Automatic Generation of Optimized Business Process Models from Constraint-Based Specifications

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Business process (BP) models are usually defined manually by business analysts through imperative languages considering activity properties, constraints imposed on the relations between the activities as well as different performance objectives. Furthermore, allocating resources is an additional challenge since scheduling may significantly impact BP performance. Therefore, the manual specification of BP models can be very complex and time-consuming, potentially leading to non-optimized models or even errors. To overcome these problems, this work proposes the automatic generation of imperative optimized BP models from declarative specifications. The static part of these declarative specifications (i.e. control-flow and resource constraints) is expected to be useful on a long-term basis. This static part is complemented with information that is less stable and which is potentially unknown until starting the BP execution, i.e. estimates related to (1) number of process instances which are being executed within a particular timeframe, (2) activity durations, and (3) resource availabilities. Unlike conventional proposals, an imperative BP model optimizing a set of instances is created and deployed on a short-term basis. To provide for run-time flexibility the proposed approach additionally allows decisions to be deferred to run-time by using complex late-planning activities, and the imperative BP model to be dynamically adapted during run-time using replanning. To validate the proposed approach, different performance measures for a set of test models of varying complexity are analyzed. The results indicate that, despite the NP-hard complexity of the problems, a satisfactory number of suitable solutions can be produced.

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