RISE'2009

January 12-14

INTERNATIONAL ADVANCED ROBOTICS PROGRAMME

International Workshop

On

Robotics for risky interventions and Environmental Surveillance

RISE'2009

12-14 Jan 2009

BRUSSELS

ABSTRACTS PROGRAMME

With the cooperation of

The general objective of the International Advanced Robotics Programme (IARP) is to encourage development of advanced robotic systems that can dispense human work for difficult activities in harsh, demanding or dangerous environments; additionally, to contribute to the revitalisation and growth of world economy.

The IARP working group RI (Risky Interventions) - SE (Environmental Surveillance) has been initiated by the European partners of the FW6-IST projects View-Finder (aiming the assistance of fire-fighting/protection services) and Guardians (aiming the use of swarm of robots for Rescue assistance) as well as by IARP partners having developed an experience in this domain through similar European and National Projects. After the first RISE'2006 workshop, organized in Brussels, the second, organized in Benicassim, this one will again focus on the objectives and first results of both (European funded) projects and similar national or international initiatives. Some modular demonstrations will follow the oral presentations: they will be organized in Beauvechain, the 1 Wing Air Base of the Belgian Defence.

The members of the View-Finder Consortium, the Guardians Consortium and the IARP members of the Working Group 'Robotics for Risky Intervention and Environmental Surveillance' want to express their thanks to Colonel Avi BEM Patrice LAURENT and his Colleagues of the 1 Wing, including the Fire-fighters of the Air Base and the Fire-fighting Service of Jodoigne for their appreciable involvement in our efforts to improve the realism of our results.

They also want to express their thanks to all End-Users of this project for their appreciated advices and encouragements.

Jacques Penders, Coordinator VF-G

Yvan Baudoin, LO VF
Enric Cervera, LO G

Co-chairmen of RISE'2009

Rudinger Dillman
Karlsruhe University

Yvan Baudoin
Royal Military Academy
IARP Co-chairman of the WG RISE

VIEW-FINDER

Vision and Chemiresistor Equipped Web-connected Finding Robots

The VIEW-FINDER project develops robots and an advanced base station for inspection of a crisis area: a common industrial fire ground where chemicals may have been released or worse, an area in the aftermath of an explosion.

The primary task of the robots is to gather data on the condition of the fire ground, and are provided with on board cameras and a wide array of chemical sensors. The data and images are sent to the base station, where they are processed and connected to geographical information collected from a web of sources; thus providing the command of the operation with in situ data. The information can also be forwarded to the relevant forces dealing with the crisis (e.g. fire fighters, rescue workers, police).

The robots navigate individually or cooperatively, following high level instruction from the base station. They are off-the-shelf robots, wheeled robots for the common fire ground and caterpillars for more exceptional occasions. For data gathering the robots are provided with task specific sensors and cameras, while conventional sensors also support autonomous navigation. The robots connect wirelessly to the base station. To reduce the risks to humans, the robots are intended as the first explorers of the area, however they are also designed to support and safeguard human personnel.

The base station collects in-situ data and combines it with information retrieved from the large-scale GMES-information bases. It is equipped with a sophisticated human interface to display the information to the comfort of the human operators and operation command.

The project is to provide proof-of-concept solutions, to be evaluated for their effectiveness in governing local risk assessment and supporting surveillance and rescue operations. End-User participation ensures addressing operational needs. Project workshops aim at further dissemination, and exploitation of results.

Thanks to the complementarities of the Guardians Project, both projects could improve the safety and the security of the Protection Services and the effectiveness of Crisis information channels.

GUARDIANS

Group of Unmanned Autonomous Robots for Discovery and Information Acquisition, Navigating to detect chemicals and explosives

The GUARDIAN project develops a swarm of autonomous robots. The swarm is designed to survey, inspect and map two types of terrains, a partly destroyed urban area and a (havocked) country side. The terrains represent the aftermath of a natural or industrial disaster or an armed conflict. The swarm is able to navigate the terrain autonomously and collect data: images, concentrations or sources of chemicals, positions of (suspicious) objects. The data are forwarded to a base station, where maps are being built and up-dated automatically. The base station also comprises the human interface from where human operators can monitor and control the swarm as a whole or some individual robots.

The swarm is aimed to be an autonomous system, able to navigate and cover the whole area. The individual robots autonomously have to avoid the many obstacles and inspect particular objects in detail. While traversing the area navigation data are to be transmitted over the wireless network and be collected and interpreted on the one hand for guiding the swarm through and on the other hand for map building. The swarm will be able to operate in an autonomous non-communicative mode, as well as in an autonomous communicative mode. In communicative mode the swarm applies automatic service discovery, meaning that the robots find peers to help them to overcome difficulties. An important problem to deal with is flexible and seamless switching between these modes in order to compensate for loss of network signals.
The swarm will be monitored by human operators, to enable this several novel problems are to be solved. One is to interweave human control with the (mostly) autonomously operating swarm and to enable the operator to single out individual robots and take control over them. A next problem is to build a reliable map from images and other data gathered by the swarm and to provide the human operator on line with a reduced but relevant overview of the terrain (presentation of the map, combined with images and other data from the robots). A problem, emerging from the novelty of applying autonomous swarms is that there are so many robots present that a human being cannot control them in detail. The project will have to find a balance between the autonomy of the robots, the autonomy of the swarm while providing the human operator the feeling of control over the system.

Thanks to the complementarities of the View-Finder Project, both projects could improve the safety and the security of the Protection Services and the Effectiveness of Crisis information channels.

PROGRAMME

January, 2009 - 12			
	Authors	**Title**	**Addresses**
VIEW-FINDER and VIEW-FINDER-like Contributions			
08.30H	**Alan Winfield**	**KN1: The potential and the challenges of Swarm Robotics in safety critical applications**	**University of Bristol, UK** Alan.winfield@uwe.ac.uk
09.15H	Y.Baudoin[1], D.Doroftei[1], G.De Cubber[1], S.A..Berrabah[1], E.Colon[1], C.Pinzon[1], A.Maslowski[2], J.Penders[3]	VIEW-FINDER : Robotics Assistance of fire-Fighting services; Introduction	[1]Royal Military Academy, Brussels,[2]PIAP, Poland,[3]Sheffield Hallam University yvan.baudoin@rma.ac.be
09.25H	Fabrice Warlet[1], Carlos Pinzon[1], Wim Mees[1], Jeremy Gancet[2], Elvina Motard[2], Michel Ilzkovitz[2]	Crisis management supporting architecture in View-Finder	[1]Royal Military Academy, [2]Space Application Service, SAS fwarlet@elec.rma.ac.be
09.45H	[1]Geert De Cubber, [1]Daniela Doroftei, [2]Lazaros Nalpantidis, [2]George Ch. Sirakoulis, [2]Antonios Gasteratos	Stereo-based terrain traversability analysis for robot navigation	[1]Royal Military Academy, Brussels, [2]DUTH, Greece Geert.de.cubber@rma.ac.be
10.05H	Piotr Kowalski, Janusz Będkowski, Andrzej Masłowski	Implementation of the Indoor Autonomous Navigation for ViewFinder Project	PIAP, Poland Amaslowski@piap.pl
10.25H	Olena Kuz'micheva and Axel Gräser	A Concept of a Robotic System for Safe Sampling Procedure during Reconnaissance of CBRN-Disasters	University of Bremen, Germany olena@iat.uni-bremen.de
COFFEE BREAK			
11.00H	Sid Ahmed Berrabah	GPS data correction using encoders and INS sensors	Royal Military Academy, Brussels sidahmed.berrabah@rma.ac.be
11.20H	C. Armbrust and B.H. Schäfer	RAVON — The Robust Autonomous Vehicle for Off-road Navigtion	University of Kaizerslautern, Germany armbrust@informatik.uni-kl.de
11.40H	Geert De Cubber[1], Gabor Marton[2]	Human Victim Detection	[1]Royal Military Academy, Brussels, [2]Budapest University of Technology and Economy Geert.de.cubber@rma.ac.be
12.00H	Hans De Smet, Carlos Pinzon, Jan Leysen, Yvan Baudoin, Jeremi Gancet Jacques Penders	The Disaster Management Action Plan proof-of-concept of a Key Management Tool for Emergency Situations	RMA, Belgium SAS, Belgium SHU, United Kingdom

12.20H	Angelos Amanatiadis, Antonios Gasteratos and Spyridon Mouroutsos	An architecture for the Control of a mechatronic head used in rescue robotics applications	Democritus University of Thrace, Xanthi, Greece agaster@pme.duth.gr
LUNCH			
13.45H	**Alberto Sanfeliu**	**KN2:The European URUS Project**	sanfeliu@iri.upc.edu
14.30H	Kristel Verbiest[1], Eric Colon[1]	Cooperative multi-robot path planning	[1]Royal Military Academy, Brussels, Kristel.verbiest@rma.ac.be
14.50H	Andrea Carbone[1] Georgios Chliveros[2] Fiora Pirri[1]	Security tasks for rescue robot	[1]Dept. of Computer and Systems Sciences Sapienza, Rome (IT) Email: carbone@dis.uniroma1.it Sheffield Hallam Univ.,Sheffield (Uk) G.Chliveros@shu.ac.uk pirri@dis.uniroma1.it
15.10H	Janusz Będkowski, Andrzej Masłowski	NVIDIA CUDA Application in the Cognitive Supervision and Control of the Multi Robot System.	PIAP, Poland Amaslowski@piap.pl
COFFEE BREAK			
15.50H	Sid Ahmed Berrabah[1], Cristina Gabriela Rozmarin[2]	Robot Navigation Based on Adaptive Fuzzy Controller	[1]Royal Military Academy, [2]Technical university of Iasi, Romenia sidahmed.berrabah@rma.ac.be
16.10H	[1]Janusz Będkowski, Piotr Kowalski, Grzegorz Kowalski, Andrzej Masłowski, Eric Colon[2]	Improvement of ATRV Jr Software Architecture for ViewFinder Application	[1]PIAP, Poland [2]Royal Military Academy, Brussels
16.30H	Koen Buys, Toon Goedemé, Herman Bruyninck	Towards high speed 6DoF inertial-visual SLAM:robust image feature detection	Katholieke Universiteit Leuven, PMA, Leuven, Belgium koen.buys@denayer.wenk.be
16.50H	Daniela Doroftei, Geert De Cubber, Eric Colon and Yvan Baudoin	Behavior Based Control For An Outdoor Crisis management Robot	Royal Military Academy, Brussels Daniela.doroftei@rma.ac.be
17.10H	G. Chliveros and L. Alboul	An algorithm and architecture for 3D vision data fusion	Sheffield Hallam University, Mobile Machines and Vision Lab, UK
17.30H	A. Rönnau, T. Kerscher, M. Ziegenmeyer, T. Schamm, J.M. Zöllner and R. Dillman	Localisation of a six legged walking robot in rough terrain by ToF-Odometry	Interactive Diagnosis and Service Systems, FZI Forschungszentrum Informatik, kerscher@fzi.de
19.00H GET TOGETHER RISE'2009			
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GUARDIANS and GUARDIANS-like Contributions			
08.30H	**Annibal Ollero**	**KN3: The AWARE Project**	'aollero@cartuja.us.es'
09.15H	J.Penders[1], E.Cervera[2]	GUARDIANS: Robotics Assistance of Fire-Fighting Services: introduction	Sheffield Hallam University, UK University of Jaume I, Spain
09.25H	J. Saez-Pons, Lyuba Alboul, and Jacques Penders,Leo Nomdedeu	Heterogeneous multi-agent system behaviour patterns for robotics applications	Sheffield Hallam University, UK J.Saez-Pons@shu.ac.uk
09.45H	[1]Salih Burak Akat, Veysel Gazi, [2]Lino Marquez	Asynchronous Particle Swarm Optimization Based Search with a Multi-Robot System: Simulation and Application	[1]TOBB University of Economics and Technology, ANKARA, TURKEY [2]University of Coimbra, COIMBRA, PORTUGAL burak.akat@gmail.com
10.05H	Fabio P. Bonsignorio	A Layered Modular Scalable User Interface for Search and Rescue and Surveillance Robot Swarm Teleoperation	Heron Robots s.r.l. Italy fabio.bonsignorio@gmail.com
10.25H	R. M. Molfino, M. Zoppi, L. Rimassa, E.E. Cepolina	A robotic worms colony for inspection of risky, difficult to enter sites	University of Genova, DIMEC, Italy molfino@dimec.unige.it
COFFEE BREAK			
11.00H	Annemarie Kokosy[1,2], Michael Defoort[3], Georges Palos[2], Thierry Floquet[1,4], Wilfrid Perruquetti[1,4]	A decentralized planification architecture for a swarm of mobile robots	1. ISEN, 41 boulevard Vauban, 59046 Lille Cedex, France 2. LAGIS, UMR CNRS 8146, Cité Scientifique, BP 48, Villeneuve d'Ascq, France 3. Ecole de Mines de Douai, 941 rue Charles Bourseul, BP 10838, 59508 Douai Cedex, France 4. Ecole Centrale de Lille, Cité Scientifique, BP. 48, 59651 Villeneuve d'Ascq Cedex, France annemarie.kokosy@isen.fr
11.20H	Ulf Witkowski[1],Stefan Herbrechtsmeier[1],Mohamed El-Habbal,[1]Jacques Penders[2], Lyuba Alboul[2],Elvina Motard[3],Jeremi Gancet[3]	Mobile Ad-hoc communication in highly dynamic environment optimized with respect to robustness, size, and power efficiency	[1]Heinz Nixdorf Institute University of Paderborn [2]Sheffield Hallam University [3]Space Applications Services witkowsk@mail.uni-paderborn.de
11.40H	Jorge Sales, Raul Marín, Leo Nomdedeu, and Enric Cervera	Estimation of the distance by using the signal strength for localization of networked mobile sensors and actuators	University of Jaume I rmarin@icc.uji.es

12.00H	Amir Naghsh,- Jeremi Gancet[2] Chris Roast,- Elvina Motard[2],- Michel Ilzkovitz[2]	HRI for a swarm of robots supporting firefighters: key characteristics and early prototypes	[2]Space Application Services, Belgium
12.20H			
LUNCH			
13.30H	**Patrick Hendrick**	**KN4: HALE UAVs for surveillance missions**	**Free University of Brussels**
14.30H	Gerasimos G. Rigatos	Sigma-Point Kalman Filters and Particle Filters for integrated navigation of unmanned aerial vehicles	ger9711@ath.forthnet.gr
14.50H	[1]Mirbek Turduev, Esma Gul, Veysel Gazi, [2]Jacques Penders, [3]Enric Cervera	Implementation of a Collision-Free Path Planning and Navigation Algorithm for Mobile Robots using 2D-Voronoi diagrams, the A* algorithm and Potential Functions	[1]TOBB University of Economics and Technology, Ankara [2]Sheffield Hallam University, Sheffield [3]University of Jaume I, Castello
15.10H	Ömer Çayırpunar, Veysel Gazi, Bülent Tavlı, Enric Cervera[1], Ulf Withowski[2], and Jacques Penders[3]	Experimental Study on the effects of communication on cooperative Search in complex Environments	[1]University of Jaume, [2]HNI, Univ Paderborn ,[3]Sheffield Hallam University omercayir@yahoo.com
COFFEE BREAK			
16.10H	Aazir Khan, Rezia Molfino	Multiple Environmental Surveillance Using the Aquila DMUAS	University of Genova, DIMEC, Italy khan@dimec.unige.it
16.30H	Leo Nomdedeu, Jorge Sales, Raul Marín, and Enric Cervera[1] Joan Saez-Pons[2]	Sensing capabilities for mobile robotics	[1]Computer Engineering and Science, University Jaume I, Spain. [2]Mobile Machines and Vision Lab, Sheffield Hallam University, United Kingdom. leo.nomdedeu@gmail.com
16.50H	A. Marjovi and L. Marques	Sonar-based multi-robot exploration and mapping	University of Coimbra, , Portugal lino@isr.uc.pt
17.10H	[1]Yunus Atas, Engin Karatas, Omer Cayirpunar, Salih Burak Akat, and Veysel Gazi, [2]Lyuba Alboul	Laser Based Cooperative Multi-Robot Map Building For Indoor Environments	[1]TOBB University of Economics and Technology, ANKARA, TURKEY [2]Sheffield Hallam University, SHEFFIELD, UNITED KINGDOM vgazi@etu.edu.tr
17.30H			
RISE'2009 Conclusions Briefing for Demonstrations/Videos in BEAUVECHAIN			