Trajectory Of Quadrator Using NMPC

Nov 13, 2014

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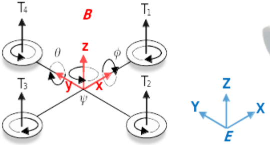
Motivation

- Real time control problems
- Under actuated dynamics
- Strongly coupled non-linearities



Quadrator by 3D-Robotics.

Dynamic Model Of Quadcopter

$$\ddot{\phi} = \dot{\theta}\dot{\psi}a_1 + \dot{\theta}a_2; \quad \ddot{\theta} = \dot{\phi}\dot{\psi}a_3 - \dot{\phi}a_4; \quad \ddot{\psi} = \dot{\theta}\dot{\phi}a_5 + b_3 U_4 \tag{1}$$

$$\Omega_r + b_1 U_2; \quad \Omega_r + b_2 U_3 \tag{2}$$

$$\ddot{x} = u_x \frac{1}{m} U_1; \quad \ddot{z} = g - \left(cos(\phi)cos(\theta)\right)\frac{1}{m} U_1; \quad \ddot{y} = u_y \frac{1}{m} U_1. \tag{3}$$

$$a_1 = \frac{(I_{yy} - I_{zz})}{I_{xx}}; \quad a_2 = \frac{J_r}{I_{xx}}; \quad a_3 = \frac{(I_{zz} - I_{xx})}{I_{yy}} \tag{4}$$

$$a_4 = \frac{J_r}{I_{yy}}; \quad a_5 = \frac{(I_{xx} - I_{yy})}{I_{zz}}; \quad b_1 = \frac{l}{I_{xx}} \tag{5}$$

$$b_2 = \frac{l}{I_{yy}}; \quad b_3 = \frac{l}{I_{zz}}; \quad b_2 = \frac{l}{I_{yy}}; \quad b_3 = \frac{l}{I_{zz}} \tag{6}$$

$$u_a = cos(\phi)cos(\theta); \quad u_x = cos(\phi)sin(\theta)cos(\psi) + sin(\phi)sin(\psi) \tag{7}$$

$$u_y = cos(\phi)sin(\theta)cos(\psi) - sin(\phi)cos(\psi) \tag{8}$$

$$J_r\dot{\theta}\Omega_r the\ gyroscopic\ effect\ due\ to\ the\ propeller \tag{9}$$

$$dynamics.\ It\ is\ assumed\ that\ U_1 = \Omega_r. \tag{10}$$

Event Related Potential (ERP) Based Learning

Tricopter Parameters

Paremeter	Value (Unit)
$Controller$	$NMPC$
$HessianApproximation$	$GaussNewton$
$DiscretizationType$	$MultipleShooting$
$SparseQPSolution$	$FullCondensing$
$IntegratorType$	$ImplicitRungeKutta$
$QPSolver$	$QP_QPOASES$
$TrackingError(RMSE)$	0.5007
$ControllerEffort$	204.769
$CPUTime$	5.058
$IterationNumber$	1
$PredictionHorizon$	40

Video

- how have any idea please put it here

Question ?