

Contents

Part I Control

Controlling Ocean One	3
Gerald Brantner and Oussama Khatib	
Safe Self-collision Avoidance for Versatile Robots Based on Bounded Potentials	19
David Gonon, Dominic Jud, Péter Fankhauser and Marco Hutter	
Towards Controlling Bucket Fill Factor in Robotic Excavation by Learning Admittance Control Setpoints	35
Heshan A. Fernando, Joshua A. Marshall, Håkan Almqvist and Johan Larsson	
Trajectory Optimization for Dynamic Grasping in Space Using Adhesive Grippers	49
Roshena MacPherson, Benjamin Hockman, Andrew Bylard, Matthew A. Estrada, Mark R. Cutkosky and Marco Pavone	
Generation of Turning Motion for Tracked Vehicles Using Reaction Force of Stairs' Handrail	65
Yuto Ohashi, Shotaro Kojima, Kazunori Ohno, Yoshito Okada, Ryunosuke Hamada, Takahiro Suzuki and Satoshi Tadokoro	

Part II Computer Vision

Finding Better Wide Baseline Stereo Solutions Using Feature Quality	83
Stephen Nuske and Jay Patravali	
High-Throughput Robotic Phenotyping of Energy Sorghum Crops	99
Srinivasan Vijayarangan, Paloma Sodhi, Prathamesh Kini, James Bourne, Simon Du, Hanqi Sun, Barnabas Poczos, Dimitrios Apostolopoulos and David Wettergreen	

Improved Tau-Guidance and Vision-Aided Navigation for Robust Autonomous Landing of UAVs	115
Amedeo Rodi Vetrella, Inkyu Sa, Marija Popović, Raghav Khanna, Juan Nieto, Giancarmine Fasano, Domenico Accardo and Roland Siegwart	
Fast and Power-Efficient Embedded Software Implementation of Digital Image Stabilization for Low-Cost Autonomous Boats	129
S. Aldegheri, D. D. Bloisi, J. J. Blum, N. Bombieri and A. Farinelli	
Evaluation of Combined Time-Offset Estimation and Hand-Eye Calibration on Robotic Datasets	145
Fadri Furrer, Marius Fehr, Tonci Novkovic, Hannes Sommer, Igor Gilitschenski and Roland Siegwart	
Part III Inspection	
Field Report: UAV-Based Volcano Observation System for Debris Flow Evacuation Alarm	163
Keiji Nagatani, Ryosuke Yajima, Seiga Kiribayashi, Tomoaki Izu, Hiromichi Kanai, Hiroyuki Kanasaki, Jun Minagawa and Yuji Moriyama	
Cooperative UAVs as a Tool for Aerial Inspection of the Aging Infrastructure	177
Sina Sharif Mansouri, Christoforos Kanellakis, Emil Fresk, Dariusz Kominiak and George Nikolakopoulos	
Autonomous Aerial Inspection Using Visual-Inertial Robust Localization and Mapping	191
Lucas Teixeira, Ignacio Alzugaray and Margarita Chli	
Sensing Water Properties at Precise Depths from the Air	205
John-Paul Ore and Carrick Detweiler	
Autonomous and Safe Inspection of an Industrial Warehouse by a Multi-rotor MAV	221
Alexandre Eudes, Julien Marzat, Martial Sanfourche, Julien Moras and Sylvain Bertrand	
Part IV Machine Learning	
Online Multi-modal Learning and Adaptive Informative Trajectory Planning for Autonomous Exploration	239
Akash Arora, P. Michael Furlong, Robert Fitch, Terry Fong, Salah Sukkarieh and Richard Elphic	

Season-Invariant Semantic Segmentation with a Deep Multimodal Network	255
Dong-Ki Kim, Daniel Maturana, Masashi Uenoyama and Sebastian Scherer	
StalkNet: A Deep Learning Pipeline for High-Throughput Measurement of Plant Stalk Count and Stalk Width	271
Harjatin Singh Baweja, Tanvir Parhar, Omeed Mirbod and Stephen Nuske	
Learning Models for Predictive Adaptation in State Lattices	285
Michael E. Napoli, Harel Biggie and Thomas M. Howard	
 Part V Mapping	
Field Deployment of the Tethered Robotic eXplorer to Map Extremely Steep Terrain	303
Patrick McGarey, David Yoon, Tim Tang, François Pomerleau and Timothy D. Barfoot	
Towards Automatic Robotic NDT Dense Mapping for Pipeline Integrity Inspection	319
Jaime Valls Miro, Dave Hunt, Nalika Ulapane and Michael Behrens	
Real-Time Semantic Mapping for Autonomous Off-Road Navigation	335
Daniel Maturana, Po-Wei Chou, Masashi Uenoyama and Sebastian Scherer	
Boundary Wire Mapping on Autonomous Lawn Mowers	351
Nils Einecke, Jörg Deigmöller, Keiji Muro and Mathias Franzius	
A Submap Joining Based RGB-D SLAM Algorithm Using Planes as Features	367
Jun Wang, Jingwei Song, Liang Zhao and Shoudong Huang	
Mapping on the Fly: Real-Time 3D Dense Reconstruction, Digital Surface Map and Incremental Orthomosaic Generation for Unmanned Aerial Vehicles	383
Timo Hinzmann, Johannes L. Schönberger, Marc Pollefeys and Roland Siegwart	
Aerial and Ground-Based Collaborative Mapping: An Experimental Study	397
Ji Zhang and Sanjiv Singh	

Part VI Navigation and Planning

I Can See for Miles and Miles: An Extended Field Test of Visual Teach and Repeat 2.0 415
Michael Paton, Kirk MacTavish, Laszlo-Peter Berczi, Sebastian Kai van Es and Timothy D. Barfoot

Dynamically Feasible Motion Planning for Micro Air Vehicles Using an Egocylinder 433
Anthony T. Fragoso, Cevahir Cigla, Roland Brockers and Larry H. Matthies

Informed Asymptotically Near-Optimal Planning for Field Robots with Dynamics 449
Zakary Littlefield and Kostas E. Bekris

Strategic Autonomy for Reducing Risk of Sun-Synchronous Lunar Polar Exploration 465
Nathan Otten, David Wettergreen and William Whittaker

Towards Visual Teach and Repeat for GPS-Denied Flight of a Fixed-Wing UAV 481
M. Warren, M. Paton, K. MacTavish, A. P. Schoellig and T. D. Barfoot

Local Path Optimizer for an Autonomous Truck in a Harbor Scenario 499
Jennifer David, Rafael Valencia, Roland Philippsen and Karl Iagnemma

Part VII Systems and Tools

Field Experiments in Robotic Subsurface Science with Long Duration Autonomy 515
Srinivasan Vijayarangan, David Kohanbash, Greydon Foil, Kris Zacny, Nathalie Cabrol and David Wettergreen

Design and Development of Explosion-Proof Tracked Vehicle for Inspection of Offshore Oil Plant 531
Keiji Nagatani, Daisuke Endo, Atsushi Watanabe and Eiji Koyanagi

Life Extension: An Autonomous Docking Station for Recharging Quadrupedal Robots 545
Hendrik Kolvenbach and Marco Hutter

Autonomous Mission with a Mobile Manipulator—A Solution to the MBZIRC 559
Jan Carius, Martin Wermelinger, Balasubramanian Rajasekaran, Kai Holtmann and Marco Hutter

Towards a Generic Solution for Inspection of Industrial Sites 575
Marco Hutter, Remo Diethelm, Samuel Bachmann, Péter Fankhauser,
Christian Gehring, Vassilios Tsounis, Andreas Lauber, Fabian Guenther,
Marko Bjelonic, Linus Isler, Hendrik Kolvenbach, Konrad Meyer
and Mark Hoepflinger

**Foresight: Remote Sensing for Autonomous Vehicles Using a Small
Unmanned Aerial Vehicle** 591
Alex Wallar, Brandon Araki, Raphael Chang, Javier Alonso-Mora
and Daniela Rus

**Dynamic System Identification, and Control for a Cost-Effective
and Open-Source Multi-rotor MAV** 605
Inkyu Sa, Mina Kamel, Raghav Khanna, Marija Popović, Juan Nieto
and Roland Siegwart

**AirSim: High-Fidelity Visual and Physical Simulation for
Autonomous Vehicles** 621
Shital Shah, Debadeepta Dey, Chris Lovett and Ashish Kapoor

**Design and Development of Tether-Powered Multirotor Micro
Unmanned Aerial Vehicle System for Remote-Controlled
Construction Machine** 637
Seiga Kiribayashi, Kaede Yakushigawa and Keiji Nagatani

Human-Robot Teaming: Concepts and Components for Design 649
Lanssie Mingyue Ma, Terrence Fong, Mark J. Micire, Yun Kyung Kim
and Karen Feigh

**An Analysis of Degraded Communication Channels in Human-Robot
Teaming and Implications for Dynamic Autonomy Allocation** 665
Michael Young, Mahdieh Nejati, Ahmetcan Erdogan and Brenna Argall

**LEAF: Using Semantic Based Experience to Prevent
Task Failures** 681
Nathan Ramoly, Hela Sfar, Amel Bouzeghoub and Beatrice Finance

**State Estimation and Localization for ROV-Based Reactor Pressure
Vessel Inspection** 699
Timothy E. Lee and Nathan Michael

Field and Service Robotics

Results of the 11th International Conference

Hutter, M.; Siegwart, R. (Eds.)

2018, XV, 715 p. 382 illus., Hardcover

ISBN: 978-3-319-67360-8