Dr. Javier Alonso-Mora

CONTACT
INFORMATION

Department of Cognitive Robotics
Faculty of Mechanical, Maritime and Materials Engineering
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RESEARCH
INTERESTS

Autonomous Robots, Motion Planning, Distributed and Multi-Robot Systems, Human-Swarm Interaction, Constrained Optimization & Control, Planning under Uncertainty, Artificial Intelligence.

EDUCATION

Ph.D. Robotics, "Collaborative Motion Planning for Multi-Agent Systems" **10/2010 - 03/2014**
ETH Zurich, Zurich, Switzerland, Prof. Roland Siegwart

M.Sc. Robotics, Systems & Control   **09/2008 - 05/2010**
ETH Zurich, Zurich, Switzerland   GPA: 5.92 (max. 6), Rank: 1

M.Sc. Industrial Engineering - Ingeniería Industrial   **09/2003 - 06/2010**
Universitat Politècnica de Catalunya, Barcelona, Spain   GPA: 9.2 (max. 10), Rank: 1

B.Sc. Mathematics - Licenciatura en Matemáticas   **09/2003 - 06/2008**
Universitat Politècnica de Catalunya, Barcelona, Spain   GPA: 9.2 (max. 10), Rank: 2

PROFESSIONAL &
RESEARCH
EXPERIENCE

Delft University of Technology, Delft, Netherlands
Assistant Professor, Department of Cognitive Robotics   **07/2017 - current**
Assistant Professor, Delft Center for Systems and Control   **10/2016 - 06/2017**

Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Lab CSAIL,
Distributed Robotics Lab - Prof. D. Rus, Cambridge, USA
Postdoctoral Associate   **08/2014 - 09/2016**
- Developed constrained optimization algorithms for multi-robot navigation, motion planning, multi-robot collaborative manipulation, reactive mission planning with formal methods and mobility-on-demand transportation including ride sharing.
- I lead the motion planning and control part for the Toyota-CSAiL research effort on self-driving cars.
- Collaborated in projects with the Singapore-MIT alliance for technology, Cornell University and across MIT.
- Wrote, jointly, a grant proposal for autonomous driving in cluttered environments.
Visiting Researcher   **02/2013 - 06/2013**
- Developed a method for collaborative manipulation of deformable objects by a team mobile manipulators. Within the larger goal of factory automation and funded by The Boeing Company.

Disney Research Zurich, Computer Vision Lab - Dr. P. Beardsley, Zurich, Switzerland
Consultant   **09/2015 - present**
Postdoctoral Researcher - joint with ETH Zurich   **03/2014 - 07/2014**
Doctoral Researcher - joint with ETH Zurich   **09/2010 - 02/2014**
Summer intern   **06/2009 - 08/2009 & 06/2010 - 08/2010**
- I had several successful technology transfers and collaborations with Imagineering R&D, The Walt Disney Company, USA.
- Lead the design of a code library to control the motion of large teams of robots.
- Created a novel interactive display formed by hundreds of mobile robots.
- Developed prototypes for autonomous driving and mobile robots on land, water and air.

ETH Zurich, Autonomous Systems Lab - Prof. R. Siegwart, Zurich, Switzerland
Postdoctoral Researcher   **03/2014 - 07/2014**
Research Assistant   **09/2010 - 02/2014**
 - Developed algorithms for multi-robot control, motion planning in dynamic environments and human-swarm interaction.
 - Performed experiments with quadrotor UAVs, wheelchairs and edutainment robots.
 - Supervised student projects and helped with teaching.

EPF Lausanne, Chair of International Finance, Lausanne, Switzerland
Research Intern   **06/2008 - 07/2008**
 - Studied optimization models for optimal fiscal policy in small countries, such as Switzerland.

Institut de Robòtica i Informàtica Industrial, Barcelona, Spain
Part-time Research Intern   **09/2006 - 12/2007**
 - Developed a numerical model (thermo and fluid dynamics) of a PEM fuel cell.

HONORS AND
AWARDS
- NWO Veni award, Talent Scheme, The Netherlands Organisation for Scientific Research, 2017.
- Best video award (2nd price), IEEE Conference in Human Robot Interaction (HRI), 2014.
- Best student paper nomination, Conference on Distributed Autonomous Robotic Systems, 2010.
- Willi-Studer Prize for highest GPA in M.Sc. RSC, ETH Zurich, 2010.
- Winning team of the Nanogram cup at the Robocup, Graz, 2009.
- McKinsey & Co. Horizon 3.0 Business Technology Office Workshop in Dubai, UAE, 2008.
- Bronze medal in the VIII Ibero-American Mathematics Olympiad for university students, 2005.
- Silver medal in the XXXIX Spanish Mathematics Olympiad for high-school students. 2003.
- Silver medal in the XIV Spanish Physics Olympiad for high-school students. 2003.
- Several prices in various Mathematics competitions for high-school students, 2000-2003.

GRANTS
Formal applicant
- "Automated drone inspections for aircraft", NWO Take Off Phase 1, The Netherlands Organisation for Scientific Research, 40,000 Eur, 2017.
- "Robots among humans: safe and socially intuitive navigation", NWO Veni award, Talent Scheme, The Netherlands Organisation for Scientific Research, 310,000 Eur, 2017.
- "Urban robotics", AMS strategic funds, Amsterdam Institute for Advanced Metropolitan Solutions (AMS), 100,000 Eur, 2017.
- Swiss Government Excellence Scholarships for Foreign Scholars ESKAS, Swiss Confederation, 50,000 Chf, 2008-2010.
- Postgraduate fellowship Caja Madrid, 40,000 Eur, 2008.
- Excellence Scholarship, Centre de Formació Interdisciplinària Superior, UPC Barcelona, 30,000 Eur, 2003-2008
- Introduction to Research Grant, Spanish National Research Council CSIC, Madrid, 5,000 EUR, 2007.
- DAAD scholarship for German studies, 1,000 Eur, 2006.

Formal co-applicant
- "Shaping collective behaviors through complex interactions", TU Delft, 3mE Cohesion grant, 50,000 Eur, 2018.
- "Formation control for waterborne structures", TU Delft, 3mE Cohesion grant, 50,000 Eur, 2017.
- "Distributed formation control for remote sensing", TU Delft Space Institute, Distributed systems, 30,000 Eur, 2016.

Informal
- Toyota-MIT parallel autonomy (S. Karaman and D. Rus) - informal co-applicant, 2016.
- Singapore-MIT Alliance for Research and Technology under the Future Mobility program, 2014-

2016.
- Office Naval Research ONR grants pDOT and SMARTS on distributed teams of robots, 2014-2016.
- Boeing-MIT research effort on smart factories, 2014-2016.
- Disney Research Zurich, covered 50% of my PhD costs, 2010-1014.

<table>
<tr><td>Teaching
Experience</td><td>

Guest lecturer
- Introduction to Artificial Intelligence, TU Delft, Delft, Netherlands
One lecture "Motion planning" and exam questions, fifty students.   **28/11/2017**
- Intelligent Vehicles, TU Delft, Delft, Netherlands
One lecture "Motion planning for Autonomous Vehicles", fifty students.   **22/10/2016 & 04/12/2017**
- Autonomous Vehicles (Duckietown), MIT, Cambridge, USA
One lecture "Constrained Optimization for Autonomous Vehicles", thirty students.   **11/04/2016**
- Robotic manipulation, Cornell University, Ithaca, USA
One lecture "Collision avoidance for cooperative robots", ten students.   **05/11/2014**

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Teaching assistant
- Introduction to mobile robots, ETH Zurich, Zurich, Switzerland.
Supervision of exercises lectures, about thirty students.   **02/2011 - 05/2011**

Supervision of Postdoctoral researchers
- M. Cap (2017 - present), supervisor (TUD).
- L. Ferranti (2017 - present), main supervisor (TUD). Joint with R. Negenborn and T. Kevizcky).

Supervision of PhD students
- B. Britto (2018 - present), main supervisor (TUD).
- H. Zhou (2017 - present), main supervisor (TUD).
- T. Naegeli (2016 - present), co-advisor, PI: O. Hilliges (ETHZ).
- W. Schwarting (2016 - 2017), daily supervisor, PI: D. Rus (MIT).
- A. Wallar (2015 - 2017), daily supervisor, PI: D. Rus (MIT).

Supervision of M.Sc. students
- R. Cumbal (2016, TUD).
- F. Marquez (2016, TUD).
- J. Juhl (2016, TUD).
- B. Zhou (2016, TUD). One joint paper published
- A. Seewer (2016, ETHZ).
- S. Baker (2015, MIT). One joint paper published.
- M. Katancevic (2014, ETHZ).
- D. Jud (2014, ETHZ). One joint paper published.
- T. Gubler (2013, ETHZ).
- M. Zellweger (2013, ETHZ).
- R. Grieder (2012, ETHZ). One joint paper published.
- P. Gohl (2012, ETHZ). One joint paper published.
- M. Schoch (2012, ETHZ). One joint paper published.
- S. Hauri (2011, ETHZ). One joint paper published.
- S. Haag (2011, ETHZ).

Supervision of research interns at Disney Research Zurich
- M. Katancevic (2013), T. Naegeli (2012), R. Grieder (2012), M. Eriksson (2012), P. Gohl (2013), S. Hauri (2011), K. Tran (2011).

Supervision of B.Sc. students
- Bachelor End Project (TUD), 2017.
- One student at MIT, 2016.
- Eight students at ETHZ, 2011-2014.
- Co-supervisor of a one year long project where 14 students developed a spherical blimp, ETHZ, 2011-2012. The project won a price to the best Fokus project, lead to a publication, a patent and a startup: www.skye.ethz.ch.

PUBLICATIONS   **Peer-reviewed journals**

(J14) J. Alonso-Mora, P. Beardsley and R. Siegwart, "Cooperative Collision Avoidance for Nonholonomic Robots", IEEE Transactions on Robotics, to appear, 2018.

(J13) W. Schwarting, J. Alonso-Mora and D. Rus, "Planning and Decision-Making for Autonomous Vehicles", Annual Review of Control, Robotics, and Autonomous Systems, vol. 1, 2018.

(J12) W. Schwarting, J. Alonso-Mora, L. Paull, S. Karaman, and D. Rus, "Safe Nonlinear Trajectory Generation for Parallel Autonomy With a Dynamic Vehicle Model", IEEE Transactions on Intelligent Transportation Systems, vol. PP, no. 99, pp. 1-15, 2017.

(J11) J. Alonso-Mora, S. Baker, and D. Rus, "Multi-robot formation control and object transport in dynamic environments via constrained optimization", The International Journal of Robotics Research, vol. 36, no. 9, pp. 1000-1021, Jul. 2017.

(J10) J. Alonso-Mora, J. A. DeCastro, V. Raman, D. Rus, and H. Kress-Gazit, "Reactive mission and motion planning with deadlock resolution avoiding dynamic obstacles", Autonomous Robots, Special Issue on Online Decision Making in Multi-Robot Coordination, pp. 1-24, 2017.

(J9) T. Naegeli, L. Meier, A. Domahidi, J. Alonso-Mora, and O. Hilliges, "Real-time Planning for Automated Multi-View Drone Cinematography", ACM Transactions on Graphics (SIGGRAPH), vol. 36, no. 4, Aug. 2017.

(J8) T. Naegeli, J. Alonso-Mora, A. Domahidi, D. Rus, and O. Hilliges, "Real-time Motion Planning for Aerial Videography with Dynamic Obstacle Avoidance and Viewpoint Optimization", IEEE Robotics and Automation Letters, vol. 2, no. 3, pp. 1696-1703, 2017.

(J7) J. Alonso-Mora, S. Samaranayake, A. Wallar, E. Frazzoli, and D. Rus, "On-demand high-capacity ride-sharing via dynamic trip-vehicle assignment", Proceedings National Academy of Science USA (PNAS), vol. 114, no. 3, pp. 462-467, Jan. 2017.

(J6) T. Digumarti, J. Alonso-Mora, R. Siegwart, P. Beardsley, "Pixelbots 2014", in Leonardo, 49 (4), 366-367, 2016.

(J5) J. Alonso-Mora, T. Naegeli, R. Siegwart, P. Beardsley, "Collision Avoidance for Aerial Vehicles in Multi-Agent Scenarios", in Autonomous Robots, 2015.

(J4) M. Rufli, J. Alonso-Mora, R. Siegwart, "Reciprocal Collision Avoidance with Motion Continuity Constraints", in IEEE Transactions in Robotics, Dec. 2013.

(J3) J. Alonso-Mora, A. Breitenmoser, M. Rufli, R. Siegwart, P. Beardsley, "Image and Animation Display with Multiple Robots", in Int. Journal of Robotics Research, May 2012.

(J2) A. Schoellig, J. Alonso-Mora, R. DAndrea, "Limited benefit of Sharing Information in Multi-Agent Iterative Learning Control", in Asian Journal of Control, 2012.

(J1) J. Alonso-Mora, A. Husar, M. Serra, J. Riera, "Numerical model for polymer electrolyte membrane fuel cells with experimental application and validation", in Asia Pacific Journal of Chemical Engineering, 4(1), 55-67, January 2009.

Conference proceedings

(C28) B. Zhou, W. Schwarting, D. Rus, and J. Alonso-Mora, "Joint Multi-Policy Behavior Estimation and Receding-Horizon Trajectory Planning for Automated Urban Driving", in Proc. IEEE Int. Conf. on Robotics and Automation (ICRA), 2018.

(C27) L. Liebenwein, W. Schwarting, C.-I. Vasile, J. DeCastro, J. Alonso-Mora, S. Karaman, and D. Rus, "Compositional and Contract-based Verification for Autonomous Driving on Road Networks", in Proc. Int. Symp. on Robotics Research (ISRR), pp. 1-16, 2017.

(C26) J. Alonso-Mora, A. Wallar, and D. Rus, "Predictive Routing for Autonomous Mobility-on-Demand Systems with Ride-Sharing", in Proc. IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), pp. 3583-3590, Oct. 2017.

(C25) M. Kamel, J. Alonso-Mora, R. Siegwart, and J. I. Nieto, "Robust collision avoidance for multiple micro aerial vehicles using nonlinear model predictive control", in Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 236-243, 2017.

(C24) H. Andersen, W. Schwarting, F. Naser, Y. H. Eng, M. H. Ang Jr, D. Rus, and J. Alonso-Mora, "Trajectory Optimization for Autonomous Overtaking with Visibility Maximization", in Proc. IEEE Int. Conf. on Intelligent Transportation Systems, Oct. 2017.

(C23) A. Wallar, B. Araki, R. Chang, J. Alonso-Mora and D. Rus "Foresight: Remote Sensing For Autonomous Vehicles Using a Small Unmanned Aerial Vehicle", in Proc. of the Conf. on Field and Service Robotics (FSR), Sep. 2017.

(C22) F. Naser, D. L. Dorhout, S. Proulx, S. D. Pendleton, H. Andersen, W. Schwarting, L. Paull, <u>J. Alonso -Mora</u>, M. H. Ang, S. Karaman, R. Tedrake, J. J. Leonard, and D. Rus, "A parallel autonomy research platform", in Proc. IEEE Intelligent Vehicles Symposium (IV), pp. 933-940, 2017.

(C21) W. Schwarting, <u>J. Alonso-Mora</u>, L. Paull, S. Karaman, and D. Rus, "Parallel autonomy in automated vehicles: Safe motion generation with minimal intervention", in Proc. IEEE Int. Conf. on Robotics and Automation (ICRA), 2017, pp. 1928-1935.

(C20) L. Paull, J. Tani, H. Ahn, <u>J. Alonso-Mora</u>, L. Carlone, M. Cap, Y. F. Chen, C. Choi, J. Dusek, Y. Fang, D. Hoehener, S.-Y. Liu, M. Novitzky, I. F. Okuyama, J. Pazis, G. Rosman, V. Varricchio, H.-C. Wang, D. S. Yershov, H. Zhao, M. Benjamin, C. Carr, M. T. Zuber, S. Karaman, E. Frazzoli, D. Del Vecchio, D. Rus, J. P. How, J. J. Leonard, and A. Censi, "Duckietown - An open, inexpensive and flexible platform for autonomy education and research", in Proc. IEEE Int. Conf. on Robotics and Automation (ICRA), pp. 1497-1504, 2017.

(C19) <u>J. Alonso-Mora</u>, E. Montijano, M. Schwager, and D. Rus, "Distributed Multi-Robot Navigation in Formation among Obstacles: A Geometric and Optimization Approach with Consensus", in Proc. IEEE Int. Conf. on Robotics and Automation (ICRA), pp. 5356-5363, 2016.

(C18) <u>J. Alonso-Mora</u>, S. Baker, D. Rus, "Multi-robot navigation in formation via sequential convex programming", in Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), Sep 2015.

(C17) <u>J. Alonso-Mora</u>, J. DeCastro, V. Raman, D. Rus, H. Kress-Gezit, "Collision-Free Reactive Mission and Motion Planning for Multi-Robot Systems", in Proc. of the Int. Symposium on Robotics Research (ISRR), Sep 2015.

(C16) <u>J. Alonso-Mora</u>, R. Knepper, R. Siegwart, D. Rus, "Local motion planning for collaborative manipulation of deformable objects in dynamic environments", in Proc. of the IEEE Int. Conf. Robotics and Automation (ICRA), May 2015.

(C15) <u>J. Alonso-Mora</u>, S. Haegeli Lohaus, P. Leemann, R. Siegwart, P. Beardsley, "Gesture based human - robot swarm interaction applied to an interactive display", in Proc. of the IEEE Int. Conf. Robotics and Automation (ICRA), May 2015.

(C14) F. Schiano, <u>J. Alonso-Mora</u>, K. Rudin, P. Beardsley, R. Siegwart, B. Siciliano, "Towards Estimation and Correction of Wind Effects on a Quadrotor UAV", in Proc. of the Int. Micro Air Vehicle Conference and Competition, Aug. 2014.

(C13) D. Jud, <u>J. Alonso-Mora</u>, J. Rehder, R. Siegwart, P. Beardsley, "Customized Sensing for Robot Swarms", in Proc. of the Int. Symposium on Experimental Robotics, June. 2014.

(C12) <u>J. Alonso-Mora</u>, P. Gohl, S. Watson, R. Siegwart, P. Beardsley, "Shared Control of Semi-Autonomous Vehicles with Local Motion Planning based on Velocity Obstacles with Motion Constraints", in Proc. of the IEEE Int. Conf. on Robotics and Automation (ICRA), June 2014.

(C11) M. Schoch, <u>J. Alonso-Mora</u>, R. Siegwart, P. Beardsley, "Viewpoint and Trajectory Optimization for Animation Display with a Large Group of Aerial Vehicles", in Proc. of the IEEE Int. Conf. on Robotics and Automation (ICRA), June 2014.

(C10) <u>J. Alonso-Mora</u>, R. Siegwart, P. Beardsley, "Human - Robot Swarm Interaction for Entertainment", ACM/IEEE Int. Conf. on Human-Robot Interaction, Mar. 2014, **Best Video Award 2nd Prize**.

(C9) J. Bento, N. Derbinsky, <u>J. Alonso-Mora</u>, J. Yedidia, "A message-passing algorithm for multi-agent trajectory planning", In Advances in Neural Information Processing Systems (NIPS), Dec. 2013.

(C8) M. Burri, L. Gasser, M. K. ch, M. Krebs, S. Laube, A. Ledergerber, D. Meier, R. Michaud, L. Mosimann, L. Muri, C. Ruch, A. Schaffner, N. Vuilliomenet, J. Weichart, K. Rudin, S. Leutenegger, <u>J. Alonso-Mora</u>, R. Siegwart, P. Beardsley, "Design and Control of a Spherical Omnidirectional Blimp", in Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), Nov. 2013.

(C7) <u>J. Alonso-Mora</u>, M. Rufli, R. Siegwart, P. Beardsley, "Collision Avoidance for Multiple Agents with Joint Utility Maximization", in Proc. of the IEEE Int. Conf. on Robotics and Automation (ICRA), May 2013.

(C6) <u>J. Alonso-Mora</u>, M. Schoch, A. Breitenmoser, R. Siegwart, P. Beardsley, "Object and Animation Display with Multiple Aerial Vehicles", in Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), Oct. 2012.

(C5) S. Hauri, <u>J. Alonso-Mora</u>, A. Breitenmoser, R. Siegwart, P. Beardsley, "Multi-Robot Formation Control via a Real-Time Drawing Interface", in Proc. of the 8th Int. Conf. on Field and Service Robots (FSR), Jul. 2012.

(C4) <u>J. Alonso-Mora</u>, A. Breitenmoser, P. Beardsley, R. Siegwart, "Reciprocal Collision Avoidance for Multiple Car-like Robots", in Proc. of the IEEE Int. Conf. on Robotics and Automation (ICRA), May 2012.

(C3) A. Schoellig, <u>J. Alonso-Mora</u>, R. DAndrea, "Independent vs. Joint Estimation in Multi-Agent Iterative Learning Control", in Proc. of the Conf. on Decision and Control (CDC), Dec. 2011

(C2) <u>J. Alonso-Mora</u>, A. Breitenmoser, M. Rufli, R. Siegwart, P. Beardsley, "Multi-Robot System for Artistic Pattern Formation", in Proc. of the IEEE Int. Conf. on Robotics and Automation (ICRA), May 2011.

(C1) <u>J. Alonso-Mora</u>, A. Breitenmoser, M. Rufli, P. Beardsley, R. Siegwart, "Optimal Reciprocal Collision Avoidance for Multiple Non-Holonomic Robots", in Proc. of the Int. Symp. on Distributed Autonomous Robotics Systems (DARS), Oct. 2010, **Nominated Best Student Paper Award**.

Workshops and technical reports

(W6) <u>J. Alonso-Mora</u>, K. Savla, D. Rus, "Optimal Control and Optimization Methods for Multi-robot Systems", in Tutorial on Multi-Robot Systems at Robotics Science and Systems (RSS), July. 2015.

(W5) <u>J. Alonso-Mora</u>, R. Siegwart, D. Rus, "Collaborative Motion Planning for Multi-Agent Systems", in Workshop The future of multiple-robot research and its multiple identities at the RSJ/IEEE Int. Conf. on Robotics and Intelligent Systems (IROS), Sept. 2014.

(W4) R. Grieder, <u>J. Alonso-Mora</u>, C. Bloeglinger, R. Siegwart, P. Beardsley, "Multi-robot Control and Interaction with a Hand-held Tablet", in Workshop Crossing the Reality Gap: Control, Human Interaction and Cloud Technology for Multi- and Many- Robot Systems at the IEEE Int. Conf. on Robotics and Automation (ICRA), June 2014.

(W3) P. Gohl , <u>J. Alonso-Mora</u>, R. Siegwart, P. Beardsley, "Vision-Based Localization for Multiple Robots with Absolute and Relative Measurements", tech report, Sept. 2012.

(W2) <u>J. Alonso-Mora</u>, A. Breitenmoser, S. Wismer, R. Siegwart, P. Beardsley, "Human-Robot Shared Control in a Large Robot Swarm", in Workshop Many-Robot Systems: Crossing the Reality Gap at the IEEE Int. Conf. on Robotics and Automation (ICRA), May 2012.

(W1) <u>J. Alonso-Mora</u>, A. Breitenmoser, M. Rufli, S. Haag, G. Caprari, R. Siegwart, P. Beardsley, "DisplaySwarm: A robot swarm displaying images", in IEEE/RSJ Int. Conf. on Intelligent Robots and Systems, Symposium: Robot Demonstrations, Oct. 2011.

Thesis

(T4) <u>J. Alonso-Mora</u>, "Collaborative Motion Planning for Multi-Agent Systems", Doctoral Dissertation, ETH Zurich, Supervised: Prof. R. Siegwart, Dr. P. Beardsley, Co-examiners: Prof. R. D'Andrea, Prof. D. Rus, 2014.

(T3) <u>J. Alonso-Mora</u>, "Multi-agent control for choreographic image display", Master Thesis, Autonomous Systems Lab, ETH & Disney Research Zurich, Supervised: Prof. R. Siegwart, Dr. P. Beardsley, 2010.

(T2) <u>J. Alonso-Mora</u>, "Multi-agent learning through experience", Semester Project, I. Dynamic Systems and Control, ETH Zurich. Supervisors: Prof. A. Schoellig, Prof. R. DAndrea, 2009.

(T1) <u>J. Alonso-Mora</u>, "Study of Two Coupled Rigid Bodies", Semester Project, Chair of Geometric Analysis, EPF Lausanne. Supervisor: Prof. T. Ratiu, 2008.

PATENTS

(P8) "System for On-Demand High-Capacity Ride-Sharing Via Dynamic Trip-Vehicle Assignment and Related Techniques", US patent, 2018 - filed.

(P7) "Shared control of semi-autonomous vehicles including collision avoidance in multi-agent scenarios", US patent 9,216,745. 2015

(P6) "Display with robotic pixels ", US patent 9,082,233, 2015.

(P5) "Robotic Texture", US patent US Patent 9,067,320, 2015.

(P4) "Robust and autonomous docking and recharging of quadrotors", US patent App. 14/452,819. 2014.

(P3) "Display with robotic pixels", US patent 8,723,872, 2014.

(P2) "Aircraft, Methods for Providing Optical Information, Method for Transmission of Acoustic Information and Method for Observing or Tracking an Object", US Patent App. 14/395,657, 2013.

(P1) "Compact omnidirectional vision sensor", US patent, 2014, filed.

International conferences, workshops and events
- "Control y navegacin de robots autnomos: drones, taxis y manipuladores mbiles", plenary speaker at the Graduation Ceremony Centre de Formacio Interdisciplinaria Superior (CFIS), UPC, Barcelona, Spain, Dec. 2017.
- "Dynamic routing and assignment for high-capacity ride sharing in intelligent transportation systems", at the DBSS Symposium - Simulation & Data: An Unbreakable Bond, Dutch Benelux Simulation Society, Delft, Netherlands, Sep. 2017.
- "High-capacity Ride-sharing and Planning in Intelligent Autonomous Transportation Systems", at the Machine Intelligence in Autonomous Vehicles Summit Amsterdam, Re.Work, Amsterdam, Netherlands, Jun. 2017.
- "Distributed formation control for teams of mobile robots", at the Office of Naval Research ONR Science of Autonomy Meeting, Washington DC, Aug. USA, 2016.
- "Constrained optimization methods for collaborative multi-robot motion planning and control", at the EITA-Smart Cities Forum, Boston, USA, Aug. USA, 2016.
- "Optimization and optimal control for multi-robot systems", at the Tutorial on Multi-robot Systems, Robotics Science and Systems, Rome, Italy, Jul. 2015.
- Multiple research talks (conference paper) in international conferences and workshops.

Institutions

Topic: "Autonomous Planning and Control for Multi-Robot Systems and Intelligent Transportation"
- Universidad de Zaragoza, Zaragoza, Spain, 2017.
- Instituto de Robotica e Informatica Industrial (IRI-CSIC), Barcelona, Spain, 2017.
- University of Groeningen, Groeningen, Netherlands 2017.
- Algorithmics group, TU Delft, Delft, Netherlands 2017.
- Continental AG, Frankfurt, Germany, 2017.
- Toyota-CSAIL annual research review, Cambridge, USA, 2016.
- Massachusetts Institute of Technology MIT, Cambridge, USA, 2016.
- GRASP lab, University of Pennsylvania, Philadelphia, USA, 2016.
- University of Twente, Enschede, The Netherlands, 2015.
- TU Delft, Delft, The Netherlands, 2015.
- SMART - National University of Singapore, Singapore, 2015.
- Harvard University, Cambridge, USA, 2015.
- Cornell University, Ithaca, NY, 2014.
- Massachusetts Institute of Technology, Cambridge, USA, 2013.
- Kantonsschule Computer Science Week at ETHZ, Zurich, Switzerland, 2012.
- Tokyo Disneyland, Tokyo, Japan, 2012.
- Pixar Animation Studios, Emmeriville, USA, 2011.
- Walt Disney Imagineering, Glendale, USA, 2011.
- Automatic Control Laboratory ETHZ, Zurich, Switzerland, 2010.

Public demonstrations

- MIT Open doors, USA, 2016. We showed our Toyota-CSAIL self-driving car to the public during one Saturday.
- Scientifica, Switzerland, 2012, 2013 and 2015. We demoed our multi-robot display during a weekend, receiving numerous visits by interested kids and adults.
- Disney Imagineering Open House, USA
- I have also been involved in many lab visits by researchers and sponsors at MIT, ETH and Disney Research Zurich.

Media appearances

- Antena 3 "El Hormiguero" (2015). Live demonstration and interview in prime time Spanish television. Over 3 million viewers.
- BBC Royal Institution Christmas Lectures (2014). Recorded demonstration. Over 1 million viewers.
- Articles in MIT news, BBC, IEEE Spectrum, Wired, New Scientist, Gizmodo

COMMUNITY SERVICE	**Technical/Program Committee Member** - Organizer of workshop on Multi-Robot Systems at IEEE Int. Conf. in Robotics and Automation (ICRA), 2017 - Associate Editor AE, IEEE Int. Conf. on Robotics and Automation (ICRA), 2017, 2018 - PC member, Robotics Science and Systems (RSS), 2016, 2017, 2018 - PC member, Intelligent Robotics and Multi-Agent Systems track, ACM Symp. on Applied Computing 2016, 2017 - Session chair, Path Planning for Mobile Robots, RSJ/IEEE Int. Conf. Intelligent Robots and Systems 2015 **Reviewing Activities** - International Journal of Robotics Research - IEEE Transactions on Robotics - IEEE Robotics Magazine - IEEE Transactions on Human-Machine Systems - Springer Autonomous Robots - Robotics & Autonomous Systems Journal - IEEE Transactions in Mechatronics - Mechatronics Journal - Robotics: Science and Systems RSS - IEEE Int. Conf. Robotics and Automation ICRA - RSJ/IEEE Int. Conf. Intelligent Robots and Systems IROS - IJCAI - AAAI
PROFESIONAL MEMBERSHIPS	TU Delft Space Institute (2016-present) TU Delft Robotics Institute (2016-present) TU Delft Transportation Institute (2016-present) IEEE Member (2015-present), Student Member (2010-2014) Robotics and Automation Society (2010-2015) ShARE Economy, EPF Lausanne (Member, 2008) Barcelona's Student Chapter, Society for Industrial and Applied Mathematics (Member, 2006-08) ETSEIB student association for Space Exploration (Member, pre-finalist ESA parabolic flight, 2005-08)
COMPUTER SKILLS	C/C++ Programming language, Python, ROS Robotic Operating System, Optimization (CPLEX, MOSEK, SNOPT, GUROBI), MS Office, Matlab, Simulink, Maple, AutoCad, Solidworks CAD, Ansys, LaTeX, Git/svn, Qt.
LANGUAGES	English (Professional level), Spanish (Mother tongue), German (Conversational level), French (Conversational level), Catalan (Conversational level).
BUSINESS & ENTREPRENEURSHIP	Venture Challenge course - Start-up business plan, market analysis and pitch, Switzerland, 2013 International Business Management for Engineers, ETH Zurich, Switzerland, 2012

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