Pedro Miraldo   *Curriculum Vitæ*

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Activities

[2019-] **Assistant Research Professor**, at "Instituto Superior Técnico, Lisboa";

[2018-2019] **Post-Doctoral Associate**, at KTH Royal Institute of Technology, Stockholm;

[2015-2018] **Invited Assistant Professor**, at "Instituto Superior Técnico, Lisboa" (ECE and CS&E);

[2014-2018] **Post-Doctoral Researcher**, at "Instituto Superior Técnico, Lisboa";

[2014] **Teaching Assistant**, at the University of Coimbra (ECE);

[2009-2014] **Research Assistant**, at the University of Coimbra;

Education

[2009-2013] **PhD degree** at the University of Coimbra (ECE);

[2007-2008] **MSc degree** at the University of Coimbra (ECE);

[2003-2007] **BSc degree** at the University of Coimbra (ECE);

Awards

[2018] **Outstanding Reviewer Award**, Computer Vision and Image Understanding (CVIU): 2018;

[2003-2008] **(four times) Academic merit**: Years 2004/2005, 2005/2006, 2006/2007, and 2007/2008. Name of the award: "Prémio 3% dos Melhores Estudantes, Universidade de Coimbra";

Research Grants

[2016-2022] **Individual Post-Doctoral grant (∼106K EUR)**: Awarded by the Portuguese Foundation for Science and Technilogy (FCT). Reference: `SFRH/BPD/111495/2015`;

[2009-2013] **PhD grant (∼57K EUR)**: Awarded by the Portuguese Foundation for Science and Technilogy (FCT). Reference: `SFRH/BD/49054/2008`;

Publications

CVPR, ECCV, ICCV, ICRA, IROS, and Journal papers

CVPR, ECCV, ICCV, ICRA, and IROS are top-tier conferences in computer vision and robotics. They have an impact similar or higher to journal papers in their respective fields.

[1] R. T. Rodrigues, **P. Miraldo**, D. V. Dimarogonas, A. P. Aguiar (2020), *Active Depth Estimation: Stability Analysis and its Applications*, IEEE Int'l Conf. Robotics and Automation (ICRA), pp. [doi]

[2] P. U. Lima, C. Azevedo, E. Brzozowska, J. Cartucho, T. J. Dias, J. Gonçalves, M. Kinarullathil, G. Lawless, O. Lima, R. Luz, **P. Miraldo**, E. Piazza, M. Silva, T. Veiga, and R. Ventura (2019), *SocRob@Home Integrating AI Components in a Domestic Robot System*, Künstliche Intelligenz (KI), **33**(4):343-356 [doi]

[3] R. Rodrigues, **P. Miraldo**, D. V. Dimarogonas, and A. P. Aguiar (2019). *A Framework for Depth Estimation and Relative Localization of Ground Robots using Computer Vision*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: [*arXiv:1908.00309*, doi]

[4] **P. Miraldo**, S. Saha, and S. Ramalingam (2019). *Minimal Solvers for Mini-Loop Closures in 3D Multi-Scan Alignment*, IEEE/CVF Conf. Computer Vision and Pattern Recognition (CVPR), pp. 9691-9700 [*arXiv:1904.03941*, doi];

[5] G. Pais, J. C. Nascimento, and **P. Miraldo** (2019). *OmniDRL: Robust Pedestrian Detection using Deep Reinforcement Learning on Omnidirectional Cameras*, IEEE Int'l Conf. Robotics and Automation (ICRA), pp. 4782-4789 [*arXiv:1903.00676*, doi];

[6] J. Campos, J. R. Rodrigues, and **P. Miraldo** (2019). *POSEAMM: A Unified Framework for Solving Pose Problems using an Alternating Minimization Method*, IEEE Int'l Conf. Robotics and Automation (ICRA), pp. 3493-3499 [*arXiv:1904.04858*, doi];

[7] A. Mateus, D. Ribeiro, **P. Miraldo**, and J. C. Nascimento (2018). *Efficient and Robust Pedestrian Detection using Deep Learning for Human-Aware Navigation*, Robotics and Autonomous Systems (RAS), **113**:23-37 [*arXiv:1607.04441*, doi];

[8] **P. Miraldo**, T. Dias, and S. Ramalingam (2018). *A Minimal Closed-Form Solution for Multi-Perspective Pose Estimation using Points and Lines*, European Conf. Computer Vision (ECCV), pp. 490-507 [*arXiv:1807.09970*,doi];

[9] A. Mateus, O. Tahri, and **P. Miraldo** (2018). *Active Structure-from-Motion for 3D Straight Lines*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: 5819-5825 [*arXiv:1807.00753*,doi];

[10] **P. Miraldo**, F. Eiras, and S. Ramalingam (2017). *Analytical Modeling of Vanishing Points and Curves in Catadioptric Cameras*, IEEE/CVF Conf. Computer Vision and Pattern Recognition (CVPR), pp: 2012-2021 [*arXiv:1804.09460*,doi];

[11] R. Rodrigues, M. Basiri, A. P. Aguiar, and **P. Miraldo** (2018). *Low-level Active Visual Navigation: Increasing robustness ofvision-based localization using potential fields*, IEEE Robotics and Automation Letters (RA-L) and IEEE Int'l Conf. Robotics and Automation (ICRA), double submission for RA-L and ICRA, **3**(3):2079-2086 [*arXiv:1801.07249*, doi];

[12] X. Liu, Z. Li, K. Zhong, Y. Chao, **P. Miraldo**, and Y. Shi (2018). *Generic distortion model for metrology under optical microscopes*, Optics and Lasers in Engineering (OLEN), **103**:119-126 [doi];

[13] J. Iglésias, **P. Miraldo**, and R. Ventura (2016). *Towards an Omnidirectional Catadioptric RGB-D Camera*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: 2506-2513 [doi];

[14] T. Veiga, **P. Miraldo**, R. Ventura, and P. Lima (2016). *Efficient Object Search for Mobile Robots in Dynamic Environments: Semantic Map as an Input for the Decision Maker*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: 2745-2750 [doi];

[15] X. Liu, Z. Li, **P. Miraldo**, K. Zhong, and Y. Shi (2016). *A framework to calibrate the scanning electron microscope under any magnifications*, IEEE Photonics Technology Letters (PT-L), **28**(16):1715-1718 [doi];

[16] T. Dias, **P. Miraldo**, and N. Gonçalves (2016). *Augmented Reality on Robot Navigation using Non-Central Catadioptric Cameras*, Springer J. Intelligent & Robotic Systems (JINT), **83**(3):359-373 [doi];

[17] F. Amigoni, J. Berghofer, A. Bonarini, G. Fontana, N. Hochgeschwender, L. Iocchi, G. K. Kraetzschmar, P. Lima, M. Matteucci, **P. Miraldo**, D. Nardi, and V. Schiaonati (2015). *Competitions for Benchmarking: Task and Functionality Scoring Complete Performance Assessment*, IEEE Robotics & Automation Magazine (RAM), **22**(3):53-61 [doi];

[18] T. Dias, **P. Miraldo**, N. Gonçalves, and P. Lima (2015). *Augmented Reality on Robot Navigation using Non-Central Catadioptric Cameras*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: 4999-5004 [doi];

[19] **P. Miraldo** and H. Araujo (2015). *Pose Estimation for Non-Central Cameras Using Planes*, Springer J. Intelligent & Robotic Systems (JINT), **80**(3):595-608 [doi];

[20] **P. Miraldo** and H. Araujo (2015). *Generalized Essential Matrix: Properties of the Singular Value Decomposition*, Elsevier Image and Vision Computing (IMAVIS), **34**:45-50 [doi];

[21] **P. Miraldo**, H. Araujo, and N. Gonçalves (2015). *Pose Estimation for General Cameras Using Lines*, IEEE Trans. Cybernetics (T-CYB), **45**(10):2156-2164 [doi];

[22] **P. Miraldo** and H. Araujo (2015). *Direct Solution to the Minimal Generalized Pose*, IEEE Trans. Cybernetics (T-CYB), **45**(3):404-415 [doi];

[23] **P. Miraldo** and H. Araujo (2014). *Planar Pose Estimation for General Cameras using Known 3D Lines*, IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS), pp: 4234-4240 [doi];

[24] **P. Miraldo** and H. Araujo (2014). *A Simple and Robust Solution to the Minimal General Pose Estimation*, IEEE Int'l Conf. Robotics and Automation (ICRA), pp: 2119-2125 [doi];

[25] **P. Miraldo** and H. Araujo (2013). *Calibration of Smooth Camera Models*, IEEE Trans. Pattern Analysis and Machine Inteligence (T-PAMI), **35**(9):2091-2103 [doi];

[26] **P. Miraldo**, H. Araujo, and J. Queiró (2011). *Point-based Calibration Using a Parametric Representation of General Imaging Models*, IEEE Int'l Conf. Computer Vision (ICCV), pp: 2304-2311 [doi];

Book Chapters

[27] L. Iocchi, G. Kraetzschmar, D. Nardi, P. U. Lima, **P. Miraldo**, and E. Bastianelli (2017). *RoCKIn@Home: Domestic Robots Challenge* (boot title *RoCKIn - Benchmarking Through Robot Competition*), InTechOnline Chapter, pp: 25-46 [doi];

Other Conferences

[28] A. Mateus, O. Tahri, and **P. Miraldo** (2019). *Active Estimation of 3D Lines in Spherical Coordinates*, American Control Conference (ACC), pp. 3950-3955 [*arXiv:1902.00473*, doi];

[29] R. Rodrigues, M. Basiri, A. P. Aguiar, and **P. Miraldo** (2017). *Feature Based Potential Field for Low-level Active Visual Navigation*, Iberian Robotics Conf. pp: 791-800, [*arXiv:1709.04687*,doi];

[30] D. Ribeiro, A. Mateus, **P. Miraldo**, and J. C. Nascimento (2017). *A Real-Time Deep Learning Pedestrian Detector for Robot Navigation*, IEEE Int'l Conf. on Autonomous Robot Systems and Competitions (ICARSC), pp: 165-171 [*arXiv:1607.04436*,doi];

[31] T. Dias, H. Araujo, and **P. Miraldo** (2016). *3D Reconstruction with Low-Resolution, High Radial Distortion Stereo Images*, ACM Int'l Conf. on Distributed Smart Cameras (ICDSC), pp: 98-103 [*arXiv:1709.06451*,doi];

[32] J. Cardoso, **P. Miraldo**, and H. Araujo (2016). *Plcker correction problem: Analysis and improvements in efficiency*, IEEE/IAPR Int'l Conf. on Pattern Recognition (ICPR), pp: 2796-2801 [*arXiv:1602.05990*,doi];

[33] R. Ventura, M. Basiri, A. Mateus, J. Garcia, **P. Miraldo**, P. Santos, and P. U. Lima (2016). *A Domestic Assistive Robot Developed Through Robotic Competitions*, WS Autonomous Mobile Service Robots, joint with Int'l Joint Conference on Artificial (IJCAI) [doi];

[34] A. Mateus, **P. Miraldo**, P. Lima, and J. Sequeira (2015). *Human-Aware Navigation using External Omnidirectional Cameras*, Iberian Robotics Conf. (ROBOT), pp: 283-295 [doi];

[35] T. Dias, **P. Miraldo**, and N. Gonçalves (2015). *A Framework for Augmented Reality using Non-Central Catadioptric Cameras*, IEEE Int'l Conf. on Autonomous Robot Systems and Competitions (ICARSC), pp: 213-220 [doi];

[36] **P. Miraldo** and H. Araujo (2014). *Pose Estimation for Non-Central Cameras Using Planes*, IEEE Int'l Conf. on Autonomous Robot Systems and Competitions (ICARSC), pp: 104-109 [doi];

[37] **P. Miraldo** and H. Araujo (2010). *Improving the Resolution of the Generic Camera Model by Means of a Parametric Representation*, Portuguese Conf. Automatic Control (CONTROLO);

[38] **P. Miraldo** and H. Araujo (2008). *Gestures Interpretation Using Computer Vision for Human-Machine Interaction*, Portuguese Conf. Pattern Recognition (RECPAD);

Research Impact

Invited Talks

[06/2019] Microsoft Research, HoloLens team, Zurich;
Title: **Robust Pose Estimation: Multi-perspective absolute pose and 3D Scan Alignment**;

[01/2019] Ericsson Research, Kista, Stockholm;
Title: **Non-Conventional Imaging Devices and their Applications in Robotics**;

[03/2018] KTH Royal Institute of Technology, Stokholm, Department of Automatic Control;
Title: **Non-Conventional Imaging Devices and their Applications in Robotics**;

Press Coverage

[2018] Our work in Human-Aware Navigation [30, 7] (with D. Ribeiro, A. Mateus, and J. C. Nascimento) have been mentioned in a Matlab Community Video., Link: here.

Research Projects

[2016-2018] **RockUE2:** Robotics coordination action for Europe two [`link`];
Founding: European Commission, with Ref: `H2020-ICT24-688441` (∼132K EUR);
Publications: N/A;

[2014-2015] **RoCKIn:** Robot competitions kick innovation in cognitive systems and robotics [`link`];
Founding: European Commission, with Ref: `FP7-EU-601012` (∼361K EUR);
Publications: [17, 27];

[2018-2019] **COIN:** Co-adaptive human-robot interactive systems [`link`];
Founding: SSF (Swidish Science Foundation);
Publications: [6, 5, 28, 4];

[2016-2019] **HaRoDE:** Human-aware service robots for domestic environments [`link`];
Founding: Portuguese Foundatin for Science and Technology (FCT),
with Ref: `FCTPTDC/EEI-SII/4698/2014` (∼180K EUR);
Publications: [34, 33, 14, 13, 10, 8, 6, 5];

[2014-2016] **SocRob:** Soccer Robots and Society of Robots [`link`];
Founding: ISR (LARSyS) from Instituto Superior Técnico,
through the FCT project with Ref: `UID/EEA/50009/2013`;
Publications: [34, 17, 33];

[2013-2014] "Novas Tecnologias para apoio à Saúde e Qualidade de Vida:
Projecto A-Cirurgia e Diagnóstico Assistido por Computador Usando Imagem";
Founding: "QREN-MaisCentro", with Ref: `Centro-SCT-2011-01` (∼172K EUR);
Publications: [36, 23, 35, 22, 21, 20, 19];

[2012-2015] Calibration and 3D Reconstruction in Omnidirectional Catadioptric Systems [`link`];
Founding: Portuguese Foundatin for Science and Technology (FCT),
with Ref: `PTDC/EIA-EIA/122454/2010` (∼78K EUR);
Publications: [24, 36, 23, 25, 22, 21, 20, 19];

[2011-2012] Automatic heart scan with ultrasound using visual servoing techniques;
Founding: Portuguese Foundatin for Science and Technology (FCT),
wit Ref: `PHC/PESSOA 2011/2012, Code Projet :  25116ND` (∼5K EUR);
Publications: N/A;

[2010-2013] **UniProjection:** Unified Projection Model of Non SVP Systems – Application to Endoscopy and Graphics [`link`];
Founding: Portuguese Foundatin for Science and Technology (FCT),
wit Ref: `PTDC/EIA-CCO/109120/2008` (∼93K EUR);
Publications: [26, 24, 25];

Events

[2020] **Program Committee**. The Thirty-Fourth AAAI Conference on Artificial Intelligence (AAAI-20), at New York, USA (link);

[2020] **Program Committee**. VISAPP, 15th Int'l Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, at Valletta, Malta (link);

[2020] **Program Committee**. ACM/SIGAPP Symposium On Applied Computing – Track on Intelligent and Multi-Agent Systems, at Brno, Czech Republic (link);

[2019] **Program Committee**. ACM/SIGAPP Symposium On Applied Computing – Track on Intelligent and Multi-Agent Systems, at Limassol, Cyprus (link);

[2018] **Program Committee**. ACM/SIGAPP Symposium On Applied Computing – Track on Intelligent and Multi-Agent Systems, at Pau, France (link);

[2017] **Local Organization**. The 4th Lucia PhD School on "Artificial Intelligence and Robotics" (September 4th: The Triumph of Light), at Instituto Superior Técnico, Lisboa (link);

[2016] **Session Chair, Omnidirectional Vision**. IEEE/RSJ Int'l Conf. Intelligent Robots & Systems (IROS), at Daejeon, Korea (link);

[2015] **@Home Organization and Technical Committee Chair**. RoCKIn Challenge 2015 (Robot Competitions Kick Innovation in Cognitive Systems and Robotics), at Lisboa, Portugal (link);

[2015] **Organization Committee**. RoCKIn Camp (Robot Competitions Kick Innovation in Cognitive Systems and Robotics), at Peccioli, Italy (link);

[2014] **Technical Committee**. RoCKIn Challenge (Robot Competitions Kick Innovation in Cognitive Systems and Robotics), at Toulouse, France (link);

Reviewing for CVPR, ICCV, ECCV, ICRA, IROS, AAAI, and Journals

IEEE Trans. Pattern Analysis and Machine Intelligence (T-PAMI): 2017(#2),2020(#1);

European Conf. Computer Vision (ECCV): 2020(#...);

IEEE/CVF Conf. Computer Vision and Pattern Recognition (CVPR): 2019(#5), 2020(#6);

IEEE/CVF Int'l Conf. Computer Vision (ICCV): 2019(#4);

IEEE Robotics and Automation Letters (L-RA): 2016(#1) ,2017(#3), 2019(#2);

IEEE Int'l Conf. Robotics and Automation (ICRA): 2016(#1), 2017(#2), 2018(#1), 2020(#3);

IEEE/RSJ Int'l Conf. Intelligent Robots and Systems (IROS): 2015(#3), 2016(#1), 2017(#3), 2018(#2), 2019(#7);

AAAI Conference on Artificial Intelligence (AAAI-20): 2020(#3);

Springer Journal of Mathematical Imaging and Vision (JMIV): 2018(#1),2019(#2),2020(#2);

IEEE Robotics and Automation Letters (L-RA): 2016(#1), 2017(#3), 2020(#1);

Elsevier Pattern Recognition Letters (PR-L): 2016(#1),2017(#1),2018(#2);

IEEE Trans. Industrial Electronics (T-IE): 2018(#1);

Elsevier Computer & Graphics (CAG): 2018(#2);

Wiley Journal of Field Robotics: 2017(#2), 2018(#3);

Elsevier Computer Vision and Image Understanding (CVIU): 2017(#3);

Springer Multidimensional Systems and Signal Processing: 2017(#1);

Elsevier Robotics and Autonomous Systems (RAS): 2016(#1);

Springer Journal of Intelligent and Robotic Systems (JINT): 2017(#2);

Reviewing for Other Conference Proceedings

AACC American Control Conf. (ACC): 2019(#1);

IEEE Int'l Conf. Automation Science and Engineering (CASE): 2019(#2);

Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP): 2018(#5);

Int'l Joint Conf. Artificial Intelligence (IJCAI): 2016(#1);

European Conf. Artificial Intelligence (ECAI): 2016(#2);

Teaching

[2017-2018] **Computer Graphics** (CS&E);

[2016-2017] **Algorithms & Data Structures** (ECE);

[2015-2016] **Automatic Control** (ECE);

[2014] **Computer Vision; and Mobile Robotics** (ECE);

Students

Ongoing PhD

[2019-] **G. Dias Pais**: *All SLAM leads to Rome: Localize and Map Dynamic Environments with 3D Sensors and Semantic Information* (with Jacinto C. Nascimento)
Results [5]

[2017-] **André Mateus**: *Mobile Robot Control using Computer Vision* (with Pedro U. Lima)
Results [34, 33, 30, 9, 7, 28]

Other Research Grants (Graduate and Undergraduate)

[2018-] Gonçalo Dias Pais (Research Assistant with a **MSc**), on *"3D Computer Vision and Deep Learning"*, papers: [5];

[2017-2018] João Campos (Research Assistant with a **MSc**), on *"3D Computer Vision"*, papers: [6];

[2017-2018] Francisco Eiras (Research Assistant with a **BSc**), on *"3D Computer Vision"*, papers: [10];

[2016-2017] Rômulo Rodrigues (Research Assistant with a **MSc**), on *"Robotics"*, papers: [29, 11];

[2015-2017] José Iglesias (Research Assistant with a **BSc and MSc**), on *"3D Vision"*, papers: [13];

Completed MSc Students

[05/2018] Gonçalo José Dias Pais (as a supervisor);
Title: OmniDRL: Robust Pedestrian Detection using Omnidirectional Cameras and Deep RL [link];
Mark: **18**/20;

[11/2017] Soraia Mendes Ferreira (as a supervisor);
Title: Mobile Arm Visual Servoing for Object Manipulation [link];
Mark: **15**/20;

[11/2017] José António Carvalho Mendes (as a co-supervisor);
Title: Forensic use of Mobile Phone Cameras: Measuring the Height of a Person [link];
Mark: **16**/20;

[11/2016] Luís Carlos Barreira Luz (as a supervisor);
Title: Cooperative Perception for People Tracking and Human-Aware Navigation [link];
Mark: **17**/20;

[11/2016] Diogo Emanuel Parreira Maximino (as a supervisor);

Title: Improvement of Non-Central Catadioptric Cameras Pose Estimation Using 3D Lines [link];
Mark: **14**/20;

[10/2015] João Miguel Camiso Soares de Goyri O'Neill (as a co-supervisor);
Title: Semantic Maps for Domestic Robots [link];
Mark: **14**/20;

[5/2015] António Pedro Pinto Ribeiro (as a co-supervisor);
Title: Odometria Visual usando campos visuais não sobrepostos [link];
Mark: **17**/20;

[09/2014] Tiago José Simões Dias (as a co-supervisor);
Title: Augmented Reality using Non-Central Catadioptric Imaging Devices [link];
Mark: **19**/20;

PhD Thesis Accompaniment Committee (CAT)

[11/2019] André Mateus, with the title:
On the Exploitation of 3D Straight Lines for Active Mapping and Camera Localization, as **Supervisor**
Mark: **N/A**/20;

MSc Thesis Jury

[2019] Afonso Soares, with the thesis:
Visual intention of interaction for HRI using gaze, posture and gestures, as **Opponent**;

[2018] Patrícia Silva, with the thesis:
Detection amd Tracking in Airborne Image Sequences, as **Opponent**;

[2018] Gonçalo Pais, with the thesis:
OmniDRL: Robust Pedestrian Detection using Omnidirectional Cameras and Deep Reinforcement Learning, as **Supervisor**;

[2017] Soraia Ferreira, with the thesis:
Mobile Arm Visual Servoingfor Object Manipulation, as **Supervisor**;

[2017] Ana Solas, with the thesis:
Adaptive Illumination: Vehicle Tracking in Bridges with Surveillance Cameras, as **Opponent**;

[2017] João Salvado, with the thesis:
Detection of Interaction Intention and Engagement in HRI using Joint Gaze and Gesture Analysis, as **Opponent**;

[2017] Ana Almeida, with the thesis:
Deep Networks for Human Visual Attention: A hybrid model using foveal vision, as **Opponent**;

[2016] Diogo Maximino, with the thesis:
Improvement of Non-Central Catadioptric Cameras Pose Estimation using 3D Lines, as **supervisor**;

[2016] Miguel Bastos, with the thesis:
Eye Tracking on Human's Visual Search, as **Opponent**;

[2016] Luís Luz, with the thesis:
Human-Aware Navigation, as **Supervisor**;