University of Pavia

Ph.D. School of Electrical and Electronics Engineering and Computer Science

SEMINAR

Input Design for Guaranteed Fault Diagnosis Using Zonotopes

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Dipartimento di Ingegneria Industriale e dell'Informazione

Abstract: Although there are many fault diagnosis algorithms available, there has been very little work on the design or modification of control inputs with the aim of increasing the detectability and isolability of faults. The use of such inputs has clear potential for overcoming a central difficulty in fault detection, which is to distinguish the effects of faults from those of disturbances, process uncertainties, etc. Accordingly, the use of active inputs could be a transformative technology in industry, provided that such inputs can be computed reliably and efficiently.
This presentation discusses new methods for computing active inputs that guarantee that the input-output data of a process will be sufficient to correctly identify a fault from a given library of possible faults. This problem is inherently nonconvex and has a combinatorial dependence on the number of faults considered. To address this, a new formulation is considered, along with related approximations, that is amenable to efficient solution using standard optimization packages (e.g. CPLEX). The theoretical contributions combine ideas from reachability analysis, set-based computations, and optimization theory to exploit detailed problem structure and thereby manage the problem complexity. Comparisons with an existing method show that the proposed formulation provides a dramatic reduction in the required computational effort.

Bio: Joseph K. Scott was born in 1984 in Royal Oak, MI, USA. He received his B.S. (2006) in Chemical Engineering from Wayne State University, and his M.S. (2008) and Ph.D. (2012) in Chemical Engineering from the Massachusetts Institute of Technology under the supervision of Professor Paul I. Barton. He is currently a postdoctoral research assistant in the Process Systems Engineering Laboratory at MIT under the supervision of Professor Richard D. Braatz. His interests are in fundamental research in dynamical systems, optimization, and control theory, applied to pressing problems in chemical process systems and renewable energy systems engineering.

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The seminar will take place in English

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