



**INSTITUTE FOR SYSTEMS AND ROBOTICS**



## ***Annual Report – 2014***

### ***Lisbon Pole***

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## 1. EXECUTIVE SUMMARY

During the year of 2014 there were no research and technological activities taking place in the framework of the Lisbon Pole of ISR, nor were financed through ISR (NIF 502 854 227). All the research activities were carried out in the context of the research unit ISR/IST where all contracts and activities took place at Instituto Superior Técnico.

For informative purposes only, we describe the scientific publications and Theses that were produced by the research group hosted at the Instituto Superior Técnico, in spite of the fact that none of these activities were developed in the context the Lisbon Pole of ISR.

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## 2. PUBLICATIONS

### a) PhD Theses (9)

1. Sébastien Gay, Visual Control of Legged Robots for Locomotion in Complex Environments using Central Pattern Generators, Ph.D. Thesis, within the IST-EPFL Joint Doctoral Initiative, January, 2014.
2. José N. Pereira, Advancing Social Interactions Among Robots: An Institutional Economics-based Approach to Distributed Robotic Systems, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, March, 2014.
3. Augusto Santos, Bi-virus epidemics over large-scale networks: emergent dynamics and qualitative analysis, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, September, 2014.
4. João Messias, Decision-Making under Uncertainty for Real Robot Teams, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, February, 2014.
5. Hugo Silva, A Probabilistic Approach to Stereo Egomotion Estimation, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, March, 2014.
6. Bruno Damas, Learning and Sensorimotor Coordination of Anthropomorphic Robotic Systems, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, October, 2014.
7. Sérgio Pequito, A Structural Approach to Design, Analysis and Optimization of Large-Scale Dynamical Systems, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, July, 2014.
8. David Cabecinhas, Nonlinear control of autonomous air vehicles, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, November, 2014.
9. Alexandre Domingues, Ambulatory sleep assessment from behavioural and physiological data, Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, October, 2014.

### b) MSc Theses (41)

1. Cell Adhesion and Nuclear Morphology Analysis from DAPI Staining Fluorescence Microscopy Images, Tânia Raquel Doroteia Ramos Mestre.
2. Integrating Sentinel Surveillance Systems and Electronic Health Records – The case of Médicos Sentinela and the National Health Service, Hugo Mendes Paixão.
3. A Mobile Application for Psychological Assessment, João Manuel de Campos e Sousa Ribeiro
4. Diagnosis of Alzheimer's Disease using Multiple Instance Learning, Alexandre Ochôa de Carvalho de Campos Matos.
5. WebCam based optical Tracker for free-, João André Marques de Matos Clemente Coelho.

6. Localização baseada em medidas de distância para sistemas interiores de larga escala, Fábio Miguel Ramos Soares
7. Signal Processing Methods for Filtered Multitone Receivers in Underwater Acoustic Communication Systems, Luís Pedro Pereira da Silva
8. Calibration of multiple laser range finders for mobile robot localization in ITER, Tiago Andre Reis de Sousa
9. Nonlinear System Identification of Autonomous Marine, João Guilherme Simões Bravo Ferreira
10. Relaxometria T2\* na Doença de Parkinson e Tremor Essencial João Carlos Saramago Nobre Gonçalves
11. Integrated Architecture for Vision-based Indoor Localization and Mapping of a Quadrotor Micro-air Vehicle , Nuno Miguel dos Santos Marques
12. Design de um Veículo Multiusos e da Interface Homem-Máquina para Operações de Manipulação Remota no ITER, João Manuel Pires Soares
13. Vision Based Multi-Target Tracking, Pedro Ribeiro da Silva
14. Adaptive Illumination, Ricardo Alexandre Garcia Caetano
15. Identificação e Validação de um Modelo Dinâmico de um Quadricóptero, Rui Miguel Martins de Oliveira
16. Global localization by Soft 3D object recognition, Fernando Frazão Leiras Ribeiro
17. Comparison of liver parenchyma textural features from B-mode ultrasound with Fibroscan results, Dulce Isabel Marcolino Gadelha
18. E-cadherin mutations, cell cycle dynamics and morphology, Catia Inês Durão Ferreira
19. Real time graphical simulation for visual based pose estimation self-calibration of a humanoid robotic arm, Pedro Emanuel Antunes Vicente
20. Sensorimotor and Neural Networks for Visual Stimuli Prediction, Ricardo Manuel Raposo dos Santos
21. Vessel Detection in Oceanographic Airborne Imagery, Miguel António Azevedo Griné
22. Reinforcement Learning of Task Plans for Real Robot Systems, Pedro Tomás Mendes Resende
23. Hybrid Indoor Localization Based on Ranges and Vídeo, Maria Beatriz Alves de Sousa Quintino Ferreira
24. Reconstruction of Lightweight 3D Indoor Representations using Color-Depth Cameras, José Nuno Laia Mendonça

25. Reconstruction of Lightweight 3D Indoor Representations using Color-Depth Cameras, José Nuno Laia Mendonça.
26. Modelação e Simulação de Comunicação Acústica Intermitente entre veículos marinhos autónomos, Filipa Andreia Sequeira Mesquita.
27. Ground-plane based indoor mobile robot localization using a RGB-D sensor, Miguel António Mendes Nunes Vaz.
28. Inference methods for nonintrusive load monitoring applications, André Tiago Ventura Tomás.
29. Robotic Home Sentinel, David Cruz da Veiga Álvares Pereira.
30. Métodos semi-supervisionados aplicados ao diagnóstico da doença de Alzheimer a partir de imagens cerebrais 3D, Frederico Figueira Alcobia.
31. Design and Implementation of a Low-Cost Mobile Robotic Platform, João Pedro Hilário Teixeira de Sousa.
32. Optimization Algorithms for Distributed Data Aggregation and Diffusion, Lucas Schmitt Balthazar.
33. WebCam based optical Tracker for free-hand US, João André Marques de Matos Clemente Coelho.
34. Multimodal Data Acquisition for Dermatology Using Google Glass, João Guilherme Antunes Martins.
35. A behavioral investigation of the algorithms underlying reinforcement learning in humans, Ana Catarina dos Santos Farinha.
36. Characterization of physiological noise in resting state fMRI data at 7T, Sandro Daniel Sabudin Nunes.
37. Study of habit learning impairments in Tourette syndrome and obsessive-compulsive disorder using reinforcement learning models, Vasco Manuel Aranha da Conceição.
38. Detecting Conversion of Mild Cognitive Impairment to Alzheimer - A Comparison Between Classifiers, Maria Inês Barbosa Silva Crujo Uva.
39. Evaluating the electrode measurement sensitivity of subdermal electroencephalography electrodes, Miguel Rodrigues Mendes.
40. Mechanistic characterization of reinforcement learning in healthy humans using computational models, Ângelo Rodrigo Neto Dias.
41. Functional connectivity measures of scalp EEG and multimodal EEG-fMRI integration in epilepsy, João Pedro Isaías Abrantes.

### c) Books and book chapters (13)

1. Kurosh Madani, António Dourado Correia, Agostinho Rosa and Joaquim Filipe (Eds.), Computational Intelligence, Revised And Selected Papers Of The International Joint Conference, IJCCI 2012, Barcelona, Spain. Studies In Computational Intelligence, Volume 577, 2014.
2. Anabela Serrão, Carlos Pinto-Ferreira, Luis Custódio, SVEL – A Avaliação Electrónica como Ferramenta de Promoção do Sucesso Escolar.
3. Rodrigo Ventura, Two Faces of Human-robot Interaction: Field and Service robots, chapter in New Trends on Medical and Service Robots: Challenges and Solutions, MMS. Springer, ISBN: 978-3-319-05430-8, vol. 20, Pages 177-192, 2014
4. José N. Pereira, Porfírio Silva, Pedro U. Lima, Alcherio Martinoli, Social-Aware Coordination of Multi-robot Systems Based on Institutions, in Human Behavior Understanding in Networked Sensing Theory and Applications of Networks of Sensors, Paolo Spagnolo, Pier Luigi Mazzeo, Cosimo Distanto (Eds), SPRINGER, ISBN: 978-3-319-10806-3 (Print) 978-3-319-10807-0 (Online), Chapter 19, Pages 407-430
5. C. Barata, M. Ruela, T. Mendonça, J. Marques, A Bag of Features approach for the classification of melanomas in dermoscopy images: The role of color and texture descriptors, Computer Vision Techniques for the Diagnosis of Skin Cancer, Springer, Chapter 3, pp.49-70, 2014.
6. Isaac Kaminer, Enric Xargay, Venanzio Cichella, Naira Hovakimyan, Antonio Manuel Pascoal, A. Pedro Aguiar, Vladimir Dobrokhodov, and Reza Ghabcheloo, Time-Critical Cooperative Path Following of Multiple UAVs: Case Studies, In Advances in Estimation, Navigation, and Spacecraft Control, a Special Edition with selected papers presented at the Itzhack Y. Bar-Itzhack Memorial Symposium on Estimation, Navigation, and Spacecraft Control, Springer-Verlag, 2014.
7. J. Soares, A. Pedro Aguiar, A. Pascoal, A. Martinoli, Design and Implementation of a Range-Based Formation Controller for Marine Robots, ROBOT2013: First Iberian Robotics Conference, Advances in Intelligent Systems and Computing, Springer, Volume 252, 2014, pp 55-67
8. Rodrigues, J.M.F., Terzic, K., Lam, R., du Buf, J.M.H. Face and Object Recognition Using Biological Features and few Views, Chapter 4 in Contemporary Advancements in Information Technology Development in Dynamic Environments, Mehdi Khosrow-Pour (ed.), IGI Global, pp. 58-77 (link).
9. C.M. Fernandes, J.J. Merelo, A.C. Rosa, A Time-Varying Inertia Weight Strategy for Particles Swarms Based on Self-Organized Criticality, Studies in Computational Intelligence, Volume 577, pp 49-62, Springer-Verlag, 2014.
10. C.M. Fernandes, A.M. Mora, J.J. Merelo, A.C. Rosa, Photorealistic rendering with an Ant Algorithm, Studies in Computational Intelligence, Volume 577, pp 63-77, Springer-Verlag, 2014.
11. Leite, N., Neves, R., Horta, N., Melício, F., Rosa, A., Solving a capacitated exam timetabling problem instance using a bi-objective NSGA-II, In: Madani, K., Correia, A.D., Rosa, A., Filipe, J. (eds.) Computational Intelligence, Studies in Computational Intelligence, vol. 577, pp. 115–129. Springer International Publishing (2014),

12. C.M. Fernandes, J.L.J. Laredo, J.J. Merelo, C. Cotta, A.C. Rosa, Shuffle and Mate: a Dynamic Model for Spatially Structured Evolutionary Algorithms Parallel Problem Solving from Nature – PPSN XIII, Lecture Notes in Computer Science Volume 8672, 2014, pp 50-59 .
13. Carlos M. Fernandes, Agostinho C. Rosa, Juan L. J. Laredo, Carlos Cotta and J. J. Merelo, Performance and Scalability of Particle Swarms with Dynamic and Partially Connected Grid Topologies, LCNS Transaction of Computational Collective Intelligence Journal, Springer.

#### d) – Publications in international journals (77)

1. G. Vegas-Sánchez-Ferrero, José Seabra, S. Aja-Fernández, M. Martín-Fernández, C. Palencia, A. Serrano, O. Rodriguez, João Sanches, Gamma Mixture Classifier for Plaque Detection in Intravascular Ultrasonic Images, IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 61(1):44-61, January, 2014.
2. M. Serrão, S. Shahrabadi, M. Moreno, J. José, J. Rodrigues, João Rodrigues, Hans Du Buf, Computer vision and GIS for the navigation of blind persons in buildings, accepted, International Journal on Universal Access in the Information Society, 2014.
3. Carlos Santiago, Jacinto Nascimento, Jorge S. Marques, Automatic 3D segmentation of endocardial border of the left ventricle from ultrasound images, accepted, IEEE Journal of Biomedical and Health Informatics., 2014.
4. D. Jakovetic, J. Xavier and J. M. F. Moura, Fast distributed gradient methods, D. Jakovetic, J. Xavier and J. M. F. Moura, IEEE Transactions on Automatic Control, vol. 59, no. 5, pp. 1131-1146, 2014
5. D. Jakovetic, J. Xavier and J. M. F. Moura, Convergence rates of distributed Nesterov-like gradient methods on random networks, IEEE Transactions on Signal Processing, vol. 62, no. 4, pp. 868-882, 2014
6. B. Swenson, S. Kar, and J. Xavier, Empirical centroid fictitious play: an approach for distributed learning in multi-agent games, "IEEE Transactions on Signal Processing. Submitted. Initial Submission: Apr. 2013. Revised: Oct. 2014.
7. J. C. Nascimento, M. Barão, J. S. Marques and J. M. Lemos, Information geometric algorithm for estimating switching probabilities in space varying HMM, IEEE Trans. on Image Processing, vol. 23, no. 12, pp. 5263-5273, Dec. 2014
8. M. Taiana, J. C. Nascimento and A. Bernardino, On the purity of training and testing data for learning: the case of Pedestrian Detection, Neurocomputing, vol. 150, Part A, pp. 214–226, 2014
9. A. Nambiar, M. Taiana, D. Figueira, J. C. Nascimento and A. Bernardino, A Multi-camera video data set for research on High-Definition surveillance, Int. Journal of Machine Intelligence and Sensory Signal Processing, special issue on "Signal Processing for Visual Surveillance", vol. 1, no. 3, pp. 267-286

10. M. V. Afonso, J. C. Nascimento and J. S. Marques, Game-based Learning: Augmented Reality in the teaching of geometric solids, *Int. J. of Art, Culture and Design Technologies*, 4(1), 65-77. doi: 10.4018/ijacdt.201401010
11. Leitão, R., Rodrigues, J.M.F., Marcos, A., Game-based Learning: Augmented Reality in the teaching of geometric solids, *Int. J. of Art, Culture and Design Technologies*, 4(1), 65-77. doi: 10.4018/ijacdt.2014010105
12. Serrão, M., Rodrigues, J.M.F., du Buf, J.M.H., Navigation framework using visual landmarks and a GIS, *Procedia Computer Science*, vol. 27, pp. 28–37. doi: 10.1016/j.procs.2014.02.005
13. S. Zejnilovic, D. Mitsche, J. Gomes, B. Sinopoli, On a generalized metric dimension with partially known graph topology, Submitted to *Theoretical Computer Science (Elsevier)*, 2014.
14. P. Oguz-Ekim, J. Gomes, J. Xavier, P. Oliveira, A polar decomposition approach for exact source localization from squared range differences", Submitted to *IEEE Communications Letters*, 2014.
15. G. Vegas-Sánchez-Ferrero, José Seabra, S. Aja-Fernández, M. Martín-Fernández, C. Palencia, A. Serrano, O. Rodriguez, João Sanches, An angular approach for range-based approximate maximum likelihood source localization through convex relaxation, *IEEE Transactions on Wireless Communications*, vol. 13, no. 7, pp. 3951-3964, July 2014.
16. David Afonso, José Seabra, Luís Pedro, J. Fernandes e Fernandes and J. Miguel Sanches, J., An Ultrasonographic Risk
17. Score For Detecting Symptomatic Carotid Atherosclerotic Plaques", *Biomedical and Health Informatics*, *IEEE Journal of*, vol.PP, no.99, pp.1,1 doi: 10.1109/JBHI.2014.2359236.
18. João Miguel Sanches, Joana Figueiredo, Martina Fonseca, Cecília Durães, Soraia Melo, Sofia Esménio and Raquel Seruca, Quantification of mutant E-cadherin using bioimaging analysis of in situ fluorescence microscopy. A new approach to CDH1 missense variants, *European Journal of Human Genetics* (2014), 1–8.
19. Domingues, A; Paiva, T.; Sanches, J.M., Hypnogram and Sleep Parameter Computation From Activity and Cardiovascular Data, *IEEE Transactions on Biomedical Engineering*, vol.61, no.6, pp.1711,1719, June 2014.
20. Domingues, A.; Paiva, T.; Sanches, J.M., Sleep and Wakefulness State Detection in Nocturnal Actigraphy Based on Movement Information, *IEEE Transactions on Biomedical Engineering*, vol.61, no.2, pp.426,434, Feb. 2014.
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23. P. Batista, GES Long Baseline Navigation with Unknown Sound Velocity and Discrete-time Range Measurements, *IEEE Transactions on Control Systems Technology*, Published online DOI: 10.1109/TCST.2014.2321973, 2014.
24. P. Batista, Long Baseline Navigation with Clock Offset Estimation and Discrete-Time Measurements, *Control Engineering Practice*, Published online DOI: 10.1016/j.conengprac.2014.10.009, 2014.
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26. Sérgio Brás, Paulo Rosa, Carlos Silvestre, Paulo Oliveira Fault Detection and Isolation in Inertial Measurement Units Based on Bounding Sets, *IEEE Transactions on Automatic Control*, Published online DOI:10.1109/TAC.2014.2363300, 2014.
27. P. Batista, C. Silvestre, P. Oliveira, Tightly Coupled Long Baseline / Ultra-short Baseline Integrated Navigation System, *International Journal of Systems Science*, Published online DOI 10.1080/00207721.2014.955070, 2014.
28. Pedro Serra, Rita Cunha, Tarek Hamel, Carlos Silvestre, Florent Le Bras, Nonlinear Image-Based Visual Servo Controller for the Flare Manoeuvre of Fixed-Wing Aircraft using Optical Flow, *IEEE Transactions on Control Systems Technology*, Published online DOI: 10.1109/TCST.2014.2330996, 2014.
29. David Cabecinhas, Rita Cunha, Carlos Silvestre, A globally stabilizing path following controller for rotorcraft with wind disturbance rejection, *IEEE Transactions on Control Systems Technology*, Published online DOI:10.1109/TCST.2014.2326820, 2014.
30. Pedro Casau, Paulo Rosa, S. M. Tabatabaeipour, Carlos Silvestre and Jakob Stoustrup, A Set-Valued Approach to FDI and FTC of Wind Turbines, *IEEE Transactions on Control Systems Technology*, Published online DOI:10.1109/TCST.2014.2322777, 2014.
31. P. Batista, C. Silvestre, P. Oliveira, A Two-step Control Approach for Docking of Autonomous Underwater Vehicles, *International Journal of Robust and Nonlinear Control*, Published online DOI:10.1002/rnc.3158, 2014.
32. J. Almeida, C. Silvestre, A. M. Pascoal, Self-triggered state-feedback control of linear plants under bounded disturbances, *International Journal of Robust and Nonlinear Control* Published online DOI:10.1002/rnc.3138, 2014.
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35. Paulo Rosa, Carlos Silvestre, Michael Athans, Model falsification using set-valued observers for a class of discrete-time dynamic systems: a coprime factorization approach, *International Journal of Robust and Nonlinear Control*, Volume 24, Issue 17, Pages 2928–2942, November 2014.
36. Paulo Rosa, Carlos Silvestre, Multiple-Model Adaptive Control using Set-Valued Observers, *International Journal of Robust and Nonlinear Control*, Volume 24, Issue 16, Pages 2490–2511, November 2014.
37. Duarte Antunes, João Hespanha, Carlos Silvestre, Stochastic Networked Control Systems with Dynamic Protocols, *Asian Journal of Control*, Volume 16, Number 6, Pages 1-12, November 2014.
38. V. Roldão, R. Cunha, D. Cabecinhas, C. Silvestre, P. Oliveira, A leader-following trajectory generator with application to quadrotor formation flight, *Elsevier Robotics and Autonomous Systems*, Volume 62, Issue 10, Pages 1597-1609, October 2014.
39. F. Rego, E. Weerd, E. Oort, E. Kampen, O. Chu, A. Pascoal, Determination of Inner and Outer Bounds of Reachable Sets Through Subpavings, *Mathematics in Computer Science*, Vol. 8, Issue 3-4, pp. 425-442, Sept. 2014, DOI10.1007/s11786-014-0199-4
40. Paulo Rosa, Gary J. Balas, Carlos Silvestre, and Michael Athans, A Synthesis Method of LTI MIMO Robust Controllers for Uncertain LPV Plants, *IEEE Transactions on Automatic Control*, Volume 58, Issue 8, Pages 2234-2240, August 2014.
41. Bruno J. Guerreiro, Carlos Silvestre, Paulo Oliveira, Automatic 2-D LiDAR Geometric Calibration of Installation Bias, *Elsevier Robotics and Autonomous Systems*, Volume 62, Issue 8, Pages 1116-1129, August 2014.
42. P. Ekim, J. Gomes, J. Xavier, M. Stosic, and P. Oliveira, An Angular Approach for Range-Based Approximate Maximum Likelihood Source Localization Through Convex Relaxation, *IEEE Transactions on Wireless Communications*, July 2014, vol. 13, nº 7, pp. 3951-3964. DOI:10.1109/TWC.2014.2314653.
43. Daniel Viegas, Pedro Batista, Paulo Oliveira, Carlos Silvestre, Position and Velocity Filters for ASC/I-AUV Tandems based on Single Range Measurements, *Journal of Intelligent & Robotic Systems*, June 2014, Volume 74, Issue 3-4, Pages 745-768, June 2014.
44. David Cabecinhas, Rita Cunha, Carlos Silvestre, A nonlinear quadrotor trajectory tracking controller with disturbance rejection, *Elsevier Control Engineering Practice*, Volume 21, Issue 3, Pages 242-252, May 2014.
45. Pedro Batista, Carlos Silvestre, Paulo Oliveira, Sensor-based Long Baseline Navigation: observability analysis and filter design, *Asian Journal of Control*, Volume 16, Number 3, Pages 1-21, May 2014.

46. Duarte Antunes, João Hespanha, Carlos Silvestre, Output Regulation for Non-square Linear Multi-rate Systems, *International Journal of Robust and Nonlinear Control*, Volume 24, Issue 5, Pages 968-990, March 2014.
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48. M. Morgado, P. Oliveira, C. Silvestre, J. F. Vasconcelos, Embedded Vehicle Dynamics Aiding for USBL/INS Underwater Navigation System, *IEEE Transactions on Control Systems Technology*, Volume 22, Number 1, Pages 322-330, January 2014.
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50. A. Portêlo, M. Figueiredo, J. Lemos, J. Marques, Moving Horizon Estimation of Pedestrian Interactions using Multiple Velocity Fields, *Signal Image and Video Processing*, DOI 10.1007/s11760-014-0620-0, 2014.
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53. Luka Lukic, José Santos-Victor, A. Billard, Learning robotic eye–arm–hand coordination from human demonstration: a coupled dynamical systems approach, *Biological Cybernetics*, 108(2):223-48, April 2014. DOI 10.1007/s00422-014-0591-9.
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61. J.L.J. Laredo, P. Bouvry, D.L. González, F. Fernández de la Vega, M.G. Arenas, J.J. Merelo, C.M. Fernandes, Designing Robust Volunteer-based Evolutionary Algorithms, *Genetic Programming and Evolvable Machines*, Volume 15 Issue 3, September 2014, Pages: 221-244
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