Chapter 5
A Similarity Measure for Process Mining in Service Oriented Architecture

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ABSTRACT
Business processes continue to play an important role in today’s service-oriented enterprise computing systems. Mining, discovering, and integrating process-oriented services has attracted growing attention in the recent years. This chapter presents a quantitative approach to modeling and capturing the similarity and dissimilarity between different process designs. The authors derive the similarity measures by analyzing the process dependency graphs of the participating workflow processes. They first convert each process dependency graph into a normalized process matrix. Then they calculate the metric space distance between the normalized matrices. This distance measure can be used as a quantitative and qualitative tool in process mining, process merging, and process clustering, and ultimately it can reduce or minimize the costs involved in design, analysis, and evolution of workflow systems.

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INTRODUCTION

With the increasing interest and wide deployment of web services, we see a growing demand for Service-Oriented Architectures (SOA) and technologies that support enterprise transformation. Effective enterprise transformation refers to strategic business agility in terms of how efficiently an enterprise can respond to its competitors and how timely an enterprise can anticipate new opportunities that may arise in the future. In the increasingly globalized economy, enterprises face complex challenges that can require rapid and possibly continual transformations. As a result, more and more enterprises are focused on the strategic management of fundamental changes with respect to markets, products, and services (Rouse, 2005). Such transformation typically has a direct impact on the business processes of an enterprise. Enterprise transformation may range from traditional business process improvement to wholesale changes to the processes supported by the enterprise – from performing current work in a new fashion to performing different work altogether. Each of these challenges may lead to a different degree of enterprise transformation.

Fundamental to enabling the transformation of an enterprise is the development of novel tools and techniques for transforming the business processes of an enterprise. In this paper, we present a critical component to the problem of process transformation from a web services point-of-view. In particular, we present a novel process difference analysis method using distance measures between process definitions of two transactional web services. The process difference analysis focuses on process activity dependencies and process structure to identify distance measures between processes.

The proposed difference analysis method achieves three distinct goals. First, by analyzing the attributes of process models, we present a quantitative process similarity metric to determine the relative distance between process models. This facilitates not only the comparison of existing process models with each other, but also provides the flexibility to adapt to changes in existing business processes. Second, the proposed method is quick and flexible, which reduces the cost of both the analysis and design phases of web service processes. Third, the proposed method enables the flexible deployment of process mining, discovery, and integration – all key features that are necessary for effective transformation of an enterprise.

SOA and Business Process Mining

Business environments are getting more complex and more dynamic, and information technology including networking is developing rapidly to support them. SOA plays a key role to associate them and thus accelerates deploying web services. Change of business environments requires many companies to transform all their business functions into serviceable elements, and the major functions are possessed in a format of business processes. Therefore, Business Process Management (BPM) and SOA are becoming two sides of the same coin, and the success of IT system is dependent on whether it can derive synergy of BPM and SOA or not. The relationships between BPM and SOA can be viewed from both sides, which are described below.

- **Business process as serviceable assets:** SOA helps BPM proliferate, helping it to be implemented through its loosely coupled and agile enabling infrastructure. Thus processes modeled by BPM tools can be rapidly implemented as services by SOA.
- **Orchestration and choreography of business services:** In multi-organizational environments such as supply chain and logistics, services should be organized and flowed over partners, which has to be supported by process management functions.