Model-based approach for fault diagnosis using set-membership formulation

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Résumé en anglais	This paper describes a robust model-based fault diagnosis approach that enables to enhance the sensitivity analysis of the residuals. A residual is a fault indicator generated from an analytical redundancy relation which is derived from the structural and causal properties of the signed bond graph model. The proposed approach is implemented in two stages. The first stage consists in computing the residuals using available input and measurements while the second level leads to moving horizon residuals enclosures according to an interval consistency technique. These enclosures are determined by solving a constraint satisfaction problem which requires to know the derivatives of measured outputs as well as their boundaries. A numerical differentiator is then proposed to estimate these derivatives while providing their intervals. Finally, an inclusion test is performed in order to detect a fault upon occurrence. The proposed approach is well suited to deal with different kinds of faults and its performances are demonstrated through experimental data of an omni-directional robot.
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