Abstract

Nature inspired algorithms are the most popular and robust algorithms for the optimization of the real world problems like pitch control of an aircraft system. This paper introduces Bat algorithm and Differential Evolution technique for the multi-objective optimization based designing of the fractional order PID (FOPID) and integer order PID controllers. The optimized values obtained from the techniques have been implemented for the Pitch control of an aircraft system to obtain the desired robust response. In this paper a mixed sensitivity $H_{\infty}$ problem is designed and simulated using Matlab. It has been shown that the design of FOPID using multi-objective bat algorithm gives better results than others.

References

2. Oustaloup, A. "Fractional order sinusoidal oscillators: optimization and their use in highly
3. Chengbin, Ma, and Y. Hori. "The application of fractional order PID controller for robust
two-inertia speed control." Proceedings of the 4th International Power Electronics and Motion
Control Conference, Xi'an, August. 2004.
implementation of Fractional Order PID controller for aerofin control system." Nature &
5. Ahuja, Ashu, Shiv Narayan, and Jagdish Kumar. "Robust FOPID controller for load
frequency control using Particle Swarm Optimization." Power India International Conference
1997.
7. Luo, Ying, et al. "Tuning fractional order proportional integral controllers for fractional
8. Han, Jinju, et al. "Pitch Loop Control of a VTOL UAV Using Fractional Order Controller."
Multiobjective Optimization with GA And Weighted Sum Objective Function Method." Small 2.2
(2013).
coupled-tank liquid-level control system using bat algorithm." Power, Control and Embedded
12. Donald. 1936 McLean. Automatic flight control systems. Prentice-Hall Incorporated,
1990.
Proceeding of the International Multiconference of Engineering and Computer Scientists, vol. II,
March 2009, pp. 18-20.

Index Terms

Computer Science

Artificial Intelligence

Keywords

Fractional order PID controller; Bat algorithm; PID optimization; Mixed sensitivity problem; Pitch
control of an aircraft system.