

Department of Electrical and Computer Engineering

Title: « A Distributed Fault Detection Filtering Approach for Nonlinear Uncertain Systems»

Christodoulos Keliris, PhD Student
Department of Electrical and Computer Engineering, University of Cyprus

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University of Cyprus

Abstract:

This work proposes a novel filtering approach for the problem of fault diagnosis for nonlinear systems with modeling uncertainty and measurement noise. In most real world applications the presence of modeling uncertainty and measurement noise may influence significantly the performance of fault detection schemes by causing, either missed fault detections or false alarms. Therefore, this trade-off between robustness and detectability is of crucial importance and as it is shown, the proposed detection scheme offers beneficial characteristics in both directions by guaranteeing no false alarms while at the same time providing tight detection thresholds. This is achieved by embedding into the design of the residual and threshold signals a general class of filters which takes advantage of the filtering noise suppression properties. The properties of this novel approach are rigorously investigated in the case of full-state measurements providing results regarding the magnitude of the detected faults, an upper bound on the detection time and the relation of the detection time with respect to the order and pole locations of the filters used. The proposed fault detection filtering approach is further investigated in the case of a class of input-output nonlinear systems through the use of nonlinear observer design combined with filtering. In all cases, respective fault detectability conditions characterizing the class of detectable faults are obtained and simulation results illustrate the effectiveness of the proposed distributed fault detection filtering approach.

Biography:

Christodoulos Keliris received a first-class Diploma degree in Electrical and Computer Engineering from Aristotle University of Thessaloniki, Greece in 2007 where he was a recipient of a 5-year scholarship from the Greek State Scholarship Foundation. He also received the MSc in Finance from Imperial College London, UK with Distinction in 2008 where his dissertation “Pricing Barrier Options” was awarded with the “Best MSc Finance Dissertation” prize. Currently, he is working towards the Ph.D. degree in Electrical Engineering at the Department of Electrical and Computer Engineering, University of Cyprus, under the supervision of Prof. Marios Polycarpou. He is collaborating with KIOS Research Center and he is contributing towards European Commission funded projects. His research interests include fault diagnosis for nonlinear systems, nonlinear control theory and intelligent systems. He is a student member of IEEE and a member of the Technical Chamber of Cyprus (ETEK).