ASEN 5519 Small UAS Guidance and Control

Homework 4 Assignment

Assigned: Friday, February 17, 2023

Due: 11:59 PM, Thursday, February 23, 2023

Background

The purpose of this assignment is to insure that your simulation capability is working before we move to control design. In order to facilitate assessment of your code, the results of seceral key functions are presented below.

Main functions

All function calls and examples below use the Ttwistor aircraft data file provided to the class. Let

$$\texttt{aircraft\_state} = [100, 200, 1000, 0.05, -0.02, 2.0, 15, -2, 3, .01, .02, .03]^T$$

$$\texttt{aircraft\_surfaces} = [-.4, .01, .02, .3]^T$$

$$\texttt{wind\_inertial} = [-1, -2, -3]^T$$

$$\texttt{density} = 1.1$$

$$\texttt{time} = 0$$

then the results of the following function calls are:

[aero_force, aero_moment] =
AeroForcesAndMoments_BodyState_WindCoeffs(aircraft_state, aircraft_surfaces,
wind_inertial, density, aircraft_parameters)

where

$$\texttt{aero\_forces} = [67.9039, 8.2737, -260.9913]^T$$

$$\texttt{aero\_moments} = [5.3760, -11.5835, -5.5928]^T$$

[aircraft_forces, aircraft_moments] =
AircraftForcesAndMoments(aircraft_state, aircraft_surfaces,
wind_inertial, density, aircraft_parameters)

where

$$\texttt{aircraft\_forces} = [69.0300, 11.0874, -204.7635]^T$$

$$\texttt{aircraft\_moments} = [5.3760, -11.5835, -5.5928]^T$$

[xdot] = AircraftEOM(time,aircraft_state,aircraft_surfaces,wind_inertial,
aircraft_parameters)

where

$\texttt{xdot} = [-4.264, 14.478, 3.196, 0.009, 0.019, 0.031, 14.563, 1.835, -45.563, 5.240, -15.222, -3.064]^T$.

Trim

SLUF

When `trim_definition` = [18, 0, 1655] then `trim_variables` = [0.0502, -0.5022, 0.1776].

Coordinated turn

When `trim_definition` = [18, 0, 1655, -500] then `trim_variables` = [0.0504, -0.5125, 0.1776, -0.0661, -0.0017, -0.0167, 0.0237].

Problems

Problem 1

Repeat Problem 3.2 from Homework 3. Submit all plots in a single pdf document