



Halmstad Colloquium talk 2013-05-15:

Dr Karl Iagnemma on

“Autonomy is overrated: Towards shared human-machine control of vehicles and other mechanical systems”

Abstract:

Many important tasks such as vehicle navigation, unmanned system teleoperation, and robotic surgery require human operators to interact with a computer controlled mechanical system. Currently, there is intense research activity devoted toward complete automation of system operation. However, human operators will remain "in the loop" for the foreseeable future, due to various technical issues, legal issues, and social issues. The development of shared control methods for operator assistance, safeguarding, and augmentation are thus a necessary component of future intelligent systems. This talk will present an approach to shared human-machine control (i.e. "semi-autonomous control") that is abstracted as a constraint planning problem. In this approach, constraints are defined to bound a safe operational region of the physical environment, input space, and state space. Methods for "threat assessment" are used to estimate the hazard level of a given scenario, and this threat estimate is used to partition control between the human operator and the control system. Simulated and experimental results are presented in the context of manned and unmanned (i.e. teleoperated) vehicle navigation, and demonstrate the framework's ability to robustly ensure vehicle safety while sharing control with a human driver.

About:

Karl Iagnemma is a principal research scientist at the Massachusetts Institute of Technology, where he directs the Robotic Mobility Group. He holds a B.S. from the University of Michigan, and an M.S. and Ph.D. from MIT, where he was a National Science Foundation Graduate Fellow. He has performed postdoctoral research at MIT, and has been a visiting researcher at the NASA Jet Propulsion Laboratory and the National Technical University of Athens (Greece), and is currently a Guest Professor at Halmstad University. He is a current or past associate editor of the IEEE Transactions on Robotics and the Journal of Field Robotics. Dr. Iagnemma's primary research interests are in the areas of design, sensing, motion planning, and control of mobile robots in outdoor terrain, including modeling and analysis of robot-terrain interaction. He is author of the monograph *Mobile Robots in Rough Terrain: Estimation, Planning and Control with Application to Planetary Rovers* (Springer, 2004), and co-editor of a pair of widely read books on the DARPA Grand Challenge and Urban Challenge unmanned vehicle races. He has recently led research programs for agencies including the U.S. Army Tank-Automotive and Armaments Command, the Army Research Office, DARPA, the NASA Mars Program Office, Nissan, Ford Motor Company, and the NASA Institute for Advanced Concepts, among others. He has authored or co-authored over 100 conference and journal papers on a wide range of robotic topics, and has consulted for various private companies and government agencies.