EUROPEAN COMMISSION
Community Research

COGNITIVE SYSTEMS
ROBOTICS
SEVENTH FRAMEWORK PROGRAMME

Collaborative project

Deliverable D8.3
Summer School Material

Project acronym:	**AIRobots**
Project full title:	**Innovative Aerial Service Robots for Remote Inspections by Contact**
Grant agreement no:	**ICT–248669**
Project web site:	**www.airobots.eu**

Due date: 31 July 2012	**Submission date: 31 July 2012**
Start date of project: 1 February 2010	**Duration: 36 months**
Lead beneficiary: UNINA	**Revision: 1**

Nature: R	**Dissemination level: PU**
R = Report P = Prototype D = Demonstrator O = Other	PU = Public PP = Restricted to other programme participants (including the Commission Services) RE = Restricted to a group specified by the consortium (including the Commission Services) CO = Confidential, only for members of the consortium (including the Commission Services)

Executive summary

This deliverable briefly describes the summer school of the project held at the ETH in Zurich from 2 to 6 July 2013. Copy of the material presented during the school (both presentations and exercises proposed to the attendees) can be downloaded from the project website www.airobots.eu under the public link download/documents/general presentations.

Contents

1 Structure and program of the school

The school was characterized by both basic theoretical lessons and research-oriented presentations. Basic theoretical lessons were given by AIRobots researchers and were focused on different aspects of aerial robotics with special emphasis toward the main topics of the project. In particular, modeling and control of aerial vehicles in presence of physical interaction with the surrounding environment, environment reconstruction through image processing, and teleoperation algorithms were the main topics addressed during the school. The research-oriented talks, aiming at presenting an updated picture of the ongoing research activities on the topic around the world, were given by "external" speakers as well as by AIRobots partners. The invited external speakers were the following:

- Prof. Vijay Kumar, University of Philadelphia
- Prof. Davide Scaramuzza, University of Zurich
- Dr. Federico Augugliaro, ETH Zurich
- Prof. Kazuya Yoshida, Tohoku University
- Dr. Paolo Robuffo Giordano, Max Planck Institute, Tübingen
- Prof. Anibal Ollero, University of Seville

Some special slots during the week were dedicated to demonstration sessions of the AIRobots prototypes and other aerial vehicles. These sessions were also used in order to illustrate some technological and practical aspects behind the construction of aerial vehicles.

A set of exercises on different theoretical aspects addressed during the week were prepared and distributed to the students. All the distributed exercises can be retrieved from the project website. In some cases the teachers of the specific topic supervised the execution of the exercises.

One of the distinguishing features of the school was the use of the AIRobots simulator described in Deliverable D4.2 (whose code is downloadable from the project website). The main functionalities of the simulator were presented during the first days of the school when the students were supported in the installation of the software on the their own laptops. The use of the software was then stimulated by asking each student to test the outcome of some exercises involving the design of control solutions on the simulator. A kind of competition among the students in order to evaluate the proposed solutions was also organized during the last day of the school with the help of the simulator.

The detailed program of the week is presented in Annex A.

2 Selection procedure and attendees

In order to select well-motivated audience, the students were asked to include in the application form a motivation letter, a CV, and an academic transcript. The deadline for the application was April 15 2012. A total number of 70 application requests were received from all over the world. An internal committee evaluated the application forms and selected 50 students who then attended the school. The maximum number of 50 external was due to logistic. Students from Europe, Japan, India, Brazil, South Korea and other countries were selected according to pure motivational and research affinity criterions. Notifications of acceptance/rejection of the applications were sent on April 22 2012. The list of names, affiliations and contacts of the selected students is presented in Annex B. The majority of the attendees were from academic institution with just a few participants coming from industry. A group picture taken during the week is shown in Figure 1.

Figure 1. A group picture of the participants to the AIRobots summer school.

3 School website

In order to advertise the school, a dedicated website was set up at the address http://www.roboticsschool.ethz.ch/airobots. Relevant information, updates and downloadable material were posted on this website. The school was also announced in the project website under the news section.

4 Social activity

The intense teaching activity was accompanied by social events specifically organized to stimulate exchange ideas and experiences among the participants. In particular, a special "BBQ session" was organized on Tuesday (July 3) evening on the roof of ETH. Furthermore, a social dinner was organized on Wednesday (July 4) evening at the foodlab of ETH. Breakfast and coffee breaks were organized all over the week at the school venue. A picture taken during the BBQ session is shown in Figure 2.

Figure 2. A relaxing moment during the "BBQ" social event on Tuesday evening.

ANNEX A: Program of the school

Time	Session	Speaker	Venue
Monday, 2 July, Modeling and Control			
8:30 - 9:00	Welcome, Introduction	*Caprari*	ML F39
9:00 - 10:30	Inspiring talk: control of fleet of UAV	*Kumar*	ML F39
10:45 - 12:00	Modeling and control, free flight	*Marconi*	ML F39
13:30 - 15:10	Modeling and control, ducted fan, rigid body model, non linear control	*Marconi, Naldi*	ML F39
15:25 - 17:00	Simulator installation + FreeFlight exercise	*Bellini, Naldi*	ML F39
Tuesday, 3 July: Modeling and Vision 1			
8:30 - 10:10	Modeling and control, CoaX, multi body model, Identification	*Konstantinos, Hürzeler*	ML F39
10:25 - 10:45	Exercise. Coax free flight	" "	ML F39
10:45 - 12:30	Visual control, + exercise	*Lippiello*	ML F39
13:30 - 14:15	2D feature and BRISK	*Leutenegger*	ML F39
14:15 - 16:00	Visual odometry (VO): History, matching, fundamentals, robustness, and applications	Scaramuzza	ML F39
16:00 - 16:30	Vision - IMU	Nikolic	ML F39
16:30 - 17:30	Exercise on VO	ASL	ML F39
18:30 - ...	BBQ on ETH roof-top		Roof-top CLA
Wednesday, 4 July: Teleoperation and Demonstrations			
8:30 - 11:00	Teleoperation and telemanipulation	Stramigioli	ML F39
11:00 - 12:00	Exercise: control of physical interaction	Naldi	ML F39
13:30 - 15:10	Industrial Motivation	Zwicker	ML F39
15:25 - 16:10 16:10 - 16:45 16:45 - 17:30	Outdoor vision based MAV, EKF, AscTec platforms, sFly demo Demo of AIRobots platforms (2 // groups)	Achtelik Hürzeler, Naldi	ML F39 Outdoor Flying room
18:30 - ...	Dinner		foodLAB,CAB
Thursday, 5 July: Case Studies and Vision 2			
8:30 - 9:50 9:50 - 10:10	EU projects: ARCAS AIRobots	Ollero Marconi	ML F39
10:25 - 10:55 10:55 - 11:10 11:10 - 11:40 11:40 - 12:00	visual SLAM sFly overview and some keypoints Real-time VO on challenging datasets ICARUS, fixwing prototype	Chli Kneip Kneip Leutenegger	ML F39
13:30 - 15:10 15:25 - 16:20 16:20 - 17:20	- Multi-UAV bilateral shared control and decentralization - Flying Machine Enabled Construction - Cooperative Exploration by Ground and Aerial Robots for Disaster Response	Giordano Augugliaro Yoshida	ML F39
Friday, 6 July: Systems, Exercices, Competition			
8:30 - 9:10 9:10 - 10:10 10:25 - 10:45 10:45 - 11:05 11:05 - 12:00	Platforms: AslaTech, Skybotix Vicon, optitrack and SW framework Leica Case study "AIRobots boiler" Vision exercise	Mengoli, Omari Hürzeler, Naldi Pradalier Nikolic Leutener	ML F39
13:30 - 17:00	Exercises and competition with simulator ducted-fan, movement, contact, vision	*Naldi, Bellini, Hürzeler,Nikolic*	ML F39
17:00 - 19:00	Goodbye reception		

ANNEX B: List of attendees

Nr	Name	Family Name	Affiliation	Countries
1	Anas	Wasill	Lulea	Sweden
2	Paul	Acquatella	TU Delft	Netherland
3	Hongrong	Huang	TU Munich	Germany
4	Antonino	Catena	Uni Catania	Italy
5	Karl	Hansen	Uni Aalborg	Denmark
6	Antonio	Toma	Poli Torino	Italy
7	Damiano	Verda	Uni Genoa	Italy
8	João	Valente	TU Madrid	Spain
9	Christina	Georgiou	Churchill College	UK
10	Alberto	Valente	Uni Verona	Italy
11	Dominick	Vanthienen	KU Leuven	Belgium
12	Raúl	Cano Bazaga	Univ. of Sevilla	Spain
13	Atsushi	Oosedo	Uni Tohoku	Japan
14	Mahdi	Dehghani	Uni Tehran	Iran
15	Ivan	Stojkovic	Uni Belgrad	Serbia
16	Fabio	Riccardi	Poli Milano	Italy
17	Parvathaneni	Sai Dinesh	Amrita Vishwa Vidy.	India
18	Carlo Alberto	Pascucci	Uni Lucca	Italy
19	Antonio	Petitti	Poli Bari	Italy
20	Iliana	Spartali	TU Athen	Greece
21	Sylvain	Thorel	Mines ParisTech	France
22	Oleksandr	Lavrushchenko	NTU Kyiv	Ukraine
23	Hyon	Lim	NU Seoul	South Korea
24	Jochem	Verboom	TU Delft	Netherland
25	Andras	Majdik	TU Cluj	Romania
26	Syed	Riaz un Nabi Jafri	IIT Genoa	Italy
27	Seiga	Kiribayashi	Uni Tohoku	Japan
28	Christos	Papachristos	Uni Patras	Greece
29	Marco	Ruzzenente	Uni Verona	Italy
30	Tambet	Treimuth	Toulouse	France
31	Giusepper	Cuccu	IDSIA lugano	Switzerland
32	Ahmad	Din	Poli Torino	Italy
33	Ehsan	Asadi	Poli Milano	Italy
34	Thomas	Michel	robonaut.ch	Switzerland
35	Nathanael	Wettstein	ETHZ	Switzerland
36	Carlos	Bentes	TI Aeronautics	Brazil
37	Mudireddy	Srikanth	Fraunhofer	Germany
38	Joonas	Melin	UT tampere	Finland
39	Georg	Heppner	FZI Karlsruhe	Germany
40	Christian	Forster	Uni Zh	Switzerland
41	Roberto	Marino	EC Nantes	France
42	Federico	Ruiz	TU Munich	Germany
43	Carlos	Almeida	ISE Porto	Portugal
44	Marcelo	Petry	Uni Porto	Portugal
45	Basaran	Bahadir Kocertürk	TU istanbul	Turkey
46	Sammy	Omari	ETHz	Switzerland
47	Syed	Hassan	Gyeongsang Nat.Un.	South Korea
48	Matteo	Fumagalli	Twente	Netherland
49	Karavia	Aditya	Central Univ.	India
50	Kazuya	Sase	Uni Tohoku	Japan