# Quadrotor with parametric uncertainties benchmark

May 2020

## 1 Introduction

We propose to extend the settings considered in ARCH-COMP 2019 for the Quadrotor benchmark, using different widths for the initial conditions to see if there's a particular sensitivity to them.

Let $\Delta x$ be the uncertainty in the initial conditions for position and velocity variables (first 6 variables in the model). We consider three scenarios:

- $\Delta x = 0.1$
- $\Delta x = 0.4$
- $\Delta x = 0.8$

Note that in ARCH-COMP 2019 we used $\Delta x = 0.4$. Moreover, we suggest to keep the system specification as before (i.e., uncertainty 0.4 with the given properties to respect) as a base but also compute the result for the other scenarios with the same settings used for $\Delta x = 0.4$; no properties need to be respected for other settings, since using the same tool settings already constrains the results. Execution times for the different cases should reported. The purpose is to see how the tool scales without relying on extra effort for the specific case with largest width of initial states $\Delta x = 0.8$.

## 2 Preliminary results

We present the flowpipe for the different scenarios $\Delta x = 0.1$, $\Delta x = 0.4$ and $\Delta x = 0.8$ in Fig. 1, 2 and 3 respectively. In Fig. 4 we superpose the flowpipe with randomly computed trajectories. Note that the system apparently is stable in this configuration.

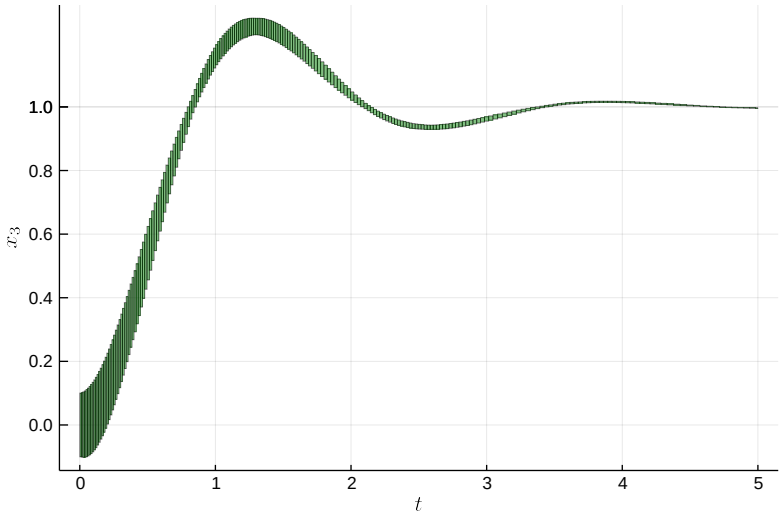


Figure 1: Width of initial states 0.1.

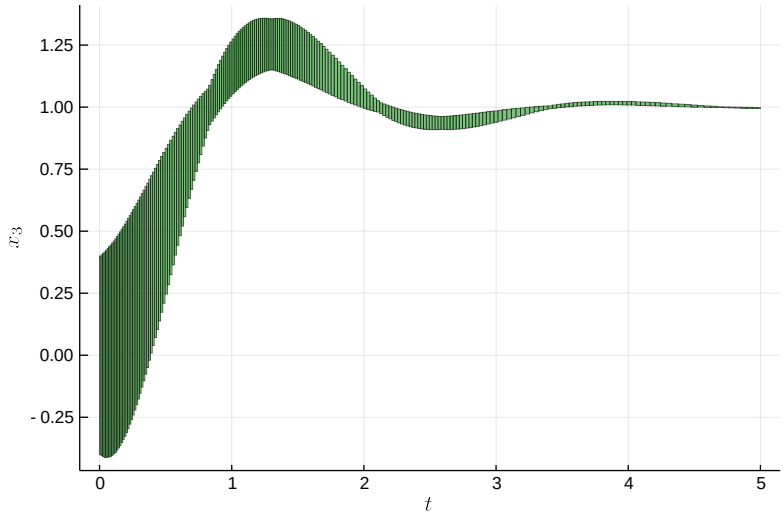


Figure 2: Width of initial states 0.4.

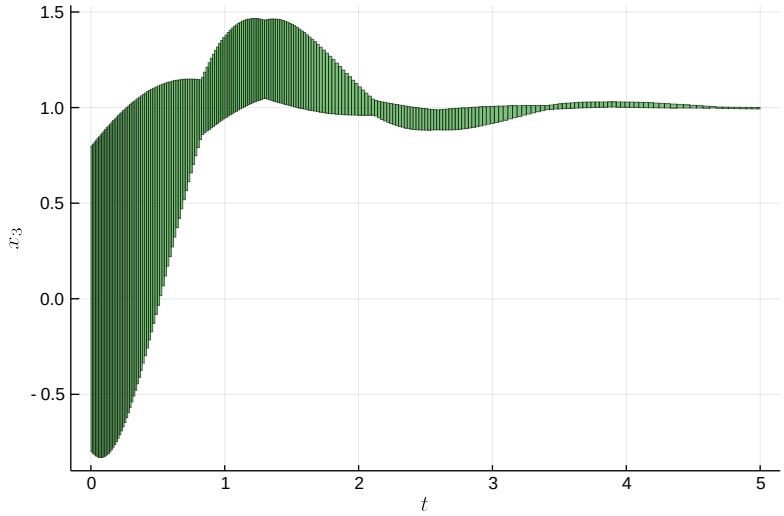


Figure 3: Width of initial states 0.8.

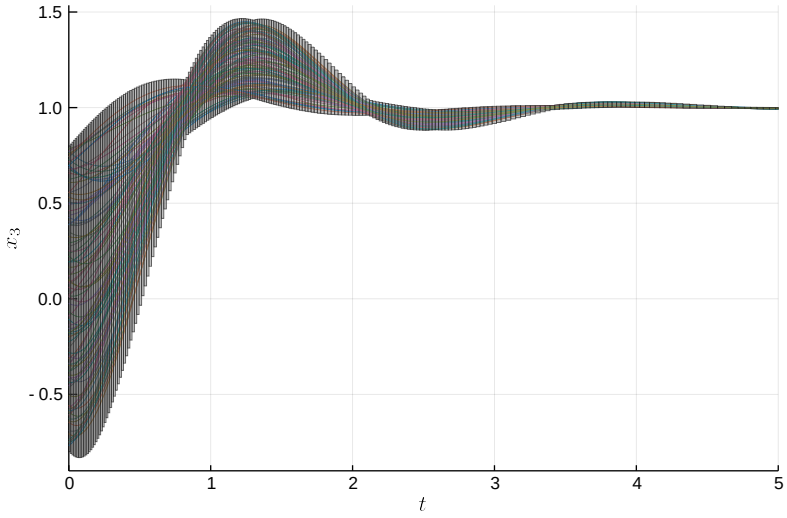


Figure 4: Randomly selected trajectories for the case where the width of initial states is 0.8.