

عنوان مقاله:

Analytical Study of Velocity and State Controller System of a Single Main Rotor Helicopter in Forward Flight

محل انتشار:

چهارمین کنفرانس ملی مهندسی مکانیک و هوافضا (سال: 1398)

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خلاصه مقاله:

This paper aims to present dynamically modeling of six degrees of freedom of a single main rotor helicopter that is equipped with a rotor having a hinge offset in forward flight and investigating the stability and control. Taking linear aero-dynamical relations into account, and each blade has been assumed to have two degrees of freedom of flapping and feathering, and the induced velocity has been assumed to be constant within the plane of the main rotor. The six degrees of freedom nonlinear dynamical model of the helicopter consisting of a main rotor, tail rotor, horizontal tail, vertical tail, fuselage, and other rotating components of helicopter have been derived. The paper covers our findings on the stability derivatives, estimating trim conditions, extracting movement equations and a new design for the flight control system for improving the flight handling quality. Due to simple structure, design background and ease of implementation, state control system has been designed based on pole placement method with linear feedback. Obtained results of this paper showed that dynamic modeling and design of controller with proposed methodology results in outcomes of high accuracy, properly consistent with requirements for flight at level 1(ADS-33E). Obtained results showed that design using pole placement is desirable and feasible according to standard.

کلمات کلیدی:

single main rotor helicopter, dynamic modeling, velocity and state controller, forward flight

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