

RESEARCH SEMINAR

Resilient and Accurate Autonomous Vehicle Navigation via Signals of Opportunity

by

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Navigation (ASPIN) Laboratory.**

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Abstract:

The steady trend towards autonomous vehicles will come with a demand for full situational awareness and extremely reliable and accurate navigation systems. With no human in the loop, the cost of navigation system failure could be severe. The vulnerability of GPS-only-based navigation has demonstrated the necessity for a complementary navigation system. We propose a new navigation framework that we call Collaborative Opportunistic Navigation. In this framework, vehicle-mounted radios collaboratively draw relevant positioning and timing information from ambient signals of opportunity (SOPs).

In this research, a number of radios with no *a priori* knowledge about their own states are dropped in an environment comprising multiple unknown SOPs. The radios draw pseudorange-type observations from the SOPs. The radios objective is to build a high-fidelity signal landscape map of the environment within which they localize themselves in space and time. Demonstrated research findings, numerically and experimentally via specialized SOP-based navigation software-defined radios mounted on ground vehicles and unmanned aerial vehicles (UAVs) will be presented.

Bio:

Zak Kassas is an Assistant Professor of Electrical and Computer Engineering at the University of California, Riverside and the Director of the Autonomous Systems Perception, Intelligence, and Navigation (ASPIN) Laboratory. He received a B.E. in E.E. from the Lebanese American University, an M.S. in Electrical and Computer Engineering from The Ohio State University, and an M.S.E. in Aerospace Engineering and a Ph.D. in Electrical and Computer Engineering from The University of Texas at Austin. From 2004 through 2010 he was a research and development engineer with the LabVIEW Control Design and Dynamical Systems Simulation Group at National Instruments Corporation. He has published over thirty refereed journal and conference articles, holds a U.S. patent, and is a senior member of the IEEE. His research interests include cyber-physical systems, navigation in GPS-challenged environments, autonomous vehicles, target tracking, and intelligent transportation systems.