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Smart Electronic Nose in Flight

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ABSTRACT:

Accidental or intentional release of dangerous and toxic chemical, biological, radiological, nuclear, or explosive (CBNRE) substances can cause significant harm to humans, physical infrastructure, and the environment. Fast and effective localization of such leaks are critical to minimize environmental impact, help direct humans out of harm's way, and lower recovery cost and time. This talk will focus on our recent efforts in developing a team of autonomous flying chemical-sensing robots with the ability to detect flammable gases and quickly estimate and localize the source of the leak. The design of the hardware and the estimation, motion planning, and control algorithms will be described. Our approach leverages Bayesian inference, coordination, and information-theoretic control for fast, robust, and effective source term estimation and localization. Recent experimental results will be presented to illustrate the ability for autonomous chemical sensing and the potential of the method to be applied to other search-related applications, including finding victims buried in an avalanche and for pest/disease management in agriculture.

BIOGRAPHY:

Kam K. Leang received the B.S. and M.S. degrees in Mechanical Engineering from the University of Utah in December 1997 and 1999, respectively, and the Ph.D. degree from the University of Washington in December 2004. He is a Professor in the Mechanical Engineering Department at the University of Utah, where he joined the department in July 2014. He is a core member of the University of Utah Robotics Center. His research covers three main areas: (1) design and control of high-speed nanopositioning systems, (2) control and manufacturing of electroactive polymer actuators for soft robotics, and (3) design, motion planning, and control of mobile robotic systems with application in environmental monitoring. He is a Fellow of ASME and more details about his research can be found at http://www.kam.k.leang.com/academics/.