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Distributed engine control under communication time delays and faults

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Gas Turbine engines are widely used for aircraft propulsion and electric power generation. The current turbine engine control system consists of a digital controller known as the FADEC (Full Authority Digital Engine Controller) and has a centralized architecture. The short-comings of this architecture in not being able to meet the requirements of intelligent propulsion concepts has led to the emergence of distributed control for turbine engine systems. Future aircraft control systems would replace the current centralized architecture with a distributed architecture due to its advantages like modularity, control system weight reduction, obsolescence reduction and improvement in engine performance. In Distributed Engine Control, each sensor/actuator is replaced by a smart sensor/actuator. These smart modules include local processing capability to allow modular signal acquisition and conditioning, digital data bus communications and diagnostics and health management functionality. A serial communication network is used to connect these smart modules with FADEC. However, since a distributed control system uses a communication network in the feedback loop to transmit sensor and actuator signals between the controller and the engine components, this gives rise to communication constraints like time delays and packet dropouts. Thus, there is a clear need to design robust distributed control systems for sampled data time delay systems for turbine engine control applications..The research group, led by the author at OSU, has carried out significant research in the area of distributed control and is currently studying the effects of time delays on the stability and performance of the system under various decentralized architectures. In this conference, the authors discusses the results of this research.

Biography

Rama Yedavalli obtained his Ph.D. degree in Dynamics and Control area from Purdue University, USA and is currently a Professor in the Department of Mechanical and Aerospace Engineering at The Ohio State University in Columbus, OH. He is a Fellow IEEE, ASME and AAAS. He published over 170 papers in many conferences and journals. He was and continues to be an member of Editorial Board for many journals and conferences. He received the O.Hugo Schuck Best Paper award from the American Automiatic Control Council and the Distinguished Alumnus award from the Indian Institute of Science in India. He offered many professional services to IEEE, ASME, AIAA and AAAS.

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