A Multi-agent Architecture for Diagnosing Simultaneous Faults along Water Canals

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Editorial

For the preservation of human life, the environment, and vested economic value, the safe and reliable operation of technical systems is critical. The proper operation of these systems has a significant impact on production costs and quality. Product excellence early defect diagnosis is crucial for avoiding costly repairs. Decline of performance and human or machine harm life. The International Federation of Automatic Control (IFAC) created the Technical Committee on Automatic Control to address this issue. Fault diagnosis, reliability analysis, and fault tolerance are all part of the SAFEPROCESS. Control and maintenance planning automatic management. This Technical Committee is a major international gathering of top academic and industrial specialists interested in physical system reliability, availability, and safety. The principal applications include chemical, electrical, mechanical, and aeronautical engineering, and this field has grown into a major study area at the confluence of systems and control engineering, artificial intelligence, applied mathematics, and statistics [1].

The 8th IFAC SAFEPROCESS 2012 Symposium in Mexico City brought together researchers and practitioners from 45 countries to discuss recent developments in the field over three days, following seven successful triennial meetings sponsored by the IFAC-TC on Fault Detection, Supervision, and Safety of Technical Processes in Baden-Baden, 1991; Helsinki, 1994; Hull, 1997; Budapest, 2000; Washington, 2003; Beijing, 2006; and Barcelona, 2009. There were seven plenary and semi-plenary speakers, 68 contributed papers, 128 invited presentations, and 33 posters at this symposium. Modern technology has improved to the point where boosting the technological process's reliability, availability, and safety is now attainable. As a result, automated monitoring is required to monitor the health and operation of elements of controlled systems. This work is accomplished by a series of procedures that begin with monitoring the status of each system component: actuators, sensors, and control equipment. The strategy begins with a reliability/safety analysis, followed by the system's design and operation.

After the process is up and running, fault detection and diagnostics are required. The defect detection is based on observed signals, and symptoms and residuals are generated using pattern recognition, estimate, or artificial intelligence approaches. When it comes to fault detection and isolation, fault intensity is crucial. The current fault should be severe enough that the effect on mass balance residuals is not mistaken with sensor noise. When faults of different classes are present in the same pool or along the canal, the fault intensity becomes important due to opposing symptoms that can cancel each other out. Aside from fault intensity combinations, the system can detect and isolate the presence of lateral outflows and hardware faults (such as gate blockages or downstream water depth sensor faults) in a single pool or across

many pools. When an outflow and a hardware problem (gate obstruction or water depth sensor fault) occur at the same time in a pool, a limitation occurs. Because the algorithm can only isolate one fault class in this situation, the fault isolation will only yield a single fault of a class based on the residuals created.

The SFI algorithm, which is designed to isolate water depth sensor problems, can help to overcome this constraint. A sensor fault can be detected by comparing the data available from water depth sensors with the expected canal pool backwater. The water depth along the canal pool can be estimated using either first principle models (or data driven models. Data driven models are especially suited to deal with channels and whenever the canal pool does not have a constant cross section due to civil engineering structures such as tunnels, syphons, aqueducts and bridges [2-5].

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Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript.

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