Rule-Based Operation Design by Generic Mini Models of Incident Generation

2025, preprint

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Rule-based operation design leverages generic mini models of incident generation to systematically structure and automate responses to typical operational events or disruptions. This approach combines the strengths of reusable incident templates with formal rule systems to enhance reliability, adaptability, and clarity in system operations.

Generic Mini Models of Incident Generation are standardized, reusable templates that represent typical incidents (such as equipment failures, process deviations, or emergency events) commonly encountered in system operations. They encapsulate the core dynamics and triggers of such incidents, serving as building blocks for larger operational models.

Operational rules define how the system should respond to incidents modeled by these mini models. They can specify actions based on events, conditions, and desired outcomes, often using paradigms like event-condition-action (ECA) rules. Example on sensor validation: 1. “Sensory data may serve as risk indication”, 2. “During functional operation, the system should verify that the values of all risk indicators comply with predefined ranges associated with normal operation”, 3. “When failure is detected (event), and backup resources are available (condition), then switch to backup (action).”

Generic mini models are created for common incidents, capturing their main features and possible triggers. Operation rules are established to link incident detection to appropriate responses. These rules can be executed automatically or guide human operators in real time.

The generic models and rules are customized to fit the specific operational context, resources, and goals. This enables the synthesis of detailed, executable operating procedures tailored to the system’s needs. During operation, the rule engine monitors for incident triggers and enforces the defined rules, ensuring consistent and timely responses. The system can adapt to unanticipated scenarios by updating rules or integrating new mini models as needed

Benefits of the rule-based frameworks include systematic and consistent response, rapid adaptation, knowledge transfer, and scalability. Example applications include nuclear power plant operations, crisis and emergency management, and IT incident management.

In summary, rule-based operation design with generic mini models of incident generation enables organizations to create robust, adaptive, and transparent operational procedures, ensuring effective management of both routine and exceptional events through modular modeling and formalized rule execution.