Guest Editorial
Special Section on 2012 Workshop on the Algorithmic Foundations of Robotics (WAFR)

IN this issue, we are pleased to present a Special Section on the 2012 Workshop on the Algorithmic Foundations of Robotics (WAFR). WAFR is a premier, single-track, biennial conference focusing on algorithms combining aspects of control theory, computational geometry and topology, geometric and physical modeling, reasoning under uncertainty, probabilistic algorithms, game theory, and theoretical computer science.

This Special Section consists of substantially revised and extended versions of five papers representing the best of WAFR 2012. All papers underwent the same rigorous T-ASE review process as regular submissions. The five papers that were eventually accepted cover topics such as RGBD image processing, estimation algorithms based on simple sensors, computational geometry problems with applications to motion and manipulation planning, and distributed real-time traffic estimation using smartphone data streams.

The first paper, "Learning to Segment and Track in RGBD," by Alex Teichman, Jake Lussier, and Sebastian Thrun of Stanford University, represents a significant step forward in automatic segmentation and tracking of unknown objects using the color video and depth information available from RGBD cameras. The algorithm uses conditional random fields, a rich feature set, and machine learning to learn how to best use the features to segment and track unknown deformable objects.

The second paper, "Counting Moving Bodies Using Sparse Sensor Beams," by Lawrence Erickson, Jingjin Yu, Yaonan Huang, and Steve LaValle of the University of Illinois Urbana–Champaign, studies the novel problem of determining the distribution of mobile agents in each room of a building if all that can be sensed are the events when an agent moves from one room to the next. This paper proves the surprising result that these simple sensors, combined with an appropriate estimation algorithm and knowledge of the total population, are sufficient to eventually estimate the distribution of agents.

The third paper, "Ray Shooting Algorithms for Robotics," by Yu Zheng and Katsu Yamane of the University of North Carolina and Disney Research Pittsburgh, describes improved algorithms for ray shooting—determining the in-

tersection of a ray and a convex set. These algorithms find a number of applications in robotics, including calculating the distance between convex bodies and optimizing contact forces in manipulation problems. The new algorithms allow working directly with parametric object representations rather than polyhedral approximations.

The fourth paper, "Robust Free Space Computation for Curved Planar Bodies," by Victor Milenkovic, Elisha Sacks, and Steven Trac of the University of Miami, Purdue University, and Epic Systems Corporation, deals with the computational geometry problem of computing the free configurations of one planar body that moves relative to a stationary body, where the boundary of each body is described by straight lines and circular arcs. The derived algorithm is robust and efficient, with potential applications in assembly and motion planning with tight tolerances.

The fifth paper, "Large-Scale Estimation in Cyberphysical Systems Using Streaming Data: A Case Study With Smartphone Traces," by Timothy Hunter, Tathagata Das, Matei Zaharia, Pieter Abbeel, and Alexandre Bayen of the University of California, Berkeley, addresses issues in big data and real-time cloud computing. The particular application is distributed low-latency estimation of traffic conditions based on smartphone GPS data.

I hope you enjoy the Special Section on WAFR 2012. My thanks to the Associate Editors and Reviewers for their diligence ensuring the high standards of WAFR and T-ASE; to Jenn Barbato, IEEE T-ASE Editorial Assistant, for working with the authors and me to keep the process on schedule; and to Ken Goldberg, IEEE T-ASE Editor-in-Chief, for forming the partnership between T-ASE and WAFR and bringing these excellent papers to T-ASE.

KEVIN LYNCH, *Guest Editor*
Northwestern University
Department of Mechanical Engineering
Evanston, IL 60208 USA
kmlynch@northwestern.edu