Abstract

In recent years, small-scale unmanned aerial vehicles such as quadrotors have shown great potential in applications including load transportation. In this project, we use tools from optimal control to generate and stabilize feasible and safe trajectories for a two-dimensional model of a quadrotor with a cable suspended payload in cluttered environments. Due to the high degree of underactuation and nonlinear dynamics of the system, optimization-based techniques, for specifying control objectives and complex desired behaviors, are better suited over traditional control design methods for these systems. In particular, we develop our trajectory generation scheme and controller using recent methods developed within the Model Predictive Control (MPC) framework, where obstacles are modeled as either polyhedrons or ellipsoids and non-differentiable collision avoidance constraints are reformulated into smooth nonlinear constraints. We then aim to compare this method with other existing planning and control algorithms such as Randomly exploring Random Trees (RRTs).