Restructuring of workflows to minimise errors via stochastic model checking: An automated evolutionary approach - DTU Orbit (06/01/2019)

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This article presents a framework for the automated restructuring of stochastic workflows to reduce the impact of faults. The framework allows for the modelling of workflows by means of a formalised subset of the BPMN workflow language. We extend this modelling formalism to describe faults and incorporate an intention preserving stochastic semantics able to model both probabilistic- and non-deterministic behaviour.

Stochastic model checking techniques are employed to generate the state-space of a given workflow. Possible improvements obtained by restructuring are measured by employing the framework's capacity for tracking real-valued quantities associated with states and transitions of the workflow. The space of possible restructurings of a workflow are explored by means of an evolutionary algorithm, where the goals for improvement are defined in terms of optimising quantities, typically employed to model resources, associated with a workflow.

The approach is fully automated and only the modelling of the production workflows, potential faults and the expression of the goals require manual input. We present the design of a software tool implementing this framework and explore the practical utility of this approach through an industrial case study in which the risk of production failures and their impact are reduced by restructuring the workflow.

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