Vision-based Fast and Aggressive Navigation with MAVs

Aggressive and agile navigation with Micro Aerial Vehicles (MAVs) through unknown environments poses a number of challenges in terms of perception, state estimation, planning, and control. To achieve this, MAVs have to localize themselves in unstructured environments. This in turn requires the MAV to use a combination of absolute or relative asynchronous measurements provided by different noisy sensors at different rates which have to be fused to obtain a reliable state estimate at rates of above 200 Hz. In this talk, we will present recent research results on the pose estimation and planning problems for agile and aggressive flights using a minimal on-board sensor suite composed mainly by a single camera system and an Inertial Measurement Unit (IMU). For truly autonomous agile navigation, the perception, planning and control problems have to be solved concurrently. We will demonstrate how these different technologies can be combined to provide an integrate and robust solution enabling aggressive and agile flight maneuvers with MAVs in different scenarios.