World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:8, No:10, 2014

3D Guidance of Unmanned Aerial Vehicles Using Sliding Mode Approach

Authors : M. Zamurad Shah, M. Kemal Ozgoren, Raza Samar

Abstract : This paper presents a 3D guidance scheme for Unmanned Aerial Vehicles (UAVs). The proposed guidance scheme is based on the sliding mode approach using nonlinear sliding manifolds. Generalized 3D kinematic equations are considered here during the design process to cater for the coupling between longitudinal and lateral motions. Sliding mode based guidance scheme is then derived for the multiple-input multiple-output (MIMO) system using the proposed nonlinear manifolds. Instead of traditional sliding surfaces, nonlinear sliding surfaces are proposed here for performance and stability in all flight conditions. In the reaching phase control inputs, the bang-bang terms with signum functions are accompanied with proportional terms in order to reduce the chattering amplitudes. The Proposed 3D guidance scheme is implemented on a 6-degrees-of-freedom (6-dof) simulation of a UAV and simulation results are presented here for different 3D trajectories with and without disturbances.

Keywords : unmanned aerial vehicles, sliding mode control, 3D guidance, nonlinear sliding manifolds
Conference Title : ICAA 2014 : International Conference on Aeronautics and Astronautics
Conference Location : Istanbul, Türkiye
Conference Dates : October 27-28, 2014