Federico Rossi

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Education

Stanford University Sept. 2013-Apr. 2018
Ph.D., Aeronautics and Astronautics. Advisor: Prof. Marco Pavone
Thesis: *On the Interaction between Autonomous Mobility-on-Demand Systems and the Built Environment: Models and Large Scale Coordination Algorithms*, April 2018

Politecnico di Milano and **Politecnico di Torino** Sept. 2010-Jul. 2013
M.Sc. (double degree) in Space Engineering GPA: 110/110 cum laude

ISAE-SUPAERO Sept. 2011-Apr. 2012
Erasmus exchange program (Admis sur titre) GPA: 16.54/20

Politecnico di Milano Sept. 2007- Sept. 2010
B.Sc. in Aerospace Engineering GPA: 110/110 cum laude

Research experience

Postdoctoral Scholar, NASA Jet Propulsion Laboratory, Maritime and Multi-Agent Autonomy Group, Robotics Section Apr. 2018-present
Visiting Researcher, NASA Jet Propulsion Laboratory, Maritime and Aerial Perception Systems Group, Robotics Section Jun.-Sept. 2017

Collective Behavior in Autonomous Robotic Systems

- Designed distributed scheduling and coordination algorithms in support of JPL's MOSAIC project
- Designed and coordinated hardware experiments to characterize the performance of navigation equipment in support of JPL's DASHER 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 Sept. 2015-Mar. 2018

- 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 Sept. 2012-Aug. 2015

- 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

Selected engineering projects

Multi-UAV patrolling (GalapagosUAV) Sept. 2013 -Jun. 2015

- 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 Jun. 2014-Aug. 2014

- 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;