeini Shahr Branch
	I can fly!	Poland	Lower Secondary School of Władysław Jagiełło in Leżajsk
	GG Aerial	Poland	Franciszek Leja State School
Underwater	Talentehaus water	Austria	Talentehaus NÖ

Directions

1 EXPERIMENTARIUM

ECER 2017, 24th - 28th April
floor 2

2 INCUBATOR

RiE 2017, 26th - 28th April
floor 3

incubator cantina

3 COLLIDER ACTIVITY CENTER

Raffy Bar & Gelato

MORRO