Simplified 6-DOF Simulation Models and Guidance Laws for Bank to Turn Unmanned Aerial Vehicles

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ABSTRACT

In this paper, simplified 6-DOF mathematical models are proposed for analyses and designs of unmanned aerial vehicles (UAVs). The derivations of those models can be based upon (1) design specifications of aerodynamics of a new UAV or (2) system identification datum of an existing UAV. Datum used are ratio of the lifting force to angle of attack, trim angle of fin and natural frequency for constant speed and altitude flight. Using the proposed method, one can perform autopilot designs, and guidance laws developments before the aerodynamic model obtained from wind tunnel tests or the physical UAV can be applied. A Tomahawk-like cruise UAV example shows simplified 6-DOF models give good approximations to the complete 6-DOF system for developing guidance and control laws.

Keywords: Simplified 6-DOF models, guidance laws, UAV.

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