OPTEC Workshop on Moving Horizon Estimation and System Identification
OPTEC, K.U. Leuven's Optimization in Engineering Center
Leuven, Belgium
August 29, 2012

Real-time Moving Horizon Estimation for an Unmanned Aerial System

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A strategy for the aerial recovery of a Micro Air Vehicle (MAV) involves coordination of a larger aircraft, a flexible and extensible cable, and a controllable capture device at the end of the cable. Aerial release and capture allows deployment of MAVs for reconnaissance missions in inhospitable areas that are outside of the MAV range. Reconnaissance missions may include face recognition, communications capture, and as advance support for ground operations. Capturing the MAVs may be important to recover data collected during the mission, prevent others from discovering MAV sensor technology, and allow reuse of the system. Controlling the aerial capture requires precise position, velocity, and trajectory following in the presence of cross-wind disturbances. A mathematical model of the towed system is validated and adjusted by real-time flight data. State and parameter estimation during the flight test improves the ability of the optimizing controller to achieve the desired rendezvous. Multiple measurements from the larger aircraft and towed capture device validate the system dynamics and suggest configuration changes for improved aerial recovery. To better address the challenges of unmanned flight, a new National Science Foundation (NSF) center has been created as an Industry & University Cooperative Research Program (I/UCRC). The Center for Unmanned Aircraft Systems (C-UAS) was initiated in 2012 with Brigham Young University as the lead institution.

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