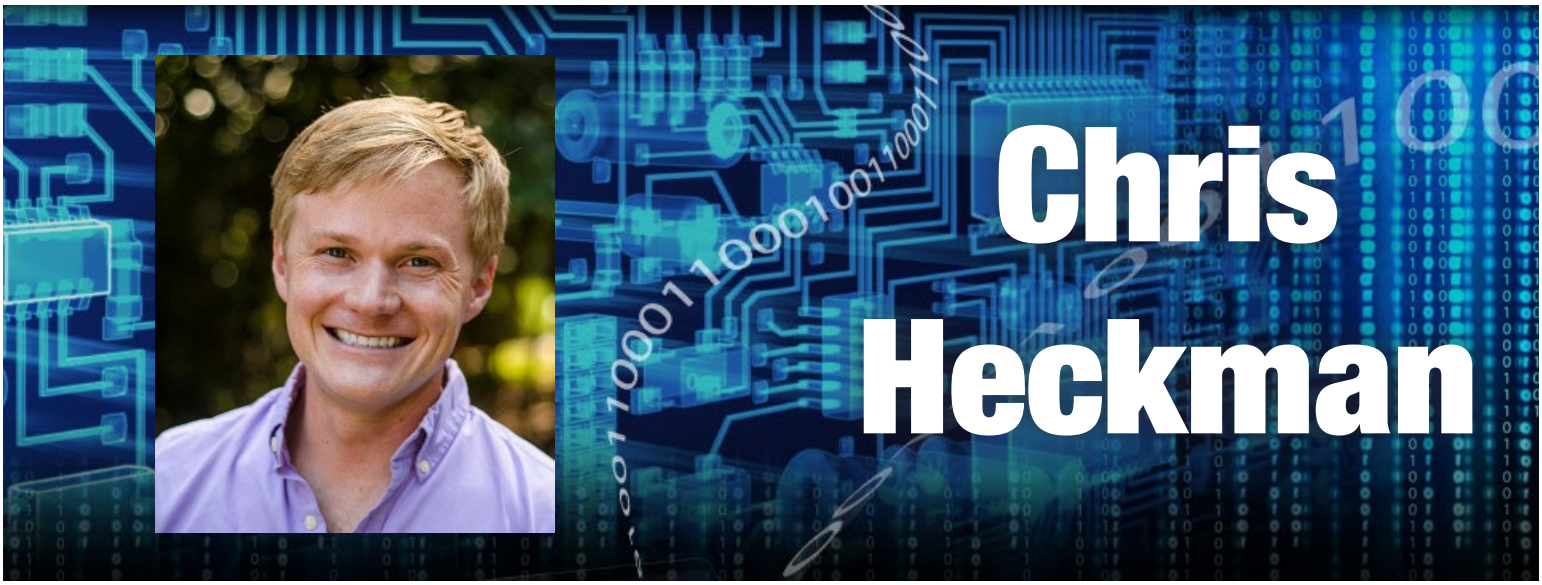
Aerospace Seminar



Assistant Professor, Computer Science - University of Colorado Boulder

Autonomous Robotics: Drift-Correcting Self Calibration in Visual Inertial SLAM and Online Model-Predictive Control

Wednesday March 8, 2017 | ECCR 151 | 12:00 P.M.

In this talk, I will discuss algorithms that are addressing critical challenges to robot autonomy: visual-inertial perception with online statistical change detection and drift correction, and adaptive simulation-in-the-loop model predictive control (MPC). Visual-inertial simultaneous localization and mapping (SLAM) is a technique used to navigate in unknown environments; we have augmented it with the ability to both self-calibrate and correct for calibration drift over time. Our method relies on determining when calibrations have become stale and initiates a new self-calibration when they do, applying calibrations post-hoc for higher accuracy. Nonlinear MPC on the other hand focuses on how to infer optimal control inputs of a high-dimensional nonlinear plant model. I will show how these methods apply to autonomous vehicles moving at fast speeds, and how they extend to novel maneuvers such as jumping and slipping on real platforms.

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Bio:

Chris Heckman is an Assistant Professor in the Department of Computer Science at the University of Colorado at Boulder. Professor Heckman earned his BS in Mechanical Engineering from UC Berkeley in 2008 and his PhD in Theoretical and Applied Mechanics from Cornell University in 2012, where he was an NSF Graduate Research Fellow. He had postdoctoral appointments at the Naval Research Laboratory in Washington, DC as an NRC Research Associate, and in the Autonomous Robotics and Perception Group at CU Boulder as a Research Scientist, before joining the faculty there in 2016.

His research focuses on developing mathematical and systems-level frameworks for autonomous control and perception. His work applies concepts of nonlinear dynamical systems to the design of control systems for autonomous agents, in particular ground and aquatic vehicles, enabling them to navigate uncertain and rapidly-changing environments. A hallmark of his research is the implementation of these systems on experimental platforms.