ISABEL RIBEIRO
SHORT CURRICULUM VITÆ

Name: **ISABEL RIBEIRO**

Date of birth: 28 September 1955

Nationality: Portuguese

Actual Position: Full Professor at Instituto Superior Técnico (IST), the School of Engineering of the Universidade de Lisboa. Researcher at Institute for Systems and Robotics (ISR), Associate Laboratory, at IST.

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EDUCATION

1999 – Aggregation on Electrical Engineering / Robotics – Instituto Superior Técnico (IST), Technical University of Lisbon - Portugal

1988 - Ph.D. on Electrical Engineering - Instituto Superior Técnico (IST), Technical University of Lisbon - Portugal

1983 - M.Sc. on Electrical Engineering - Instituto Superior Técnico (IST), Technical University of Lisbon - Portugal

1978 - Graduation (5 years course) on Electrical Engineering - Instituto Superior Técnico (IST), Technical University of Lisbon - Portugal

POSITIONS HELD

- [2014 - …] – Member of the School Council of IST. Vice-President since 2015.
- [2012 - …] – Vice-President of IST-ID (Associação do IST para a Investigação e Desenvolvimento)
- [2012-2013] – Vice-President of IST for Administrative and Financial affairs.
- [Sept-Dec.2011] – Member of the General Council of the Technical University of Lisbon
- [2008-2011] – Adviser of the President of the Portuguese Foundation for Science and Technology (FCT) for the area of research projects and research units and labs.
- Jan.2006-July 2007 – Director of the Institute for Systems and Robotics, Associate Laboratory
- [2005 - …] – Full Professor of IST
- [2005-2008] – Chair of the IFAC Technical Committee on Intelligent Autonomous Vehicles
- 2003 – 2005 - Adjoin Director for Project Management of Instituto Superior Técnico (IST)
- 2002 – 2005 - Vice-Director of the Institute for Systems and Robotics (ISR)
- Jan-Sep.2001 – Member of the Executive Board of Instituto Superior Técnico (IST)
- 1999-2000 – Vice-President of the Scientific Council of Instituto Superior Técnico (IST)
- 1998-Feb.2001 – Elected member of the Electrical Engineering Board of the Ordem dos Engenheiros, the Professional Association of Portuguese Engineers
- 1996-1999 - Responsible for the Control Section of the Electrical and Computer Engineering Department of IST
- 1991-1994 - Responsible for the scientific coordination of the Control and Robotics specialization of the undergraduate course on Electrical and Computer Engineering of IST
- Oct.94-March.95 - Visiting researcher at the Joint Research Centre, Ispra, Italy
- Since 1992 – Responsible for the Land Mobile Robotics Laboratory of the Institute for Systems and Robotics (ISR), Lisbon
- Nov.91-Dec.92 - Member of the Executive Board of IST
- Since 1991 - Associate Professor at IST
- 1988-1989 - Assistant Professor at IST

RESEARCH INTERESTS

- Navigation of Land Autonomous Robots

- Sensor Fusion and Perception for Robot Navigation
- Cooperative Robotics
- Remote Handling in ITER

MAIN PROFESSIONAL RESEARCH ACTIVITIES

– [April2011-October2011] - Principal Investigator of the project "Activities Related to the optimization of Trajectories for the Cask and Plug Remote Handling System in Tokamak Building and Hot Cell", F4E-GRT-276-01 (MS-RH), funded by Fusion for Energy (F4E) (The European Joint Undertaking for ITER and the Development of Fusion Energy). IST is the project leader that also involves ASTRIUM ST (France). In this project IST will generate optimal trajectories for all typologies of CPRHS, Cask Transfer Systems and Rescue Cask in all predicted missions in Tokamak and Hot Cell buildings, assuming navigation with both wheels of the CTS following and not following the same path, and maximizing the length of the common parts for different paths. Studies on motion associated with parking in the Hot Cell Building will be carried out.

– [Mar2009-June2010] – Principal Investigator of the project "ITER TCS/ATS - Activities related to the development of an Air Transfer System prototype and Cask Transfer System Virtual Mockup", F4E-2008-GRT-016 (MS-RH), funded by Fusion for Energy (F4E) (The European Joint Undertaking for ITER and the Development of Fusion Energy). IST is the project leader that also involves CIEMAT (Spain) and ASTRIUM (France). In the project IST defined the trajectories for the nominal operation of the Transfer Cask System, this leading to request for ITER building modifications, defined the complete specifications for a test facility for a real vehicle prototype and provided technical consultancy to F4E.

– [2008-2011] - Adviser for the Executive Board of FCT (Portuguese Foundation for Science and Technology). Co-responsible for the preparation of the Call for Proposals for Scientific Research and Technological Development Projects in all Scientific Domains launched by FCT. One call opened in November 2008, received around 5800 proposals and during 2009 she was responsible for the IT aspects related with the scientific evaluation. She was responsible for the next call that opened in September 2009. She authored the "Guide for preparation and submission of R&D projects" and the "Guide for Peer Review of R&D projects". During 2009 and 2010 she was the FCT responsible for the negotiations with "Programa Operacional Factores de Competitividade", the funding programme responsible for the allocation of FEDER funds to FCT.

– [Mar.2005-Nov.2005] – Principal investigator of the project, "Accurate Measurements of High Voltage Installations with Laser Range Scanners and GPS", executed on demand by the Portuguese company LABELEC – Electricity of Portugal (EDP). Development of robotic methodologies applied to power line inspection. A prototype (hardware and software) to measure power line obstacle clearance based on laser scanning and performing on-line fault detection and classification during helicopter normal inspections of power lines was developed. The prototype demonstrated the feasibility of the concept and LABELEC contracted, later on, the product development to an ISR/IST spin-off company, Albatroz, which was also involved in the first phase. In this later phase (2008) she provide scientific consultancy on the assessment of the developed product. The company now commercializes the product in Portugal and Spain.

- [March 2003 –Sep 2004] – Director of the project RAPOSA- Semi-Autonomous Robot for Search and Rescue Operations sponsored by Innovation Agency, Portuguese Ministry of Science and Technology. RAPOSA is a Search and Rescue robot designed to operate in outdoors hazardous environments, and developed within a consortium project with the ISR spinoff SME IdMind and the Lisbon Fire Department. The robot is tele-operated but is capable of carrying out short tasks autonomously. During task execution, the robot sends the information on environmental data from different

sensors to the remote command station. The robot was designed to allow it to negotiate standard sized stairs and sewer pipes. The most innovative contribution of RAPOSA is the tether remote docking, which can be accomplished remotely by using the visual feedback of a web cam installed in the back side of the robot, and a remotely-controlled door latch. The tether supplies power and acts as a wireless access point.

- [2000 – 2004] Researcher on the project RESCUE- Cooperative Navigation for Rescue Robots funded by the Portuguese Ministry of Science and Technology. The project comprises a team of two robots (a land robot and a blimp) with cooperative navigation capabilities, so as to demonstrate the ability of the robots to act individually and cooperatively in search and rescue-like operation scenarios.
- [1997 – 2001] Principal Investigator of the project COOPERA – Cooperation among multiple robotic devices of the PRAXIS funding program (Portuguese Ministry of Science and Technology).
- [1996-1998] - Scientific responsible for the projects ERB 5004 CT 96 0127-NET/96-431 (EFDA) - [1996-1997] "Flexible Guidance and Docking System for ITER Remote Handling Transport Cask", ERB 5004 CT97 0088-NET/97-460 (EFDA) -“Guidance and Navigation Systems for ITER RH Air Cushion Transport Casks” and “Tele-operation of Transport Vehicles and Robotic Manipulators” sponsored by the European Atomic Energy Community and EURATOM/Instituto Superior Técnico ASSOCIATION. The projects main goals were to provide conceptual studies on flexible navigation, guidance, docking and tele-operation methodologies for component transportation on the future International Thermonuclear Experimental Reactor (ITER) facilities. Based on these first studies, the reference design for the transportation system of ITER was changed from a rail-based system into a Flexible Air Cushion based system, and is still (in 2011) the basis for the reference design used for the remaining transportation activities.
- [1995-2000] - Responsible for the IST participation on the European project RESOLV - Reconstruction using Scanned Laser and Video of the ACTS Programme, EU. The project aims at the 3D environment reconstruction of large and complex environments using range and intensity data. On this project IST fully developed the navigation tools for a mobile platform that transports a scanning sensor composed by a Laser Range Finder and a Video Camera.
- Since 1992- Responsible for the Land Mobile Robotics Laboratory of the Institute for Systems of Robotics (ISR) of Instituto Superior Técnico (IST), where activity is being developed on the areas of mobile robots navigation architectures, path planning and trajectory finding, obstacle detection and avoidance, vehicle localization, flexible Automated Guided Vehicles, and outdoors robotics, all of them supported on different types of sensors and vehicles. Research work is also under way on the area of cooperation among multiple robotic devices.
- [1993-1999] – Director and Principal Investigator of the project PO-ROBOT - Multiple-purpose Portuguese Flexible Mobile Robot sponsored by the NATO Science for Stability Programme. The project addresses the area of mobile robotics and aims to develop and implement, in a commercially available mobile robot (Robuter platform), the main navigation and mission management functions aiming at demonstrating that it might be able to safely operate in indoors structured or semi-structured environments. The mobile platform is able to carry, on a point-to-point delivery basis, material transportation tasks in industrial environments.
- [1989-1990] - Responsible for the project that design, implement and test an Automated Guided Vehicle (AGV) system, with a fleet of four vehicles, in Portugal. The project, done in cooperation with EFACEC, a Portuguese CIM supplier, aimed at automatically providing the material transportation between the 120 working places and the two automatic warehouses of EFACEC's electrical transformer plant. The system is successfully running since 1991. The outcome of the project is now being commercialised by EFACEC, with several installations in Europe, South America and Asia.

- [1989-1991] – Member of the research team of the project AIMBURN- Advanced Intelligent Multi-Sensor System for Control of Boilers and Furnaces – of the ESPRIT Programme, EU. She actively participated on the proposal elaboration and discussion and was responsible for the acquisition and processing of sensorial data used for the identification of sub-systems of a glass furnace of the Portuguese company Barbosa & Almeida.
- [1988-1989] Member of the research team of the project Automatic Material Transportation in a CIM Scenario sponsored by Junta Nacional de Investigação Científica e Tecnológica - JNICT (Portugal). She was responsible for the project, development and tests of the prototype of an industrial Automated Guided Vehicle.
- Since 1988 she has participated in a number of Technical Committees and Organizing Committees of national and international conferences and symposiums and has act as a referee in paper evaluation for conferences and journals. In 2002 she organized, in Lisbon, a Summer School on Cooperative Robotics attended by 32 European PhD students. In 2004 she was the General Chair of the 5th IFAC Symposium on Intelligent Autonomous Vehicles (IAV2004), and in 2007 co-organized the RobotMat2007 - Workshop on Robotics and Mathematics.
- Since 1988 she was responsible for teaching activities on both graduate and undergraduate courses of Instituto Superior Técnico (IST), in the areas of Systems and Control Theory and Robotics as well as for the supervision of Master and Ph.D. students.
- She is the author of one Book, more than 130 scientific papers published in journals or presented in international conferences with peer review. She gave a number of invited talks and seminars in robotics related topics. ” She gave a plenary invited talk on the subject “The Remote Handling Systems for ITER” in the 26th Symposium on Fusion Technology, Porto, Portugal, September 2010.
- She supervised four PhD students, with the thesis successfully discussed.

KEY TECHNOLOGICAL ACHIEVEMENTS

- In 1988 she introduced the mobile robotics research area in Portugal, after spending the last part of her PhD thesis preparation at Carnegie Mellon University where she get acquainted with the work carried out at the Robotics Institute. More than 20 years later, this area is addressed both at teaching and research levels in almost all Portuguese Universities, and many students of Portuguese High Schools build and program their own mobile robots.
- In 1989-1990 she was the leader of a joint project with EFACEC (a large Portuguese CIM company), executed on demand by the company, that design, constructed and implemented in EFACEC’s electric transformer plant, and for the first time in Portugal, a fleet of 4 Automated Guided Vehicles (AGVs). The vehicles represented the state of the art in AGVs at that time. They are working since then, and are a line of business of EFACEC that constructed and sold other sets of AGVs, installed in Portugal, Spain and China.
- In 1996, ITER’s component transportation conceptual design was based on rails, and was evolving under the responsibility of the Japanese Team. Components to be transported are heavy (max 45 tons) and radioactive and thus have to be transported with no close human intervention. She was asked to lead an ISR/IST team to propose a different conceptual design for the transportation. In 1998 the proposal was done, based on a Flexible Air Cushion vehicle, with two drive and steering wheels, and partially supported on air-cushion pads. It may work as an AGV (Automated Guided Vehicle), i.e., following a path defined at floor level or, for certain operations in very cluttered areas, as a mobile robot with an associated navigation system. This design was accepted as the reference by ITER’s Joint Central Team and is still (in 2011) the basis reference design used to steer the design

of the remaining RH transportation systems. Since 2009, contributions for ITER RH systems, within the frame of two F4E grants, in the definition of optimal trajectories of the Transfer Cask System that lead to the assessment of building design compatibility with the operation of these vehicles and technical consultancy to F4E.

- From 2005 to 2008 she played a major role in the development of a new product for the inspection of power lines using range and intensity data acquired by a laser scanner and a vision camera installed on board an helicopter that performs scheduled inspections of power lines. The product, designed and implemented on demand by the Portuguese company LABELEC – Electricity of Portugal (EDP), was developed in two phases. In the prototype phase work was carried out at IST/ISR and at LABELEC, under the leadership of Isabel Ribeiro. At the final stage, the ISR/IST spin-off company Albatroz, hold by a former student of her, took the lead. She acted as scientific consultant for the assessment of the developed product. The product is now commercialized in Portugal, Spain and good perspectives exist for its use in South America.
- The project **Raposa** (2003-2004), where she acted as Director, built a search and rescue robot. The project participants were IST/ISR, the ISR spinoff SME IdMind and the Lisbon Fire Department. The most innovative contribution of RAPOSA is the tether remote docking, which can be accomplished remotely by using the visual feedback of a web cam installed in the back side of the robot, and a remotely-controlled door latch. The tether supplies power and acts as a wireless access point. A license for technology, mark and intellectual rights usage by IdMind, under the payment of royalties to IST, was negotiated. The company already supplied two of these robots to institutions in foreign countries.

RELEVANT PUBLICATIONS

- Alberto Vale, Isabel Ribeiro, "Motion Planning of large scale vehicles for remote material transportation", Chapter 9 of the book "Motion and Operation Planning of Robotics System: Background and Practical Approaches", Springer, chapter DOI:10.1007/978-3-319-14705-5_9, pp.249-292, 2015.
- Alberto Vale, Daniel Fonte, Filipe Valente, Isabel Ribeiro, "Trajectory optimization for autonomous mobile robots in ITER", Robotics and Autonomous Systems, Vol.62, pp.871-888, 2014, http://dx.doi.org/10.1016/j.robot.2014.01.007.
- Alberto Vale, Daniel Fonte, Filipe Valente, João Ferrira, Isabel Ribeiro, Carmen Gonzalez,"Flexible Path Optimization for the Cask and plug Remote Handling System", Fusion Engineering and Design, Elsevier, Vol. 88, pps. 1900-1903, 2013.
- João Ferreira, Alberto Vale, Isabel Ribeiro, "Localization of Cask and Plug Remote Handling System in ITER" , Fusion Engineering and Design, Elsevier, Vol.88, pp. 1992-1996, 2013.
- Isabel Ribeiro, Carlo Damiani, Alessandro Tesini, Satoshi Kakudate, Mikko Siuko, Carlo Neri, "The Remote Handling Systems in ITER", Fusion Engineering and Design, Elsevier, Vol. 86, pps. 471-477, 2011, doi:10.1016/j.fusengdes.2011.01.138
- Filipe Valente, Alberto Vale, Daniel Fonte, Isabel Ribeiro, "Optimized Trajectories of the Transfer Cask System in ITER", Fusion Engineering and Design, Elsevier , Vol.86, pps. 1967-1970, 2011, http://dx.doi.org/10.1016/j.fusengdes.2010.12.027
- Daniel Fonte, Alberto Vale, Isabel Ribeiro, "Path Optimization for Rhombic-Like Vehicles: An Approach Based on Rigid Body Dynamics, accepted for presentation the 15th IEEE International Conference on Advanced Robotics (ICAR 2011), Tallinn, Estonia, June 20-23, 2011.
- C. González Gutiérrez, C. Damiani, M. irving, J-P. Friconneau, A. Tesini, I. Ribeiro, A. Vale, "ITER Transfer cask System: status of design, issues and future developments", Fusion Engineering and Design, Elsevier , Vol. 85, issues 10-12, December 2010, pps. 2295-2299.

- Francisco Melo, Isabel Ribeiro, "Coordinated Learning in multiagent MDPs with Infinite State-Space, *Autonomous Agents and Multiagent Systems*, Vol. 21, Nº3, November 2010, pp.321-367.
- D. Fonte, F. Valente, A. Vale, I. Ribeiro, "A motion planning methodology for rhombic-like vehicles for ITER remote handling operations", Proceedings of the 7th IFAC Symposium on Intelligent Autonomous Vehicles, IAV2010 , Lecce, Italy, September 2010.
- Fernando Gomez Bravo, Alberto Vale, Maria Isabel Ribeiro, "Navigation Strategies for Cooperative Localization based on Particle Filters", Integrated Computer-Aided Engineering, Vol. 14:3, pp. 263-279 IOS Press 2007.
- Carlos Marques, João Cristóvão, Paulo Alvito, Pedro Lima, João Frazão, Isabel Ribeiro, Rodrigo Ventura, "A Search and Rescue Robot with Tele-Operated tether Docking System", Industrial Robot, the International Journal of Industrial and Service Robots, Emerald Publishing Company, Vol.34, No.4, pp.332-338, 2007.
- Francisco Melo, Isabel Ribeiro, "Learning to Coordinate in Topological Navigation Tasks", Proceedings of the 6th IFAC Symposium on Intelligent Autonomous Vehicles, IAV2007, Toulouse, France, 3-5 September 2007.
- N.Gonçalves, M.Shanmugavel, J.Sequeira, A.Tsourdos, B. White, I.Ribeiro, "Indoor Active Surveillance", Proceedings da 13th IEEE International Conference on Methods and Models in Automation and Robotics, Szczecin, Poland, 27-30 August 2007.
- João Gomes-Mota, Alberto Vale, Artur Matos André, Isabel Ribeiro, "Tracking Accurate Measurements of High-Voltage Installations with Laser Range Scanner and GPS", Proceedings da *General Session do Conseil Internationale dês Grands Reseaux Eléctriques*, CIGRE2006, Paris, França, 27 August- 1 September 2006.
- Fernando Gomez Bravo, Alberto Vale, Isabel Ribeiro, "Particle-Filter Approach and Motion Strategy for Cooperative Localization", Proceedings of the International Conference on Informatics in Control, Automation and Robotics, ICINCO 2006, Setubal, Portugal, August 2006.
- João Sequeira, Isabel Ribeiro, "A Semiotic Approach to the Control of Semi-Autonomous Robots", International Journal of Systems Science, special issue em Cooperative Control Approaches for Multiple Mobile Robots ,Taylor & Francis, Vol.37, nº6, pp.361-376, Maio 2006.