Rui Paulo Pinto da **Rocha**   **CURRICULUM VITAE**

University of Coimbra   E-mail: rui.rocha@uc.pt / rprocha@isr.uc.pt
Dep. Eng.ª Eletrotécnica e de Computadores   Phone: +351 239796256 / Fax: +351 239796247
Universidade de Coimbra – pólo 2   WWW: http://faculty.uc.pt/uc26413
3030-290 Coimbra, Portugal   Skype: rprocha

Academic Qualifications

University of Porto   Faculty of Engineering, Porto
Ph.D. on Electrical and Computer Engineering   May 8, 2006
Grade: Approved by unanimity
Thesis: Building Volumetric Maps with Cooperative Mobile Robots and Useful Information Sharing – a Distributed Control Approach based on Entropy
Committee: J. Martins Carvalho (chair), Wolfram Burgard, Isabel Ribeiro, José M. B. Mendonça, Paulo Costa, Jorge M. Dias (supervisor), Adriano S. Carvalho (co-supervisor)

University of Porto   Faculty of Engineering, Porto
M.Sc. on Electrical and Computer Engineering, Area: Industrial Informatics   Mar. 22, 1999
Grade: Excellent

University of Porto   Faculty of Engineering, Porto
Engineering degree (B.Sc. plus 2 years) on Electrical and Computer Engineering   Jul. 31, 1996
Grade: 17 (out of 20)

Experience

University of Coimbra   Dept. of Electrical & Computer Engineering
Associate Professor (tenure position)   May 2021 – Present

Institute of Systems and Robotics   University of Coimbra
Senior Researcher   Dec. 2000 – Present

University of Coimbra   Dept. of Electrical & Computer Engineering
Assistant Professor (tenure position)   May 2011 – May 2021

University of Coimbra   Dept. of Electrical & Computer Engineering
Assistant Professor (tenure track position)   May 2006 – May 2011

University of Coimbra   Dept. of Electrical & Computer Engineering
Teaching Assistant   Feb. 2000 – May 2006

University of Minho   Dept. of Informatics
Junior Teaching Assistant   Nov. 1998 – Feb. 2000

EFACEC S.A.   Automation and Robotics Division
R&D Engineer for industry projects of automatic material handling devices   Oct. 1996 – Jan. 2000

Professional Organizations

- Institute of Electrical and Electronics Engineers (IEEE), Senior Member #90069426
- IEEE Robotics & Automation Society, Member
- Ordem dos Engenheiros (Portuguese Association of Engineers), Member #41560

Research Interests

Multi-robot systems; cooperative perception; human-robot team cooperation; decentralized control; efficient information sharing; autonomous mobile robots.

Representative Publications in ISI-Indexed Scientific Journals

[1] L. Guevara, R. P. Rocha and F. A. Cheein, "Improving the Manual Harvesting Operation Efficiency by Coordinating a Fleet of N-Trailer Vehicles, Computers and Electronics in Agriculture, 185, 106103, Elsevier, 2021.

[2] P. Menezes and R. P. Rocha, "Promotion of Active Ageing through Interactive Artificial Agents in a Smart Environment", SN Applied Sciences, 3, 583, 2021.

[3] M. S. Couceiro, D. Portugal, R. P. Rocha and A. Araújo, "Fostering Human-Robot Cooperative Architectures for Search and Rescue Missions in Urban Fires", Simulation, 97(3), pp. 177-194, 2021.

[4] D. Portugal and R. P. Rocha, "Performance Estimation and Dimensioning of Team Size for Multi-Robot Patrol", IEEE Intelligent Systems, 32(6), pp. 30-38, Nov./Dec. 2017.

[5] D. Portugal and R. P. Rocha, "Cooperative Multi-Robot Patrol with Bayesian Learning", Autonomous Robots, 40(5):929-953, Jun. 2016.

[6] J. M. Santos, M. S. Couceiro, D. Portugal and R. P. Rocha, "A Sensor Fusion Layer to Cope with Reduced Visibility in SLAM", Journal of Intelligent & Robotic Systems, 80(3):401-422, Dec. 2015.

[7] A. Fernandes, M. S. Couceiro, D. Portugal, J. M. Santos and R. P. Rocha, "Ad Hoc Communication in Teams of Mobile Robots using Zigbee Technology", Computer Applications in Engineering Education, 23(5):733-745, Sep. 2015.

[8] A. Araújo, D. Portugal, M. S. Couceiro and R. P. Rocha, "Integrating Arduino-based Educational Mobile Robots in ROS", Journal of Intelligent & Robotic Systems, 77(2):281-298, Feb. 2015.

[9] M. S. Couceiro, A. Fernandes, R. P. Rocha and N. M. F. Ferreira, "Understanding the Communication Complexity of the Robotic Darwinian PSO", Robotica, 33(1):157-180, 2015.

[10] M. S. Couceiro, D. Portugal, R. P. Rocha and N. M. F. Ferreira, "Marsupial Teams of Robots: Deployment of Miniature Robots for Swarm Exploration under Communication Constraints", Robotica, 32(7):1017-1038, Oct. 2014.

[11] M. S. Couceiro, P. A. Vargas, R. P. Rocha and N. M. F. Ferreira, "Benchmark of Swarm Robotics Distributed Techniques in a Search Task", Robotics and Auton. Systems, 62(2):200-213, Feb. 2014.

[12] D. Portugal and R. P. Rocha, "Distributed Multi-Robot Patrol: A Scalable and Fault-Tolerant Framework", Robotics and Autonomous Systems, 61(12):1572-1587, Dec. 2013.

[13] P. Drews Jr., P. Núñez, R. P. Rocha, M. Campos and J. Dias, "Novelty Detection and Segmentation based on Gaussian Mixture Models: a Case Study in 3D Robotic Laser Mapping", Robotics and Autonomous Systems, 61(12):1696-1709, Dec. 2013.

[14] M. S. Couceiro, J. A. T. Machado, R. P. Rocha and N. M. F. Ferreira, "A Fuzzified Systematic Adjustment of the Robotic Darwinian PSO", Robotics & Auton. Sys., 60(12):1625-1639, Dec. 2012.

[15] R. Rocha, A. Cunha, J. Varandas and J. Dias. "Towards a New Mobility Concept for Cities: Architecture & Programming of Semi-Autonomous Electric Vehicles", Industrial Robot, 34(2):142-149, Mar. 2007.

[16] R. Rocha, J. Dias and A. Carvalho. "Cooperative Multi-Robot Systems: a study of Vision-based 3-D Mapping using Information Theory". Robotics and Auton. Systems, 53(3–4):282-311, Dec. 31, 2005.

Representative Publications in Peer-Reviewed International Conferences

[17] P. Silva and R. P. Rocha, "Low-Power Footprint Inference with a Deep Neural Network offloaded to a Service Robot through Edge Computing", In Proc. of 38th ACM/SIGAPP Symposium on Applied Computing (SAC 2023), Tallinn, Estonia, Mar. 28–31, 2023.

[18] J. Falcao, P. Menezes and R. P. Rocha, "Automatic Identification of the Wireless Sensor Network Topology in a IoT and Discovery of User Routines", In Proc. of 2020 Int. Conf. on Omni-layer Intelligent Systems (COINS 2020), Barcelona, Spain, Aug. 31 – Sep. 2, 2020.

[19] R. Prykhodchenko, R. P. Rocha and M. S. Couceiro, "People Detection by Mobile Robots Doing Automatic Guard Patrols", In Proc. of 20th IEEE Int. Conf. on Autonomous Robot Systems and Competitions (ICARSC 2020), pp. 300-305, Ponta Delgada, Portugal, 2020.

[20] G. S. Martins, R. P. Rocha, F. J. Pais and P. Menezes, "ClusterNav: Learning-Based Robust Navigation Operating in Cluttered Environments", In Proc. of IEEE Int. Conf. on Robotics and Automation 2019 (ICRA 2019), pp. 9624-9630, Montreal, Canada, May 20-24, 2019.

[21] F. M. Noori, D. Portugal, R. P. Rocha and M. S. Couceiro, "On 3D Simulators for Multi-Robot Systems in ROS: MORSE or Gazebo?", In Proc. of 15th IEEE International Symposium on Safety, Security, and Rescue Robotics 2017 (SSRR 2017), pp. 19-24, Shanghai, China, Oct. 11-13, 2017.

[22] J. Rosa and <u>R. P. Rocha</u>, "Exportation to the Cloud of Distributed Robotic Tasks Implemented in ROS", In Proc. of 32nd ACM Symposium on Applied Computing (SAC 2017), pp. 235-240, Marrakech, Morocco, Apr. 4-6, 2017.

[23] D. Portugal, C. Pippin, <u>R. P. Rocha</u> and Henrik I. Christensen, "Finding Optimal Routes for Multi-Robot Patrolling in Generic Graphs", In Proc. of 2014 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2014), Chicago, Illinois, USA, pp. 363-369, Sep. 14-18, 2014.

[24] D. Portugal and <u>R. P. Rocha</u>, "Scalable, Fault-Tolerant and Distributed Multi-Robot Patrol in Real World Environments", In Proc. of 2013 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2013), Tokyo, Japan, pp. 4759-4764, Nov. 3-8, 2013.

[25] M. S. Couceiro, <u>R. P. Rocha</u> and N. M. Ferreira, "Fault-Tolerance Assessment of a Darwinian Swarm Exploration Algorithm under Communication Constraints", In Proc. of 2013 IEEE Int. Conf. on Robotics and Automation (ICRA 2013), Karlsruhe, Germany, pp. 2000-2005, May 6-10, 2013.

[26] M. S. Couceiro, D. Portugal and <u>R. P. Rocha</u>, "A Collective Robotic Architecture in Search and Rescue Scenarios", In Proc. of 28th ACM Symposium on Applied Computing (SAC 2013), Coimbra, Portugal, pp. 64-69, Mar. 18-22, 2013.

[27] M. S. Couceiro, C. Figueiredo, D. Portugal, <u>R. P. Rocha</u> and N. M. Ferreira, "Initial Deployment of a Robotic Team: a Hierarchical Approach under Communication Constraints Verified on Low-Cost Platforms", In Proc. of IEEE/RSJ Int. Conf. on Intelligent Robots and Systems 2012 (IROS 2012), Vilamoura, Portugal, pp. 4614-4619, Oct. 7-12, 2012.

[28] D. Portugal and <u>R. P. Rocha</u>, "On the Performance and Scalability of Multi-Robot Patrolling Algorithms", In Proc. of 9th IEEE Int. Symposium on Safety, Security, and Rescue Robotics (SSRR 2011), Kyoto, Japan, pp. 50-55, Nov. 1-5, 2011.

[29] M. S. Couceiro, <u>R. P. Rocha</u> and N. M. Ferreira, "Ensuring Ad Hoc Connectivity in Distributed Search with Robotic Darwinian Particle Swarms", In Proc. of 9th IEEE Int. Symposium on Safety, Security, and Rescue Robotics (SSRR 2011), Kyoto, Japan, pp. 284-289, Nov. 1-5, 2011.

[30] P. Núñez, P. Drews Jr, A. Bandera, <u>R. Rocha</u>, M. Campos and J. Dias, "Change Detection in 3D Environments Based on Gaussian Mixture Model and Robust Structural Matching for Autonomous Robotic Applications", In Proc. of 2010 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2010), Taipei, Taiwan, pp. 2633-2638, Oct. 18-22, 2010.

[31] P. Drews Jr, P. Núñez, <u>R. Rocha</u>, M. Campos and J. Dias, "Novelty Detection and 3D Shape Retrieval using Superquadrics and Multi-Scale Sampling for Autonomous Mobile Robots", In Proc. of 2010 IEEE Int. Conf. on Robotics and Automation (ICRA 2010), Anchorage, Alaska, USA, pp. 3635-3640, May 3-8, 2010.

[32] D. Portugal and <u>R. Rocha</u>, "MSP Algorithm: Multi-Robot Patrolling based on Territory Allocation using Balanced Graph Partitioning", In Proc. of 25th ACM Symposium on Applied Computing (SAC 2010), Sierre, Switzerland, pp. 1271-1276, Mar. 22-26, 2010.

[33] P. Núñez, P. Drews Jr, <u>R. Rocha</u>, M. Campos and J. Dias, "Novelty Detection and 3D Shape Retrieval based on Gaussian Mixture Models for Autonomous Surveillance Robotics", In Proc. of 2009 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2009), St. Louis, MO, USA, pp. 4724-4730, Oct. 11-15, 2009.

[34] <u>R. Rocha</u>, F. Ferreira and J. Dias, "Multi-Robot Complete Exploration using Hill Climbing and Topological Recovery", In Proc. of 2008 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2008), Nice, France, pp. 1884-1889, Sep. 22-26, 2008.

[35] <u>R. Rocha</u>, J. Dias and A. Carvalho. "Exploring Information Theory for Vision-Based Volumetric Mapping", In Proc. of IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2005), Edmonton, Canada, pp. 2409-2414, Aug. 2-6, 2005. DOI: 10.1109/IROS.2005.1545338

Scientific Journals Editorial Service
- Robotics, MDPI, ISSN 2218-6581. Editorial Board.
- International Journal of Advanced Robotic Systems, SAGE, ISSN 1729-8806. Editorial Board.
- Journal of Behavioral Robotics, Paladyn, ISSN 2081-4836. Editorial Board.
- Robotics, MDPI, Special Issue "The State-of-the-Art of Robotics in Europe", R. P. Rocha, O. R. García, T. Chaminade, and Kerstin Thurow (guest editors), 2022 -.

- Applied Sciences, MDPI, Special Issue on Intelligent Robotics, N. Lau, L. P. Reis and R. P. Rocha (guest editors), Dec. 2021.
- Cybernetics and Systems: An International Journal, 50(8), Special Issue on Intelligent Robotics and Multi-Agent System, R. P. Rocha and Daniel Kudenko (guest editors), Nov. 2019.
- Journal of Intelligent and Robotic Systems, 77(2), Special Issue on Autonomous Robot Systems, L. P. Reis, J. M. Ferreira Calado and R. P. Rocha (guest editors), Feb. 2015.

Organization of Scientific Conferences and Workshops
- IROS 2012, 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems, Vilamoura, Algarve, Portugal, Oct. 7-12, 2012. Registration Chair.
- SAC 2013, ACM Symp. on Applied Computing, Coimbra, Portugal, Mar. 18-22, 2013. Vice-Chair.
- ECMR 2023, European Conference on Mobile Robots, Coimbra. Portugal, Sep. 4-7, 2023. Workshops & Tutorials Chair.
- ICARSC 2013, IEEE 13th International Conference on Autonomous Robot Systems and Competitions, Lisbon, Portugal, Apr. 24, 2013. Co-Chair.
- CLAWAR 2017, 20th International Conference on Climbing and Walking Robots and Support Technologies for Mobile Machines, Porto, Portugal, Sep. 11-13, 2017. Publicity Chair.
- SAC 2023, SAC 2022, SAC 2021, SAC 2020, SAC 2019, SAC 2018, SAC 2017, SAC 2016, SAC 2015, ACM Symposium on Applied Computing – Technical track on Intelligent Robotics and Multi-Agent Systems. Track Co-Chair.
- SAC 2013, ACM Symposium on Applied Computing – Technical track on Cooperative Multi-Agent Systems and Applications. Track Co-Chair.
- EPIA 2015, 17th Portuguese Conference on Artificial Intelligence – Thematic track on Intelligent Robotics, Sep. 8-11, 2015. Track Co-Chair.

Participation in Scientific and Program Committees of International Scientific Conferences
- ICRA 2021, IEEE International Conference on Robotics and Automation. Associate Editor.
- ICRA 2020, IEEE International Conference on Robotics and Automation. Associate Editor.
- ICAR 2019, 19th International Conference on Advanced Robotics. Associate Editor.
- AAMAS 2017, AAMAS 2015, International Conference on Autonomous Agents and Multiagent Systems. Program Committee.
- RSS 2014, 2014 Robotics: Science and Systems Conference, University of California, Berkeley, USA, Jul. 12-16, 2014. Program Committee.
- MRS 2019, IEEE RAS Int. Symposium on Multi-Robot and Multi-Agent Systems. Program Committee
- SSRR 2020, SSRR 2016, SSRR 2015, SSRR 2013, SSRR 2012, IEEE International Symposium on Safety, Security, and Rescue Robotics. Program Committee.
- CLAWAR 2023, CLAWAR 2022, CLAWAR 2021, CLAWAR 2020, CLAWAR 2019, CLAWAR 2018, International Conference on Climbing and Walking Robots and Support Technologies for Mobile Machines. Program Committee
- ICARSC 2023, ICARSC 2022, ICARSC 2021, ICARSC 2020, ICARSC 2019, ICARSC 2018, ICARSC 2017, ICARSC 2016, ICARSC 2015, ICARSC 2014, ICARSC 2012, IEEE International Conference on Autonomous Robot Systems. Program Committee.
- ICART 2024, ICART 2023, International Conference on Agents and Artificial Intelligence. Program Committee.
- IBERAMIA 2016, IBERAMIA 2014, Ibero-American Conference on Artificial Intelligence. Program Committee.
- ROBOT 2019, ROBOT 2017, ROBOT 2015, ROBOT 2013, Iberian Robotics Conference. Program Committee.

Activity as a Reviewer in Scientific Journals
- Transactions on Robotics (IEEE), since 2011/02/09
- IEEE Robotics and Automation Magazine, since 2020/09/01
- IEEE Robotics and Automation Letters, since 2016/09/14
- International Journal of Robotics Research, since 2019/01/10
- Autonomous Robots (Springer), since 2010/02/01
- Robotics and Autonomous Systems (Elsevier), since 2014/07/07
- IEEE Transactions on Cybernetics, since 2018/01/04
- Journal of Intelligent and Robotic Systems (Springer), since 2006/06/01
- Robotica (Cambridge University Press), since 2012/11/01
- ACM Computing Surveys, since 2019/04/03
- Computers and Electronics in Agriculture (Elsevier), since 2020/06/17
- Information Sciences (Elsevier), since 2012/04/24
- Intelligent Transportation System Magazine (IEEE), since 2010/10/19
- International Journal of Machine Learning and Cybernetics (Springer), since 2012/09/14
- Mechatronics (Elsevier), since 2009/05/05
- Journal of Robotics (Hindawi Publishing Corporation), since 2009/12/18
- Sensors, since 2012/05/31
- International Journal of Advanced Robotic Systems (InTech), since 2011/09/07

Activity as a Reviewer in International Scientific Conferences
- IEEE International Conference on Robotics and Automation (ICRA), 2010–2021
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2005, 2007–2011, 2013–2018, 2020–2023
- ACM Symposium On Applied Computing (SAC), 2008 - 2012
- IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR), 2012–2016, 2019–2022
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2015, 2017
- Robotics: Science and Systems Conference, 2014
- International Symposium on Distributed Autonomous Robotic Systems (DARS), 2012
- European Conference on Mobile Robotics (ECMR), 2017
- International Conference on Autonomous Robot Systems and Competitions (ICARSC), 2012–2021
- Ibero-American Conference on Artificial Intelligence (IBERAMIA), 2014, 2016
- Intelligent Transportation Systems Conference (ITSC), 2012, 2016
- Int. Conf. on Climbing and Walking Robots and Support Technologies for Mobile Machines (CLAWAR), 2017–2021
- International Conference on Advanced Robotics (ICAR), 2011
- Portuguese Conference on Artificial Intelligence (EPIA), 2011
- IEEE International Conference on Systems, Man, and Cybernetics (SMC), 2010
- Annual Conference of the IEEE Industrial Electronics Society (IECON), 2009

Funded Research Projects
- Rui P. Rocha (Principal Investigator at University of Coimbra), EuroAGE – Iniciativas Inovadoras para a Promoção do Envelhecimento Ativo na Região EuroACE, Ref. POCTEP-0043_EUROAGE_4_E, Funded by Interreg V A Spain – Portugal Program, Jan. 2017 - Dec. 2020, 144 000€.

- Rui P. Rocha (Principal Investigator at University of Coimbra), STOP − Cooperative Robotic Securities, Ref. CENTRO-01-0247-FEDER-017562, Funded by Portugal 2020-Centro 2020, Oct. 2016 - Sep. 2019, 95 700€.
- Rui P. Rocha (Principal Investigator), CHOPIN − Cooperation between Human and rObotic teams in catastroPhic INcidents, Ref. PTDC/EEA-CRO/119000/2010, Funded by Portuguese Science Agency (FCT), Apr. 2012 - Sep. 2015, 100 000€.
- Rui P. Rocha (Researcher), SEMFIRE – Safety, Exploration and Maintenance of Forests with the Integration of Ecological Robotics, Ref. CENTRO-01-0247-FEDER-032691, Funded by Portugal 2020-Centro 2020, Oct. 2018 - Sep. 2021.
- Rui P. Rocha (Researcher), GrowMeUp, Funded by European Commission, Ref. H2020-643647, Feb. 2015 – Jan. 2018.
- Rui P. Rocha (Consultant), CASIR – Coordinated Attention for Social Interaction with Robots, Ref. PTDC/EEI-AUT/3010/2012, Funded by Portuguese Science Agency (FCT), Apr. 2013 - Jul. 2015.
- Rui P. Rocha (Researcher), TICE.Healthy – Systems of Health and Quality of Life, Ref. AdI-QREN-COMPETE-13842, Funded by Agência de Inovação (Portugal), Jan. 2011 - Dec. 2014.
- Rui P. Rocha (Researcher), TICE.Mobility – User-Centered Mobility System, Ref. AdI-QREN-COMPETE-13843, Funded by Agência de Inovação (Portugal), Jan. 2011 - Dec. 2013.
- Rui P. Rocha (Researcher), HANDLE – Developmental Pathway Towards Autonomy and Dextery in Robot In-Hand Manipulation, Funded by European Commission, Ref. FP7-ICT-2008-1-231640, Feb. 2009 - Feb. 2012.
- Rui P. Rocha (Researcher), Prometheus – PRediction and interpretatiOn of huMan bEhavior based on probabilistic sTructures and HEterogeneoUs Sensors, Funded by European Commission, Ref. FP7-ICT-2007-1-214901, Jan. 2008 - Dec. 2010.
- Rui P. Rocha (Researcher), IRPS – Intelligent Robotic Porter System, Funded by European Commission, Ref. FP6-IST-045048, Jan. 2007 - Dec. 2009.
- Rui P. Rocha (Researcher), BACS – Bayesian Approach to Cognitive Systems, Funded by European Commission, Ref. FP6-IST-027140, Jan. 2006 – Feb. 2010.

Supervision of Ph.D. Students
- André Gonçalves Araújo. "Multi-Constrained, Decentralized Multi-Robot Motion Coordination". On going since Sep. 2019. Co-supervised by João F. Ferreira (NTU) and Micael Couceiro (Ingeniarius).
- David Bina Siassipour Portugal. "Autonomous Patrolling and Inspection of Infrastructures with Cooperative Multi-Robot Teams". Concluded on March 2014.
- Micael Santos Couceiro. "Multi-Agent Cooperation over Unreliable Mobile Ad Hoc Communication Networks". Concluded on April 2014. Co-supervised by Nuno Ferreira (ISEC-IPC).

Teaching Experience
Ph.D. level: Cooperative Robotics, Mobile Robotics Methodologies. M.Sc. level: Autonomous Robotic Systems; Cognitive Robotics; Industrial Process Automation; Software Engineering; Databases. B.Sc. level: Electronics; Data Structures and Algorithms; Programming; Digital Systems; Microprocessors; Measures and Instrumentation. Pre-Bologna engineering courses: Robotic Manipulators; Control Theory; Measurements and Instrumentation; Electronics, Electrical Materials Fundamentals; Digital Systems and Microelectronics.