World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:12, No:11, 2018

Three-Dimensional Optimal Path Planning of a Flying Robot for Terrain Following/Terrain Avoidance

Authors : Amirreza Kosari, Hossein Maghsoudi, Malahat Givar

Abstract : In this study, the three-dimensional optimal path planning of a flying robot for Terrain Following / Terrain Avoidance (TF/TA) purposes using Direct Collocation has been investigated. To this purpose, firstly, the appropriate equations of motion representing the flying robot translational movement have been described. The three-dimensional optimal path planning of the flying vehicle in terrain following/terrain avoidance maneuver is formulated as an optimal control problem. The terrain profile, as the main allowable height constraint has been modeled using Fractal Generation Method. The resulting optimal control problem is discretized by applying Direct Collocation numerical technique, and then transformed into a Nonlinear Programming Problem (NLP). The efficacy of the proposed method is demonstrated by extensive simulations, and in particular, it is verified that this approach could produce a solution satisfying almost all performance and environmental constraints encountering a low-level flying maneuver

Keywords : path planning, terrain following, optimal control, nonlinear programming
Conference Title : ICMDCE 2018 : International Conference on Mechanics, Dynamics and Control Engineering
Conference Location : Amsterdam, Netherlands
Conference Dates : November 05-06, 2018