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Extracting Useful Knowledge from Event Logs: A Frequent Itemset Mining Approach

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abstract Business process analysis is a key activity that aims at increasing the efficiency of business operations. In recent years, several data mining based methods have been designed for discovering interesting patterns in event logs. A popular type of methods consists of applying frequent itemset mining to extract patterns indicating how resources and activities are frequently used. Although these methods are useful, they have two important limitations. First, these methods are designed to be applied to original event logs. Because these methods do not consider other perspectives on the data that could be obtained by applying data transformations, many patterns are missed that may represent important information for businesses. Second, these methods can generate a large number of patterns since they only consider the minimum support as constraint to select patterns. But analyzing a large number of patterns is time-consuming for users, and many irrelevant patterns may be found. To address these issues, this paper presents an improved event log analysis approach named AllMining. It includes a novel pre-processing method to construct multiple types of transaction databases from a same original event log using transformations. This allows to extract many new useful types of patterns from event logs with frequent itemset mining techniques. To address the second issue, a pruning strategy is further developed based on a novel concept of pattern coverage, to present a small set of patterns that covers many events to decision makers. Results of experiments on real-life event logs show that the proposed approach is promising compared to existing frequent itemset mining approaches and state-of-the-art process model algorithms.

1. Introduction

Business processes are structured sets of activities performed using resources in an organization to achieve specific business goals. They are a key component of modern organizations and their management often determines the success of organizations in the long and in the short term. Business processes in modern organizations are supported by different types of information systems, which can collect information about their execution for monitoring and improvement purposes [18]. In other words, digitally supported business processes enable evidence-based business process manage-

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