Federico Rossi

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Education

Stanford University Ph.D. Aeronautics and Astronautics Advisor	r. Prof. Marco Pavone	Sept. 2013-Apr. 2	2018
Thesis: On the Interaction between Autonomo Environment: Models and Large Scale Coordi	ous Mobility-on-Demand nation Algorithms, April	Systems and the 1 2018	Built
Politecnico di Milano and Politecnico di Toria M.Sc. (double degree) in Space Engineering	no GPA: 110/110 cum lauc	Sept. 2010-Jul. 2 de	2013
ISAE-SUPAERO Erasmus exchange program (Admis sur titre)	GPA: 16.54/20	Sept. 2011-Apr. 2	2012
Politecnico di Milano B.Sc. in Aerospace Engineering	GPA: 110/110 cum lau	Sept. 2007- Sept. 2 de	2010

Research experience

Robotics Technologist, NASA Jet Propulsion Laboratory, Maritime and Multi-Agent Autonomy
Group, Robotics SectionDec. 2018-presentPostdoctoral Scholar, NASA Jet Propulsion Laboratory, Maritime and Multi-Agent Autonomy
Group, Robotics SectionApr. 2018-Dec. 2018

Collective Behavior in Autonomous Robotic Systems

- Designed distributed scheduling and coordination algorithms in support of JPL's MOSAIC project
- Designed algorithms for communication-aware optimal orbit design in support of NASA's ICC project
- Assessed the performance of collective behavior algorithms with respect to scalability, robustness, bandwidth utilization, and maturity in support of JPL's Maritime Swarm project

Graduate Research Assistant, Stanford Autonomous Systems Laboratory Sept. 2013-Mar. 2018

Autonomous Mobility on Demand

- Proposed network flow, mixed-integer linear programming and randomized approximation algorithms for real-time congestion-aware and charge-aware control of AMoD systems
- Demonstrated the performance of the proposed algorithms with large-scale agent-based simulations (MATLAB/MATSim)

Distributed Decision-Making in Robotic Networks

- Proved analytical lower bounds on execution time, bandwidth usage, and robustness for distributed optimization and decision-making problems in robotic networks, and identified optimal algorithms
- Designed a novel distributed decision-making algorithm that trades off time complexity for bandwidth utilization and energy use in wireless networks
- Designed and implemented an efficient C++ multiagent simulator and message-passing system

Sept. 2015-Mar. 2018

Sept. 2012-Aug. 2015

Selected engineering projects

Multi-UAV patrolling (GalapagosUAV) Implemented geometric deployment algorithms (C++/CGAL) for fleets of UAVs to deter poaching in the Galapagos Islands, in collaboration with Stanford University and Universidad San Francisco de Quito

Implemented communication protocols to transmit images and videos over unreliable IP and serial data links (C++/MAVLINK)

Stanford Space Robotics Facility

- Led a team of 3 developing embedded software (C++/Simulink) for a fleet of robots
- Designed a real-time multithreaded architecture for estimation, control and motion planning
- Designed, implemented, and tested an embedded on-board position and attitude controller

M.Sc. Capstone project: Martian moons sample return mission Mar. 2012-Jul. 2012

- Phase A feasibility study (up to Preliminary Design Review) of a sample return mission to Martian moons Phobos and Deimos.
- Led a team of 12 during the final phase of the project
- Designed the attitude determination and control system for all components of the mission

Relevant teaching experience

School of Engineering, Stanford University

Teaching assistant

Apr.-Jun. 2015, 2016, and 2017 AA203, Introduction to Optimal Control and Dynamic Optimization

- Advised graduate students conducting research projects on optimal control and motion planning
- Taught lectures on combinatorial motion planning (Dijkstra, A^* , elements of computational complexity theory)
- Led discussion on nonlinear optimization, dynamic programming and variational formulations, numerical methods, mixed-integer linear programming, and motion planning

Selected publications

- [1] **F. Rossi**, S. Bandyopadhyay, M. Wolf, and M. Pavone. "Review of Multi-Agent Algorithms for Collective Behavior: a Structural Taxonomy". In: IFAC Aerospace Controls TC Workshop: Networked & Autonomous Air & Space Systems (NAASS 2018). 2018.
- [2] F. Rossi, R. Zhang, Y. Hindy, and M. Pavone. "Routing Autonomous Vehicles in Congested Transportation Networks: Structural Properties and Coordination Algorithms". In: Autonomous Robots (2018).
- [3] M. Salazar, F. Rossi, M. Schiffer, C. H. Onder, and M. Pavone. "On the Interaction between Autonomous Mobility-on-Demand and the Public Transportation Systems". In: Proc. IEEE Int. Conf. on Intelligent Transportation Systems. Best Student Paper Award. 2018.

A full list of publications is available at https://www.federico.io

Technical skills

MATLAB; Python; C++; ROS; Simulink; QGIS;

Jun. 2014-Aug. 2014

Sept. 2013 - Jun. 2015