

What's Next?

Operational Support for Business Process Execution

In the last decade flexibility has become an increasingly important in the area of business process management. Information systems that support the execution of the process are required to work in a dynamic environment that imposes changing demands on the execution of the process. In academia and industry a variety of paradigms and implementations has been developed to support flexibility. While on the one hand these approaches address the industry demands in flexibility, on the other hand, they result in confronting the user with many choices between different alternatives. As a consequence, methods to support users in selecting the best alternative during execution have become essential.

In this thesis we introduce a formal framework for providing support to users based on historical evidence available in the execution log of the process. This thesis focuses on support by means of (1) *recommendations* that provide the user an ordered list of execution alternatives based on estimated utilities and (2) *predictions* that provide the user general statistics for each execution alternative. Typically, estimations are not an average over all observations, but they are based on observations for “similar” situations. The main question is what similarity means in the context of business process execution.

We introduce *abstractions* on execution traces to capture similarity between execution traces in the log. A trace abstraction considers some trace characteristics rather than the exact trace. Traces that have identical abstraction values are said to be similar. The challenge is to determine those abstractions (characteristics) that are good predictors for the parameter to be estimated in the recommendation or prediction. We analyse the *dependency* between values of an abstraction and the mean of the parameter to be estimated by means of regression analysis. With regression we obtain a set of abstractions that explain the parameter to be estimated.

Dependencies do not only play a role in providing predictions and recommendations to instances at run-time, but they are also essential for simulating the effect of changes in the environment on the processes, both locally and globally. We use stochastic simulation models to simulate the effect of changes in the environment, in particular changed probability distribution caused by recommendations. The novelty of these models is that they include dependencies between abstractions and simulation parameters, which are estimated from log data. We demonstrate that these models give better approximations of reality than traditional models.

A framework for offering operational support has been implemented in the context of the process mining framework ProM. We demonstrate the applicability of our results by means of a declarative process running in the Declare workflow management system, connected to ProM's Operational Support Service. The execution in Declare is supported by means of recommendations and predictions.