2016-12-01

Reachability

Use “min with target” formulation

* Suboptimal disturbance can be accounted for
* Optimal tracking error can be determined offline

Next time

* Talk about MPC
  + Confirm disturbance guarantees with MPC?
* Write out algorithm?

Things to consider

* Write journal version and simplify to IROS version
* Numerical integration error introduced in MPC (due to forward Euler method in dynamics constraint)

2016-11-21

**Project overview**

Reach goal while avoiding collisions with obstacles

Somil: Exploration

**Reachability advantages**

Robust set computation

Flexibility with respect to planning methods

Online controller

* Least restrictive
* Look-up table

**Things to do**

Path planners:

* MPC
* TrajOpt

Exploration

* Standard algorithms
* Controller blending

Robust bubbles

* Nonholonomic tracking itself
* Nonholonomic tracking holonomic

Guarantees?

**Time commitment, roles**

Mo

Ye

* Teach us MPC

Somil

* Look into exploration

Sylvia

* Tracking models

**Pavone’s paper**

Control structure

- u\_nom + k(x\*, x)

- appears to only work for two sets of the same dynamics

- should be flexible wrt planning method, but seems to use MPC for some reason

Offline

- Compute RTT set (RCI)

- worst-case disturbance

- finite time horizon (could be useful for our RTT work)

- independent of nominal trajectory

- unaugment target and augment obstacles

- online update of nominal trajectory allows smaller time horizon and therefore smaller "bubble" --> accounts for realized disturbance (Problem MPC)

Online:

- MPC ("Problem MPC")

- geodesic computation

Numerical results

- Problem MPC: 1s

- tracking controller: 5ms

- MPC iteration: 0.35s

- Disturbance: 0.1 m/s^2

- Tracking error: 0.76m semi major, 0.44m semi minor