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Adaptive control of nonlinear system based on QFT application to 3-DOF flight control system (Article)

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Abstract

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Research on unmanned aerial vehicle (UAV) became popular because of remote flight access and cost-effective solution. 3-degree of freedom (3-DOF) unmanned helicopters is one of the popular research UAV, because of its high load carrying capacity with a smaller number of motor and requirement of forethought motor control dynamics. Various control algorithms are investigated and designed for the motion control of the 3DOF helicopter. Three-degree-of-freedom helicopter model configuration presents the same advantages of 3-DOF helicopters along with increased payload capacity, increase stability in hover, manoeuvrability and reduced mechanical complexity. Numerous research institutes have chosen the three-degree-of-freedom as an ideal platform to develop intelligent controllers. In this research paper, we discussed about a hybrid controller that combined with Adaptive and Quantitative Feedback theory (QFT) controller for the 3-DOF helicopter model. Though research on Adaptive and QFT controller are not a new subject, the first successful single Adaptive aircraft flight control systems have been designed for the U.S. Air Force in Wright Laboratories unmanned research vehicle, Lambda [1]. Previously researcher focused on structured uncertainties associated with controller for the flight conditions theoretically. The development of simulationbased design on flight control system response, opened a new dimension for researcher to design physical flight controller for plant parameter uncertainties. At the beginning, our research was to investigates the possibility of developing the QFT combined with Adaptive controller to control a single pitch angle that meets flying quality conditions of automatic flight control. Finally, we successfully designed the hybrid controller that is QFT based adaptive controller for all the three angles.

SciVal Topic Prominence

Topic: Helicopters | Attitude Control | Backstepping

Prominence percentile: 85.842

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3-degree of freedom (3-DOF) | Adaptive controller | Hybride controller | Quantitative feedback theory (QFT) | UAV

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