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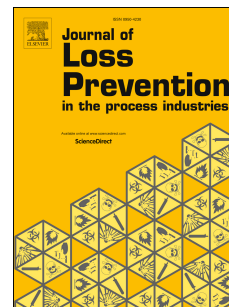
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A quantitative approach for optimal alarm identification

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Abstract

Alarm identification refers to selecting a set of measurements to be configured to the alarm system. Contrary to prior literature which uses qualitative cause-effect based techniques, the present work incorporates quantitative aspects such as the time taken by measurements for deviation, to make alarm identification more reliable.

The present work proposes a systematic approach to alarm identification through an optimization formulation, as a Mixed-Integer Linear Programming (MILP) problem, for the time. The proposed formulation maximizes the time available for operators to respond to faults while keeping the number of alarms triggered at a minimum. Subsequently, a linear multi-objective optimization formulation reduces the number of optimal solutions taking into account additional criteria, such as order of priority of potential faults.

The proposed formulation is applied to the Tennessee Eastman (TE) Challenge problem. A closed-loop simulator was used for fault propagation, to obtain quantitative information required to apply the formulation, and CPLEX solver in GAMS was used to solve this case study problem.

Keywords: Alarm identification, Mixed-Integer Linear Programming, Process safety, Alarm Management, Abnormal event management

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