Abstract

The dynamic load and vibration caused by landing impact and the unevenness of runway will result in airframe fatigue, discomfort of crew/passengers and the reduction of the pilot’s ability to control the aircraft. The aim of the current paper is to design Proportional Integral Derivative classical controller based on Bees Intelligent Algorithm as the optimization technique for nonlinear model of active landing gear system that chooses damping and stiffness performance of suspension system at touchdown as optimization object. Optimal setting of controller parameters to achieve desirable time response using numerical software method based on Bees Algorithm is easier and more effective than other traditional methods because it does not need high experience and complex calculations and leads to better results. This research develops nonlinear two-dimensional mathematical model to describe landing gear system with oleo-pneumatic shock absorber and linear tire. Based on this model, the dynamic equations derived are used to investigate the behavior of an aircraft active landing gear system subject to runway disturbance excitation and the stability conditions of the landing system around static equilibrium position is studied according to the Routh-Hurwitz criterion. Simulink control system simulation software is utilized to validate the theoretical analysis of system
stability and results comparison and adaptation of this paper with research of Wang and Xing about investigation of active landing gear system. Results of system numerical Simulation with optimized controller using Bees Algorithm in MATLAB software shows that the transmitted impact load to airframe, the vertical vibration of aircraft and time to return static equilibrium position at touchdown are significantly improved compared with other control performances.

References

Application of Active Suspension System to Reduce Aircraft Vibration using PID Technique and Bees Algorithm


Index Terms

Computer Science Algorithms

Keywords

Aircraft Active Landing Gear PID Technique Bees Algorithm