

**LARSyS**  
Laboratory of Robotics  
and Engineering Systems

# LARSyS 2015

Laboratory of Robotics and Engineering Systems  
Annual Meeting

## PROGRAM

Fundação Portuguesa das Comunicações

3 July 2015

CENTER FOR INNOVATION,  
TECHNOLOGY AND POLICY RESEARCH



PÓLO DO I.S.T



# Laboratory of Robotics and Engineering Systems

## **LARSyS 2015: Annual Meeting**

### **A Brief Introductory Note**

**LARSyS 2015** - This is our annual event gathering all researchers from the four centers of LarSys. More than a conventional conference it is an opportunity to brainstorm, communicate, get to know each other and foster new ideas.

We believe the venue is particularly suitable to live discussions and close interaction. That is why we brought the coffee to the conference room, shortened lunch break extended the midday poster session and launched a blog <http://larsyshub.wordpress.com> where the community is invited to share their works and ideas. We hope we have created an environment that inspires us all to engage into fruitful discussions.

A word of appreciation to Alexandra Frazão, Cátia Jardim and Alexandra Araújo for their support and help in organizing all the logistics involved in the organization of LarSys2015.

The organizing committee

Lígia Pinto, Mónica Mendes, Carlos Santos Silva, João Paulo Costeira

# LARSyS

LARSyS brings together four R&D units, involving the University of Lisbon (through IST-Instituto Superior Técnico) and the University of Madeira:

1. **Institute for Systems and Robotics of IST (ISR -IST);**
2. **Centre for Innovation, Technology and Policy Research of IST (IN+/IST);**
3. **Marine, Environment and Technology Centre of IST (MARETEC/IST);**
4. **Madeira Interactive Technologies Institute at the University of Madeira (MITI).**

Through this association, which emerged naturally from previous consortia, LARSyS seeks for enhanced capacity to foster research at new frontiers of knowledge at the best international level. It considers researchers from different backgrounds and perspectives acquired in different areas of science (e.g., experimental, computational, and theoretical) and different sectors (university, industry, governmental, and regional administration).

LARSyS operates through its **four research centers**, which provide specific areas of expertise in their main domains of knowledge. They involve **ten Laboratories and/or Groups**, affiliating researchers in a way suitable to conduct specialized work in their main fields of expertise and to provide the necessary knowledge and experience to foster LARSyS's scientific program, as follows:

- **Dynamic Systems and Ocean Robotics group.** DSORg @ISR aims: i) to study challenging theoretical problems in the areas of advanced marine robotic vehicle systems design, navigation, and control and ii) to exploit the theoretical methodologies developed to yield efficient systems and tools for ocean exploration and exploitation.
- **Evolutionary Systems and Biomedical Engineering group.** LaSEEB @ISR is dedicated to research and development in Biomedical Systems and Engineering, with emphasis on the study of human brain function, with applications in sleep and cognition, and more recently in pathologies such as epilepsy, dementia and cerebrovascular disease.
- **Intelligent Robots and Systems group.** IRSg @ISR research approaches complex systems from a holistic standpoint, rather than focusing on some of the subsystems. The topic of cooperation is currently the group major research topic.
- **Signal and Image Processing group.** SIP Group @ISR conducts research related to information processing from sensory data: Sensor and Information Networks, Ocean Acoustics, Image and Video Analysis and Biomedical Engineering.
- **Computer and Robot Vision group.** VisLab group @ISR conducts research on computer and robot vision, focusing on video analysis, surveillance, learning, humanoid robotics and cognition.
- **Laboratory of Thermofluids, Combustion and Energy Systems.** LTCES @IN+ the research has a background on experimental and mathematical/physical modeling of thermal-fluid-dynamics and combustion systems making use of advanced techniques for flow measurements focused in understanding the fundamental relationship between concurrent thermodynamic transports phenomena involved in energy conversion processes.
- **Laboratory of Industrial Ecology and Sustainability.** LIES @IN+ includes a multidisciplinary group dedicated to develop models that can be used to support decision making in a set of diversified but correlated areas ranging from the urban to the national or international scales.
- **Laboratory of Technology Policy and Management.** LTPM @IN+ aims to foster policy analysis of emerging issues in science, technology and industry with emphasis on in-depth policy formulation and the need to secure the sustainable development of our societies.
- **MITI - Madeira Interactive Technologies Institute.** M-ITI operates in the interdisciplinary domain of Human-Computer Interaction (HCI), with the goal of engaging in important scientific and technological challenges (eg. aging population, sustainability in smart cities and digital culture).
- **MARETEC - Marine, Environment and Technology Centre.** MARETEC research is focused on marine energies, environment and on environmental economy and economy of the energy. Marine, Environment and Technology Centre

The research agendas of the various Laboratories and/or groups is complemented and extended through "Thematic Areas". On the top of that structure, the strategy of LARSyS is promoted and implemented through **six Thematic Areas**. They aim to explore new frontiers of knowledge driven by needs and markets as we envisage them today,

making use of target objectives and linkages with end-users. They consider emerging themes under, on, above, in and beyond our daily human live.

Each Thematic Area has been defined together with a main target in a time horizon of 15 years (2030), without prejudice of involving other projects. They include five “Areas of Application-driven Research” and one area of “Fundamentals”. They provide a matrix-based form for the organization of LARSyS, facilitating networks of researchers from the various centers and groups to foster the exchange of ideas across disciplines and the exploration of new frontiers of knowledge in emerging themes.

The five Thematic Areas of “Application-driven Research” are as follows:

- **OCEAN EXPLORATION and EXPLOITATION**, relying on competences and human resources of DSORg (ISR/IST), MARETEC, LTPM (IN+/IST) and MITI.
- **URBAN SYSTEMS**, relying on competences and human resources of SIPg (ISR/IST), MARETEC, LIES (IN+/IST) and MITI.
- **AERONAUTIC and SPACE SYSTEMS**, relying on competences and human resources of IRSg and DSORg (ISR/IST), MARETEC, LTCES and LTPM (IN+/IST) and MITI.
- **ENGINEERING FOR AND FROM THE LIFE SCIENCES**, relying on competences and human resources of SIPg, IRSg, LASEEBg and VISLAB (ISR/IST), LTCES and LTPM (IN+/IST) and MITI.
- **COGNITIVE ROBOTS AND SYSTEMS FOR ASSISTED LIVING AND WORKING**, relying on competences and human resources of VISLAB and IRSg (ISR/IST), LTPM (IN+/IST) and MITI.

The Thematic Area of “Fundamentals” consider formal and informal networks of researchers, from various centers, aimed to explore new frontiers of knowledge in themes without any specific known application. They consider basic knowledge beyond our current applications. It is named as follows:

- **DISTRIBUTED INFORMATION PROCESSING AND DECISION MAKING**, relying on competences and human resources of SIPg (ISR/IST), DSORg, IRSg (ISR/IST), MARETEC, LTPM (IN+/IST) and MITI.

The scientific program and managing structure of LARSyS was designed to guarantee a clear leadership aware of the most relevant international scientific trends and of the economic and social importance of science and technology. Sample examples of our **international partnerships** include:

- MIT-Portugal Program, through its overall coordination and an active involvement of researchers in the areas of Sustainable Energy Systems (SES) and Engineering Design and Advanced Manufacturing (EDAM);
- Carnegie Mellon Portugal Program, through an active involvement of researchers in the areas of Electrical and Computer Engineering (ECE), Computer Science (CS), Human Computer Interaction (HCI) and Engineering and Public Policy (EPP);
- IST-EPFL Program, through its overall coordination and an active involvement of researchers in the areas of Distributed and Cognitive Robotics and Biomedical Engineering;
- IRGC, International Risk Governance Council, through the coordination of IRGC-Portugal, which involves five Associate Laboratories in Portugal.

## PROGRAM (SESSIONS)

Time	Parallel session 1	Parallel Session 2
9h00-9h15	Welcome, Opening Remarks	
9h15-9h50	Keynote Speech Chris Csikszentmihályi	
9h50-11h00	Ocean Exploration and Exploitation	Aeronautic and Space Systems
11h00-11h30	Coffee Break + Posters	
11h30-13h00	Urban sustainability: the water-energy nexus and urban metabolism	
13h00-13h45	Lunch + Posters	
13h45-14h30	Posters + Videos	
14h30-16h00	Engineering For and From The Life Sciences	Distributed Information Processing and Decision
16h00-16h30	Coffee Break + Posters	
16h30-18h00	Cognitive Robots and Systems for Assisted Living and Working	
18h00-19h00	Ideas for the Future, Summary of Discussions, Closing Remarks	
19h00	Dinner	

## PROGRAM - DETAIL

Time	Parallel session 1	Parallel Session 2
9h00-9h15	<b>Welcome, Opening Remarks</b> João Sentieiro, Nuno Nunes, Manuel Heitor, José Santos-Victor, Ramiro Neves	
9h15-9h50	<b>Inaugural Lecture</b> Chair: Nuno Nunes Speaker: <b>Chris Csikszentmihályi</b> Discussants: André Pina, Marcos Mateus, Cláudia Soares	
9h50-11h00	<b>Ocean Exploration and Exploitation</b> António Pascoal (Chair and Discussant) 10:00 António Pascoal— <b>Tools and methods for ocean exploration and exploitation: a general perspective</b> 10:10 Lúcia Pinto— <b>Ocean Modeling and Monitoring</b> 10:20 Pedro Batista - <b>Novel methodologies in long baseline navigation with pseudo-range measurements</b> 10:30 Sérgio Jesus - <b>The ocean soundscape</b> 10:40 Pedro Abreu – <b>Deep sea navigation: tales of the LUSO ROV</b> 10:50 R. Santos, L. Sebastião, R. Fernandes, N. Nunes: <b>The +Atlantic Initiative</b>	<b>Aeronautic and Space Systems</b> Joana Mendonça(Chair and Discussant) 10:00 Joana Mendonça(Chair): <b>Innovation in Aeronautics</b> 10:10 Rita Cunha: <b>Nonlinear Control for Aerial Vehicles</b> 10:20 Rodrigo Ventura: <b>Air Traffic Management at NAV</b> 10:30 José Luis Silva: <b>Analysis of Interactive Systems based on Formal Specification</b> 10:40 Maria João Corte Real: <b>Patterns of labour force specialisation</b> 10:50 Teodoro Trindade: <b>Reconstruction of flame images from highly undersampled data</b>
11h00-11h30	<b>Coffee Break + Posters</b>	
11h30-13h00	<b>Urban systems for sustainability</b> Paulo Ferrão (Chair and Discussant) 11:30 Carlos Santos Silva: <b>Urban models for sustainable cities</b> 12:45 Nuno Nunes: <b>SEDUCE - SEnsing of Domestic Users for Conservation of Energy</b> 12:00 Valentina Nisi: <b>Yasmine’s Adventures: A mobile urban experience exploring the socio cultural potential of Digital Entertainment</b> 12:15 JP. Costeira/J.Mira <b>Monitoring Lisbon’s Airport with 3D cameras</b> 12:30 Eduardo Jauch - <b>Urban flood modelling</b> 12:45 <b>Discussion</b>	
13h00-13h45	<b>Lunch + Posters</b>	
13h45-14h30	<b>Posters + Videos</b>	

Time	Parallel session 1	Parallel Session 2
14h30-16h00	<p><b>Engineering For and From The Life Sciences</b>            João Sanches (Chair and Discussant)            14:30 João Sanches: <b>Challenges on Eng. for Life Sciences</b>            14:40 Fernando Lopes da Silva: <b>Brain Computer Interfaces (BCI): applications in the rehabilitation of stroke patients and in autism: promises, limitations and challenges</b>            15:15 Athanasios Vourvopoulos: <b>Optimizing Motor Imagery Neurofeedback through the Use of Multimodal Immersive Virtual Reality and Motor Priming,</b>            15:25 João Sequeira, <b>Humans and Robots in Hospital Environments: The MOnarCH case</b>            15:35 Ana Moita - <b>On the Design of Thermofluidic Devices</b>            15:45 <b>Discussion</b></p>	<p><b>Distributed Information Processing and Decision</b>            João Xavier (Chair and Discussant)            14h30 João Xavier: <b>Distributed Processing:Challenges and Applications</b>            14h40 António Pascoal: <b>Networked Robotic Systems for Ocean Exploration: Theory and Practice</b>            14h50 Discussant: Pedro Caldeira Abreu            15h00 Pedro Lima: <b>Practical POMDPs for Multirobot Systems</b>            15h10 Discussant: Rodrigo Ventura            15h20 Muriel Pádua: <b>Energy consumer markets: biases or price mechanism? Some evidence</b>            15h30 Discussant: Luís Custódio            15h40 Tiago Ramos: <b>Development of decision support systems for improving irrigation water management</b>            15h50 Discussion</p>
16h00-16h30	<b>Coffee Break + Posters</b>	
16h30-18h00	<p><b>Cognitive Robots and Systems for Assisted Living and Working</b>            16:30 Alexandre Bernardino: <b>Overview</b>            16:40 José Santos-Victor / Lorenzo Jamone: <b>Cognitive Robotics and Systems: examples and perspectives on reverse engineering the brain.</b>            17:00 Rodrigo Ventura: <b>Human-aware Networked Robot Systems</b>            17:20 José Luís Silva, Afonso Gonçalves and John Muñoz: <b>Interactive Systems: Prototyping, Assessment and Visualization Tools</b>            17:40 <b>Discussion</b></p>	
18h00-19h00	<p><b>Ideias for the Future</b>            Manuel Heitor (Chair)</p> <p><b>Closing Remarks</b>            Nuno Nunes, Manuel Heitor, José Santos-Victor, Ramiro Neves</p>	
19h00	<b>Dinner</b>	

## LIST OF POSTERS

online platform <http://larsyshub.wordpress.com>

*Optimizing Motor Imagery Neurofeedback through the Use of Multimodal Immersive Virtual Reality and Motor Priming*, Vourvopoulos, A., J. E. M. Cardona, S. B. i Badia

*Assisting Senior Fitness Testing Through the Use of Gesture Detection with Depth Sensors*, Afonso Gonçalves, E. Rubio, M. S. Cameirão, S. Bermudez i Badia

*Why Alone? Sensing Children's Social Interactions in the Playground*, Ferreira MJ, Caraban A, Lyra O, Belin V, Karapanos E

*Integrating computational modeling and participatory design strategies in a novel framework for the personalization of cognitive rehabilitation: A case study bridging paper- and-pencil and virtual reality tasks for stroke rehabilitation*, Ana Lúcia Faria, Salomé Pinho, Sergi Bermúdez i Badia

*Brick by Brick: Rebuilding Dublin from Ulysses to the Digital Datasphere*, Ashby, S., Hanna, J.

*Semi-Automatic Labeling for Public Non-Intrusive Load Monitoring Datasets*, Lucas Pereira, Nuno J. Nunes

*From Ontology to Implementation (EMOTIONS project)*, Duarte Gouveia

*Microexpression in Human-Computer Interaction*, Monchu Chen

*Improving Value Function Approximation in Factored POMDPs by Exploiting Model Structure*, Tiago Veiga, Matthijs Spaan, Pedro Lima

*Learning Affordances in Animals and Robots*, Atabak Dehban, Lorenza Calcaterra, Lorenzo Jamone, José Santos-Victor, Adam R. Kampff

*Depth based novelty detection with non-uniform spherical occupancy grid for humanoid robot heads*, Nuno Moutinho, Rui Figueiredo, Alexandre Bernardino, José Santos-Victor

*Operational modelling for supporting and characterising the Marine Renewable Energies in Western Iberia*, Campuzano F.J., Juliano M., Fernandes R., Simões A., Franz G., Pinto L., Caeiro N., Neves R.

*Numerical estimation of the nutrients origin and fate for the Western Iberia coastal region*, Campuzano F.J., Kenov I., Brito D., Juliano M., Fernandes R., Pinto L., Neves R.

*An integrated forecasting system for hydro-biogeochemical and waves modelling in the Tagus estuary*, Franz G., Campuzano F.J., Fernandes R., Pinto L., de Pablo H., Kenov I., Neves R.

*Combining operational models and data into a dynamic vessel risk assessment tool for coastal regions*, Fernandes R., Lourenço F., Braunschweig F., Neves R.

*HAB alert system for the Portuguese coast*, Pinto L., Mateus M., Silva A., de Pablo H., Moita T.

*TBD*, Santos A. B., Felisberto P., Jesus S. M.

*Smart Byke for Smart City*, Carvalho J., Marques M., Costeira J.P., Jorge P.M., Mira J.

*Effects of Channel Physical Parameters Distortion in Passive Time Reversal Underwater Communications*, Lussac P. Maia, António Silva and Sérgio M. Jesus

*A Holistic Approach to Video Surveillance*, Dario Figueira

*Whitened cross correlation of broadband ship noise for multipath identification*, Wu Y., Santos A. B., Felisberto P., Jesus S. M.

*Using Smartphones to Assess Students' Well-Being and Support Tutoring*, Pinto, N., Barros, R., Baras, K., Soares, L.

*A cellular memetic algorithm for examination timetabling problems*, Nuno Leite, Fernando Melicio e Agostinho C. Rosa

*Intelligent Robots and Systems group: 2002-2015 Highlights*, Lima, P. et al

*Project MONarCH*, Sequeira, J., and the MONarCH team

*Motion Planning Methodologies for the Transfer Cask System in ITER*, Vale, A. and Ribeiro, I.

*Robot Competitions: 1994-2014*, Pedro Lima et al



*Selecting observers for source localization via error exponents*, S. Zejnilovic and J. Xavier and J. Gomes and B. Sinopoli

*Flexible and precise Irrigation platform to improve farm scale water productivity (FIGARO)*, Leitão P. C., Jiménez-Bello M. A., Baibich R., Silva A., Neves R., Ramos T., Simionesei L., Martinez F.

*Integrating modelling approach to study the relations between stressors and indicators*, Almeida C., Jauch E., Segurado P., Ferreira T., Neves R.

*Movements analysis in Parkinson's patients based on the Kinect and Cyber Glove II sensor data*, Sofija Spasojević, José Santos-Victor

*Microchannel Cooling Technologies*, Silvério V.

*ARTIVIS - Arts, Real-Time Video and Interactivity for Sustainability*, Mónica Mendes

*Speckle Noise Decomposition Using Polynomial Approximation*, Manya Afonso, João Sanches

*Creativity in HCI Education*, Arminda Lopes

*Relationship between EEG phase-amplitude coupling and BOLD data in simultaneous ECoG-fMRI in humans*, T. Murta, U. J. Chaudhary, D. W. Carmichael, P. Figueiredo, L. Lemieux

*Mapping the BOLD signal correlates of heart rate variability in resting-state fMRI at 7 T*, Rodrigues R, Nunes S, Bianciardi M, Dias A, Silveira LM, Wald L, Figueiredo P.

*Dynamic response characterization of electrostatic actuation on biofluid droplets*, Laurência C. Moita AS, Prazeres Prazeres DMF, Moreira ALN

*Two-phase CPU liquid cooling*, Moura M, Teodori E., Moita AS, Moreira ALN

*Pool boiling: The effect of extreme surface*, Valente T, Teodori E, Moita AS, Moreira ALN

*A new hierarchical brain parcellation method based on discrete Morse theory for functional MRI data*, Dias A, Bianciardi M, Nunes S, Abreu R, Rodrigues J, Silveira LM, Wald LL, Figueiredo P

*Exploring monogenic decomposition in carotid atherosclerotic plaque characterization*, David Afonso, J. Miguel Sanches

*Robust Global Trajectory Tracking for a Class of Underactuated Vehicles*, P. Casau, R. G. Sanfelice, R. Cunha, D. Cabecinhas, C. Silvestre

*A neurophysiological based game for ADHD assessment*, Pedro Franco, Teresa Paiva, J. Miguel Sanches

*Humanoid Robot Perception System for Everyday Activities*, Saponaro G., Antunes A., Jamone L., Bernardino A.

*LiDAR-based Control of Aerial Vehicles for Automatic Inspection of Buildings and Industrial Facilities*, Bruno J. N. Guerreiro, Carlos Silvestre, Rita Cunha

*A Globally Exponentially Stable filter for Bearing Only Simultaneous Localization and Mapping in 3-D*, Pedro Lourenço, Pedro Batista, Paulo Oliveira, Carlos Silvestre

*A Bio-Inspired Stereoscopic Vision Probabilistic Framework*, R. Figueiredo, N. Moutinho, H. Araújo, A. Bernardino

*Automatic Analysis of Dermoscopy Images for Melanoma Diagnosis*, Barata C, Marques J S, Celebi M E

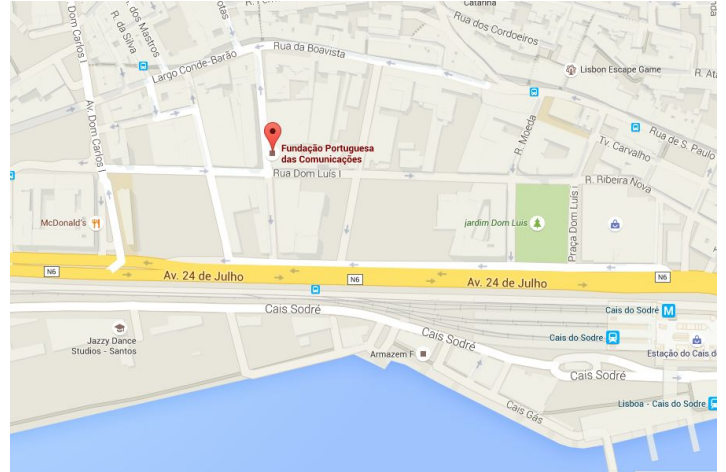
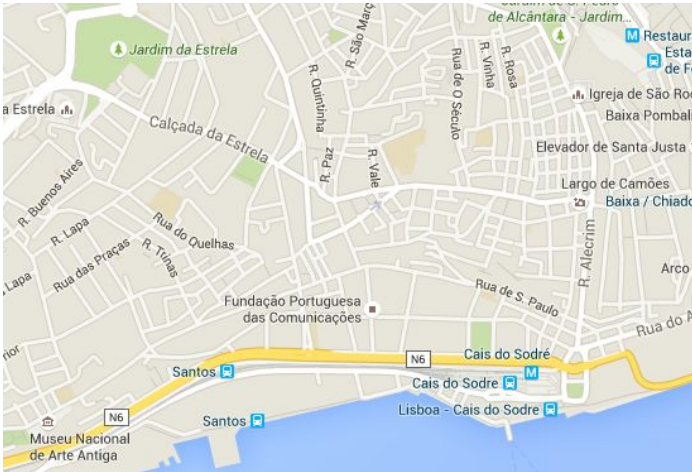
*Segmentation of the Left Ventricle in Cardiac MRI*, Santiago C, Nascimento JC, Marques JS

## VENUE and Location

### Fundação Portuguesa das Comunicações

Rua do Instituto Industrial, nº 16  
Lisboa

<http://www.fpc.pt>



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