Roberto Tron, Ph.D. Curriculum Vitæ

Contact Information

Roberto Tron
Mechanical Engineering Department
Room 301
Boston University
110 Cummington Mall
Boston, MA 02215

Tel: (617) 353-3951
E-mail: tron@bu.edu

Research Interests

Distributed algorithms for multi-agent robotic systems and cyber-physical systems, with a particular focus on vision-based formation control and localization. Geometric control and optimization on Riemannian manifolds. Subspace clustering with a particular focus on motion segmentation.

Awards

- Best Reviewer Award at the IEEE International Conference on Computer Vision, 2013
- Best Student Paper Award at the IEEE Conference on Decision and Control, 2012
- Best Student Paper Award Runner-up at the IEEE Conference on Decision and Control, 2011
- General Chairs' Recognition Award for Interactive Papers at the IEEE Conference on Decision and Control, 2009

Work Experience

- Assistant professor
  Boston University, Boston, MA, USA (2016)
  - Department: Mechanical Engineering
- Postdoctoral researcher, GRASP Lab
  University of Pennsylvania, Philadelphia, PA, USA (2013-2016)
  - Adviser: Professor Kostas Daniilidis
  - Areas of Interest: Distributed vision-based formation control for flying vehicles and localization. Geometric Riemannian structure for the space of constraints between two and three projective views (essential matrices and trifocal tensors).

Education

- Ph.D., Electrical and Computer Engineering
  Johns Hopkins University, Baltimore, MD, USA (2007-2012)
  - Thesis Topic: *Distributed Optimization on Manifolds for Consensus Algorithms and Camera Network Localization*
  - Adviser: Professor René Vidal
  - Area of Study: Computer vision, distributed algorithms
- M.Sc., Telecommunication Engineering
  Politecnico di Torino, Torino, Italy (2004-2007)
  - Thesis Topic: *Real-Time Segmentation of Dynamic Scenes*
  - Adviser: Professor Enrico Magli

- Area of Study: Computer vision, machine learning
- Diplôme d'ingègneur, Multimedia Track
  Eurecom Institute, Sophia-Antipolis, France (2005-2006)
  - Adviser: Professor Jean-Luc Dugelay
- Master de Recherche,Master IGMMV Image et Géométrie pour le Multimédia et la Modélisation du Vivant (2005-2006)
  Universitè de Nice-Sophia Antipolis, Nice, France
- B.Sc., Telecommunication Engineering
  Politecnico di Torino, Torino, Italy (2001-2004)

Teaching

- Spring 2016 (Boston University), ME 302 "Engineering Mechanics II": Introduces students to dynamics (kinematics and kinetics of particles and rigid bodies).
- Intersession 2012 (The Johns Hopkins University), "Introduction to model rocketry": Designed and taught this new intersession class for three-weeks (18 hours) in January 2012.

Book chapters

R. Tron, A. Terzis and R. Vidal. "Distributed Consensus Algorithms for Image-Based Localization in Camera Sensor Networks." *Distributed Video Sensor Networks*, LNCS, Springer Verlag, 2010.

Refereed Journal Publications

R. Tron, R. Vidal. "Distributed 3-D Localization of Camera Sensor Networks from 2-D Image Measurements." *IEEE Transactions on Automatic Control*, (to appear).

B. Afsari, R. Tron, R. Vidal. "On the Convergence of Gradient Descent for Locating the Riemmanian Center of Mass." *SIAM Journal of Control and Optimization*, 2013.

R. Tron, B. Afsari and R. Vidal. "Riemannian Consensus for Manifolds with Bounded Curvature." *IEEE Transactions on Automatic Control*, 2013.

R. Tron and R. Vidal. "Distributed Algorithms for Camera Sensor Networks." *IEEE Signal Processing Magazine*, 2010.

S. Rao, R. Tron, R. Vidal, and Y. Ma. "Motion Segmentation in the Presence of Outlying, Incomplete, or Corrupted Trajectories." *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2010.

R. Vidal, R. Tron, and R. Hartley. "Multiframe Motion Segmentation with Missing Data Using PowerFactorization and GPCA." *International Journal on Computer Vision*, 2008.

Conference and Workshop Publications

R. Tron, L. Carlone, F. Dellaert, K. Daniilidis. "Rigid Components Identification and Rigidity Enforcement in Bearing-Only Localization using the Graph Cycle Basis", *IEEE American Control Conference*, (submitted).

L. Carlone, R. Tron, K. Daniilidis, F. Dellaert. "Initialization Techniques for 3D SLAM: a Survey on Rotation Estimation and its Use in Pose Graph Optimization", *IEEE Conference on Robotics and Automation*, (submitted).

N. Atanasov, R. Tron, V. M. Preciado, G. J. Pappas. "Joint Estimation and Localization in Sensor Networks", *IEEE Conference on Decision and Control*, 2014, (to appear).

R. Tron, K. Daniilidis. "Statistical Pose Averaging with Varying and Non-Isotropic Covariances", *IEEE European Conference on Computer Vision*, 2014.

R. Tron, J. Thomas, G. Loianno, J. Polin, V. Kumar, K. Daniilidis. "Vision-based formation control of aerial vehicles", *Workshop on Distributed Control and Estimation for Robotic Vehicle Networks*, 2014.

R. Tron, P. Osteen, J. Owens, K. Daniilidis. "Pose Optimization for the Registration of Multiple Heterogeneous Views", *Workshop on Multi-View Geometry in Robotics*, 2014.

R. Tron, K. Daniilidis. "On the Quotient Representation for the Essential Manifold", *IEEE Conference on Computer Vision and Pattern Recognition*, 2014.

R. Tron, K. Daniilidis. "An Optimization Approach to Bearing-Only Navigation with Applications to a 2-D Unicycle Model", *IEEE International Conference on Robotics and Automation*, 2013.

R. Tron, B. Afsari and R. Vidal. "Intrinsic Consensus on $SO(3)$ with Almost Global Convergence", *IEEE Conference on Decision and Control*, 2012. (Best student paper award.)

R. Tron, B. Afsari and R. Vidal. "Average Consensus on Riemannian Manifolds with Bounded Curvature", *IEEE Conference on Decision and Control*, 2011. (Best student paper runner-up.)

Y. Chen, R. Tron, A. Terzis, and R. Vidal. "Accelerated Corrective Consensus: Convergence to the Exact Average at a Faster Rate." *American Control Conference*, 2011.

R. Tron and R. Vidal. "Distributed Computer Vision Algorithms Through Distributed Averaging." *IEEE Conference on Computer Vision and Pattern Recognition*, 2011.

Y. Chen, R. Tron, A. Terzis and R. Vidal. "Corrective Consensus: Converging to the Exact Average." *IEEE Conference on Decision and Control*, 2010.

R. Tron and R. Vidal. "Distributed Image-Based 3-D Localization of Camera Sensor Networks." *IEEE Conference on Decision and Control*, 2009. (Best interactive presentation award.)

S. Rao, R. Tron, Y. Ma, and R. Vidal. "Motion Segmentation via Robust Subspace Separation in the Presence of Outlying, Incomplete, or Corrupted Trajectories." *IEEE International Conference on Computer Vision and Pattern Recognition*, 2008.

R. Tron, R. Vidal and A. Terzis. "Distributed Pose Averaging in Camera Sensor Networks via Consensus on SE(3)." *International Conference on Distributed Smart Cameras*, 2008. (Oral presentation.)

R. Tron and R. Vidal. "Distributed Face Recognition via Consensus on SE(3)." *Workshop on Omnidirectional Vision*, 2008.

R. Tron and R. Vidal. "A Benchmark for the Comparison of 3-D Motion Segmentation Algorithms." *IEEE International Conference on Computer Vision and Pattern Recognition*, June 2007. (Oral presentation.)

Referee Service

I have been a reviewer for various editors, journals and conferences, including:

- Editors:
  - Springer, UK
- Journals:
  - IFAC Automatica
  - IEEE Journal of Selected Topics in Signal Processing
  - IEEE Transactions on Automatic Control
  - IEEE Transactions on Control of Network Systems
  - IEEE Transactions on Pattern Analysis and Machine Intelligence
  - IEEE Transactions on Neural Networks and Learning Systems
  - IEEE Transactions on Image Processing
  - SIAM Journal on Control and Optimization
  - SIAM Journal on Imaging Sciences
  - Springer Journal of Mathematical Imaging and Vision
- Conferences:
  - IEEE American Control Conference (2 years)
  - IEEE Conference on Decision and Control (4 years)
  - EUCA European Control Conference
  - IEEE Asian Conference on Computer Vision
  - IEEE Conference on Computer Vision and Pattern Recognition (4 years)
  - IEEE International Conference on Computer Vision
  - IEEE European Conference on Computer Vision

- IEEE/RSJ International Conference on Intelligent Robots and Systems

Professional Memberships

- IEEE Society
- IEEE Control System Society

Outreach and Education Services

- Served as a project judge at the 2014 FIRST LEGO League championship, a robotics competition for children (ages 9 to 14) promoting independent learning and teamwork.
- Advisor to the undergraduate "Unmanned Aerial Vehicle Club" in the Mechanical Engineering Department at Boston University. This student-directed group teaches interested students how to build aerial platforms (quadrotor and fixed wing vehicles) and how to use them in more advanced projects.

Software Skills

Programming:

- MATLAB, C++, Python, BASH

Productivity Packages:

- LaTeX (BibTeX, TikZ), ROS (Robotic Operating System), Emacs, most common productivity packages (for Windows, OS X, and Linux platforms)

Operating Systems:

- Microsoft Windows family, Apple OS X, Linux (Ubuntu)

Languages

Italian (native speaker), English, French