

Turbine Engine Reconfigurable Control Systems for Aircraft Propulsion Performance Improvement

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Abstract

Artificial intelligent technologies are being investigated for development of advanced adaptation and reconfiguration algorithms for turbine engine distributed control systems. Adding adaptation and reconfiguration feature to the control systems is expected to improve engine performance and provide more efficient aircraft operations. The benefits of transitioning from the existing centralized supervisory control, the Full Authority Digital Electronic Control (FADEC), of turbine engines to distributed control architecture have been well articulated in the literature. The major benefits are summarized as; weight reduction, cost saving, and damage tolerant turbine engines. However, consideration of advanced intelligent technologies in the design and operation of distributed control systems has been a challenging task and requires further investigation. This paper describes research activities to address the above stated challenge leading to fully reconfigurable distributed control systems for turbine engines of the future aircrafts. The goal of the research work is to accelerate the development and implementation of disturbed control systems in aircrafts propulsion controls and its integration with distributed diagnostics and prognostics algorithms. This will be achieved by means of using artificial intelligent technologies to design adaptation and reconfiguration algorithms and integrate it with a set of engine decentralized controllers. Fuzzy inference concept will be used to develop and implement the proposed adaptation and reconfiguration algorithms. Finally, the integrated reconfiguration algorithms with the control system will be tested and verified on publicly available turbine engine simulation software.

Topics: Control systems , Gas turbines , Aircraft propulsion