Real-Time Safe Path Tracking of Quadrotors

authors

Abstract— **Quadrotors have become very popular in research and industry for tasks that require exploration of unknown environments. However, there are limited techniques for fast, real-time path planning that ensure safety for the quadrotor. Simplified models of quadrotor dynamics are easy to plan, but do not capture nonlinear behavior. Guaranteed safe paths can be computed for more realistic and complicated dynamics of quadrotors, but these paths require heavy computational load. We propose a method that combines these two approaches. First we precompute a guaranteed tracking error bound for the realistic dynamics following a simplified dynamics model using reachability analysis. We then perform path planning in real-time using the simplified model. This results in a radius around the simplified model that our quadrotor is guaranteed to remain in. Path planning method, results, etc.**

I. INTRODUCTION

Tracking with quadrotors is a need

There exist methods that work in real time and methods that work for safety but not very many for both

Goal: combine both in a simple way

II. RELATED WORK

work on fast planning
work on safe planning
work on both
how ours is different

III. COMPUTING TRACKING SAFETY RADIUS

HJ Reachability (1p)
Relative dynamics, setup, etc. (1p)
Capture basin computation (0.5p)

IV. FAST PATH PLANNING USING MODEL PREDICTIVE CONTROL

Potential methods to use (.5p)
Dealing with obstacles (.5p)

V. RESULTS AND COMPARISONS

demonstrate feasibility (.5)
real-time computation load (.5)
comparison to other methods (.5)

VI. CONCLUSIONS

Conclusion (0.5p)

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