Exception Prediction in Workflow Management

by

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Abstract

EXCEPTION PREDICTION IN WORKFLOW MANAGEMENT

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Master of Science in E-Commerce Technology

Departmental workflows within a digital business ecosystem are often executed concurrently and required to share limited number of resources. However, unexpected events from the business environment and delay in activities can cause temporal exceptions in these workflows. In these circumstances, one of the crucial tasks for a workflow administrator is to detect any potential exceptions as early as possible so that corrective measures can be taken. However such detections can be extremely complex since a workflow process may consist of various control flow pattern and each pattern has its own way of influencing temporal properties of a task. In this thesis, we address the problem of workflow exceptions and propose solutions to predict them in advance before they really occur in order to reduce cost for handling them.

In general, an organization may need to execute different workflows simultaneously for different segments of the business. In addition, these concurrent workflows can be interdependent and loops may also exist in these workflows.

We propose two approaches for predicting exceptions in workflow. In the first approach, we calculate the temporal and resource constraints for each task within the workflow specification and use them to predict potential deadline violations. In the second approach, we use a critical path-based algorithm that resolves all the resource conflicts in the workflows for predicting exceptions. In this thesis we describe both approaches in detail and elaborate them with examples. We will also analyze their performance in terms of computing complexity and rate of successful prediction.

The proposed approaches are validated in several experiments against workflow instances of different nature. In these experiments, we generate workflow instances based on different configurations and apply our prediction algorithms. We measure the rate of occurrence of exceptions and the rate of successful prediction on different workflow instances.

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LIST OF ABBREVIATIONS

AET. Actual End Time

ECT. Earliest Completion Time

EST. Earliest Start Time

ET. Execution Trace

HD. Hard Deadline

LET. Latest End Time

WfMS. Workflow Management System

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