

Lecture Notes
in Business Information Processing

181

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Volume Editors

Chun Ouyang
Queensland University of Technology
Brisbane, QLD, Australia
E-mail: c.ouyang@qut.edu.au

Jae-Yoon Jung
Kyung Hee University
Yongin, Republic of Korea
E-mail: jyjung@khu.ac.kr

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Preface

This volume collects the proceedings of the second Asia-Pacific Conference on Business Process Management (AP-BPM 2014) held in Brisbane, Australia, during July 3-4, 2014. The conference aims to provide a high-quality forum for researchers and practitioners to exchange research findings and ideas on BPM technologies and practices that are highly relevant (but are not limited) to the Asia-Pacific region. Another key objective of the conference is to set up a bridge between actual industrial requirements and leading-edge research outcomes on the growth of economic rising powers of the Asia-Pacific region.

As the second edition in this conference series, AP-BPM 2014 attracted an increasing number of submissions: 33 (qualified) submissions, comparable to the inaugural AP-BPM conference held in Beijing, China, last August. These submissions reported on up-to-date research findings of scholars from 12 countries (China, Korea, Australia, Indonesia, Malaysia, Japan, India, The Netherlands, Italy, Portugal, Germany, and USA). After each submission was reviewed by at least three Program Committee members, nine full papers were accepted for publication in this volume of conference proceedings (i.e., 27.3% acceptance rate). These nine papers cover various topics that can be categorized under four main research focuses in BPM, including process mining (three papers), process modeling and repositories (two papers), process model comparison (two papers), and process analysis (two papers).

In addition, another 11 submissions were accepted as short papers. They are not published in this volume but seven of them were finally included in the conference's scientific program, as the topics and research findings of these papers were considered interesting for discussion at the conference.

This year the conference also featured with two invited keynote presentations. On the first day, Hyerim Bae, Professor at in the Industrial Engineering Department at Pusan National University, Korea, talked about a number of activities that can be carried out, using the process models discovered from the event logs, to deliver valuable inputs for industry. An extended abstract of this keynote is included in the proceedings. On the second day, Michael Rosemann, Professor and Head of the Information Systems School at Queensland University of Technology, Australia, contributed with inspiring insights into proposals of three future research and development directions for BPM academics and professionals. A full paper of this keynote is included at the beginning of the proceedings.

We would like to thank the Program Committee members and the external reviewers for their thorough reviews and discussions of the submitted papers. We express our gratitude to other conference committees as well, especially to the general chair, Arthur ter Hofstede, and the Steering Committee for their valuable guidance, to the organization chair, Moe Wynn, and other staff at Queensland

University of Technology for their attentive preparations for this conference, and to the publicity chairs, Artem Polyvyanyy, Minseok Song, and Zhiqiang Yan, for their efforts in publishing conference updates and promoting the conference in the region. Last but not least, we are thankful to the authors of the submissions, the keynote speakers, the presenters, and all the other conference participants, because the conference could not be held without their contributions and interest.

July 2014

Chun Ouyang
Jae-Yoon Jung

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AP-BPM 2014 is organized in Brisbane, Australia, by the Queensland University of Technology.

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Keynotes

What We Can Do with Process Models after We Discover Them from Event Logs

Hyerim Bae

Industrial Engineering Dept., Pusan National University, Busan, Korea
hrbae@pusan.ac.kr

Extended Abstract

Process mining is a process management technique that allows us to analyze business processes based on event logs [1]. Since process mining was first introduced, its main use has been the discovery, from event logs, of correct high-fitness process models [2]. As the results of early process discovery trials, many process mining algorithms, such as α -Algorithm, Fuzzy mining, Heuristic mining, and genetic algorithm, have been developed: these help us to find good process models that reflect event logs precisely.

However, in real business environments, people show more interest in the practical use of process models discovered from event logs. For example: they want to find higher levels of knowledge, diagnose their system, or find the causes of problems in their company and solve them. In this keynote address, which is based on the experience of actual process mining projects in Korea, I will talk about what we can do with process models after discovering them from event logs.

To illustrate our methods, we use two sets of event logs: one generated while containers are handled in a container port [4, 5], and the other generated while ships are assembled in a ship yard [3]. After we discover process models from these two sets of huge logs, there are three things that we can do with them.

1) Model-based real-time monitoring of process instances

Many companies think of their processes as important assets. And yet, they are unsure if process instances exactly follow the defined model. Even if we assume that a process model discovered from event logs reflects a real process well enough, there are always requirements for real-time monitoring of process instances.

Fig. 1 is a screen capture of a monitoring system that shows the current block-movement status in a ship yard. For managers, the system indicates each block's status by showing, in the discovered process model, the location of its current activity. The system also indicates the path, or work flow, of each block.

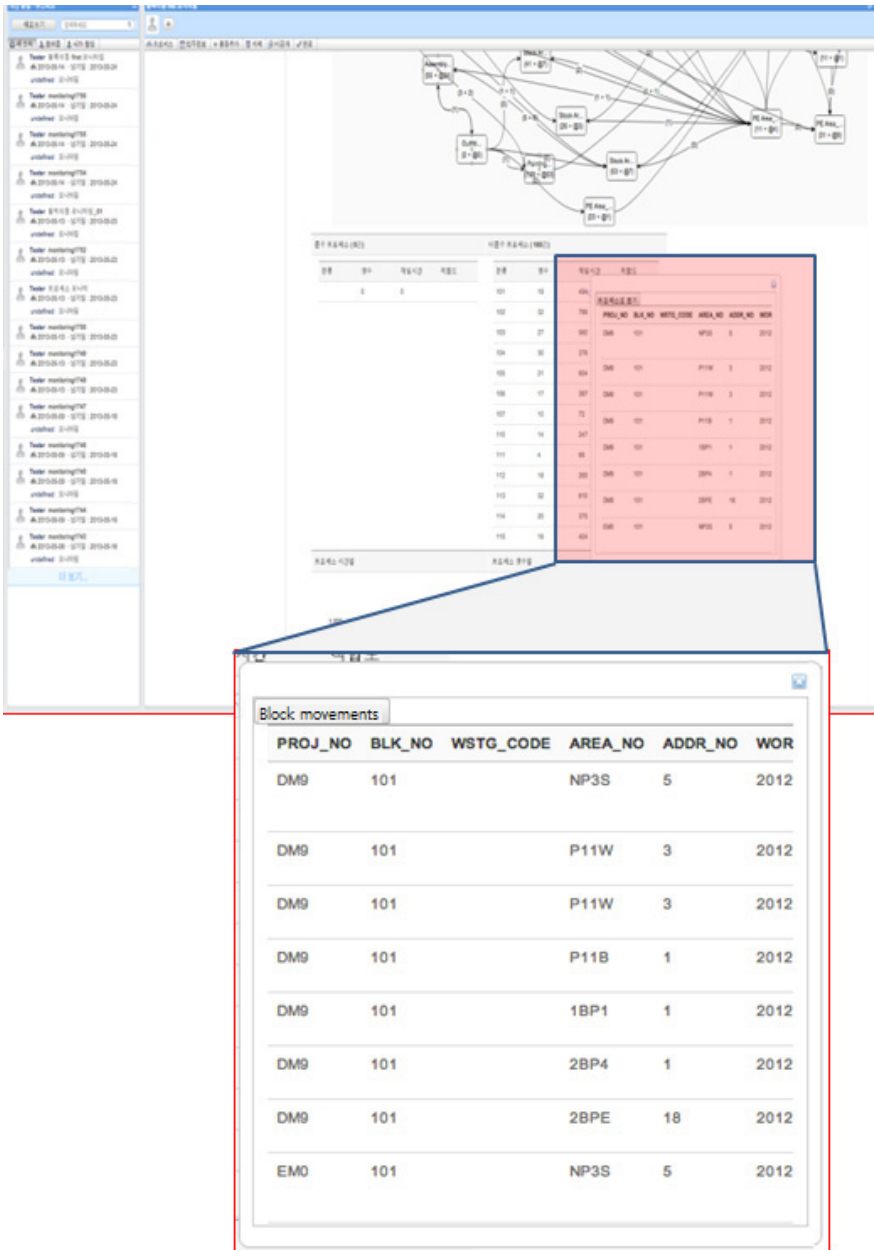


Fig. 1. Block-movement monitoring

2) Problem solving based on a process model

We can find and solve problems using a discovered process model. A central function of problem finding and solving is to detect work flows that do not exist in the process model. In fact, sometimes we can find a work flow that managers

were not aware of. In that case, we can notify managers of it. For the purposes of problem solving, we can also carry out time-gap analysis. The time gaps between two arbitrarily chosen nodes can be listed in descending order. This way, we can see that the instance with the longest time gap has a problem. Also, as an advanced functionality of problem solving, multi-dimensional analysis can be introduced.

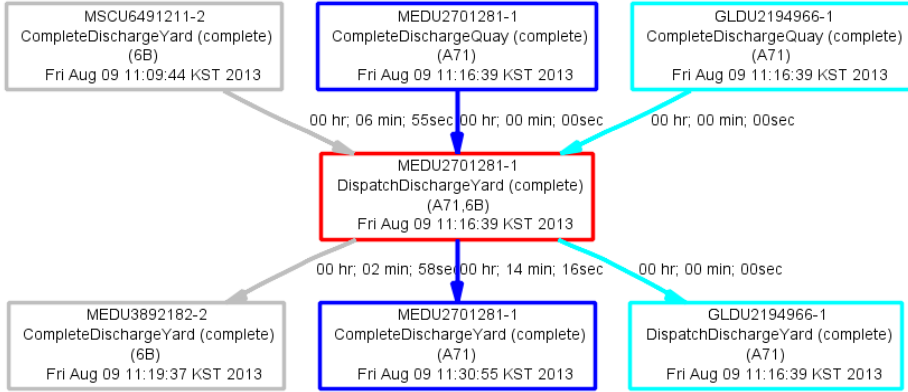


Fig. 2. Multi-dimensional process analysis for problem solving

Fig. 2 shows a multi-dimensional process view of container-handling events. After a user isolates a suspected problematic event with the red box, the system shows the previous and next events. The gray boxes show the event flow of the 6B block in the container yard—they indicate both where the red event has been dealt with, and where it will be dealt with. The blue boxes show the previous and next work events of the container. The sky-blue boxes show the work flow of the crane that handled the container. On each arc between two events, the time gap between two completed activities is represented. The number of previous and next events can be increased by user request. Using this multi-dimensional process view, we can infer what attribute causes the delay of an event.

3) Prediction of process result based on process model

A process model can be used to predict the result of process execution. In this keynote address, a prediction method that uses a Bayesian Network will be presented. A process model discovered from an event log can be understood as representing the dependency relations among activity nodes. That is, if two activities are connected by an arc, the execution of the previous activity influences the result of the next activity. In this regard, we can generate a Bayesian Network from an event log, and, using the network, we can predict the result of process execution with conditional probability.

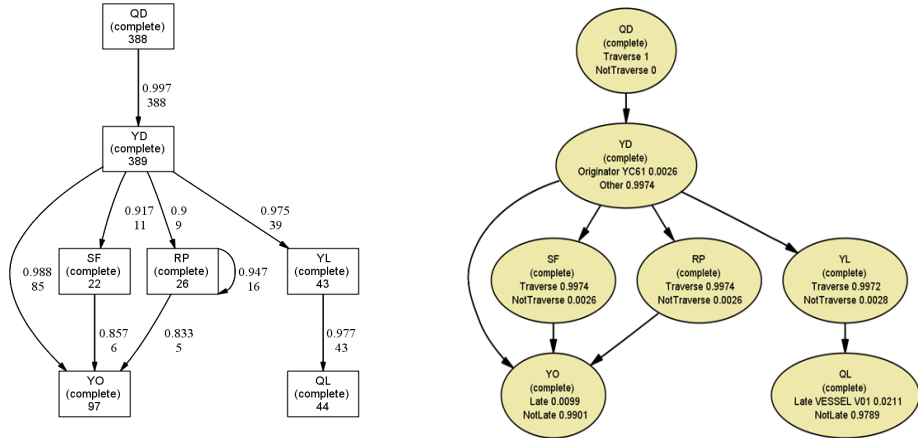


Fig. 3. Process model and Bayesian Network generated from event log

References

1. van der Aalst, W.M.P.: Process Mining: Discovery, Conformance and Enhancement of Business Processes. Springer, Berlin (2011)
2. van der Aalst, W.M.P., Weijters, A., Maruster, L.: Workflow Mining: Discovering Process Models from Event Logs. IEEE Transactions on Knowledge and Data Engineering 16(9), 1128–1142
3. Park, J., Lee, D., Bae, H.: Event-log-data-based method for efficiency evaluation of block assembly processes in shipbuilding industry. ICIC Express Letters: Part B: Applications 5(1), 157–162 (2014)
4. Sutrisnowati, R.A., Bae, H., Park, J., Ha, B.-H.: Learning Bayesian network from event logs using mutual information test. In: The 2nd International Workshop on Knowledge-Intensive Business Process, KiBP 2013 (2013)
5. Sutrisnowati, R.A., Bae, H., Park, J., Pulshashi, I.R.: Knowledge discovery of port logistics process using partial directed acyclic graph composition. In: The 17th International Conference on Industrial Engineering: Theory, Application and Practice, IJIE 2013 (2013)

Proposals for Future BPM Research Directions

Michael Rosemann

Queensland University of Technology
Information Systems School
2 George Street, Brisbane Qld 4000, Australia
m.rosemann@qut.edu.au

Abstract. Business Process Management has substantially matured over the last two decades. The techniques, methods and systems available to scope, model, analyze, implement, execute, monitor and even mine a process have been scientifically researched and can be in most cases deployed in practice. In fact, many of these BPM capabilities are nowadays a commodity. However, an opportunity-rich environment and rapidly emerging digital disruptions require new BPM capabilities. In light of this context, this paper proposes three future research and development directions for BPM academics and professionals. First, Ambidextrous BPM demands the shift of focus from exploitative to explorative BPM. Second, Value-driven BPM postulates a stronger focus on the desired outcomes as opposed to the available BPM methods. Third, Customer Process Management suggests complementing the dominating internal view of BPM with a stronger, design-inspired view on the process experiences of external stakeholders.

Keywords: Ambidextrous BPM, value-driven BPM, customer process management, design-led process innovation, configurable BPM.

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