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FIRST FEEDBACK CONTROL TESTS FOR FAST FLYING TETHERED AIRPLANES

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In order to be able to perform estimation and control experiments, a test platform suitable for rotation start of two tethered airplanes has been built. This platform allows us to perform experiments both outdoors and indoors, independent of wind and weather conditions. The platform consists of a rotating mechanical structure, the carousel, and one or two airplanes. The control architecture includes a PC based computer and a micro-controller inside the airplane. Orocos Toolchain has been chosen for the underlying control software layer. This toolchain is an architecture-independent component based framework for all aspects of real-time control for mechatronic and airspace systems.

Here we present the first experimental results, in which we performed control of the pitch and roll of the airplane with respect to local acceleration vector. Future research on this test platform includes development of a moving horizon estimator (MHE) for state estimation that fuses multiple sensors such as an inertial measurement unit (IMU), a stereo vision camera system, a GPS etc. Alongside development of a MHE a model predictive controller (MPC) will be developed.