

# Conference Booklet

7<sup>th</sup> IFAC Conference on Management and  
Control of Production and Logistics  
Bremen, Germany, February 22 - 24, 2016

[www.mcpl2016.logdynamics.de](http://www.mcpl2016.logdynamics.de)

Organized by  
Bremen Research Cluster for Dynamics in Logistics (*LogDynamics*)





## Preface

Dear Participant,

continuing in the footsteps of the six previous IFAC Conferences on Management and Control of Production and Logistics, MCPL is the seventh event in this series to be held in Bremen (Germany) from February 22<sup>nd</sup> to February 24<sup>th</sup> 2016, in conjunction with the 5<sup>th</sup> International Conferences on Dynamics in Logistics - LDIC 2016. The conference is accompanied by the industrial Internet of Things (IoT) Workshop as well as by the 1<sup>st</sup> Log-Dynamics Summer School (LOGISS) 2016 as satellite events. The IFAC MCPL 2016 is the 7<sup>th</sup> conference in a very successful series of events, previously held in Fortaleza (Brazil), Campinas (Brazil), Grenoble (France), Santiago (Chile), Sibiu (Romania) and Coimbra (Portugal). This seventh edition will be organized by the Bremen Research Cluster for Dynamics in Logistics (*LogDynamics*) of the University of Bremen and the BIBA Bremer Institut für Produktion und Logistik, one of the most important research centers for Production and Logistic Systems in Europe.

The MCPL 2016 conference is concerned with dynamic aspects of logistic processes and networks. The spectrum of topics reaches from modeling, planning and control of processes over supply chain management and maritime logistics to innovative technologies and robotic applications for cyber-physical production and logistic systems. The growing dynamic confronts the area of logistics with completely new challenges: it must become possible to describe, identify and analyze the process changes. Moreover, logistic processes and networks must be redesigned to be rapidly and flexibly adaptable to continuously changing conditions.

The conference, sponsored by IFAC, aims to bring together researchers and practitioners from different areas of production and logistics with a special focus on the engineering side of management and control of such systems. The central idea is to establish a common ground in order to promote a synergy among different disciplines for exploring new solutions for complex scientific and technical challenges.

The conference program consists of four invited keynote speeches and 20 papers selected by a strong reviewing process. The conference is organized in accordance to the main areas Modeling, Planning and Scheduling, Advanced Process Control, City and Freight Logistics, Intelligent Manufacturing Systems, and (Green) Supply Chain Management.

The invited talks are presented as plenary sessions. Other presentations are organized in 6 sessions. Participants are invited to freely choose between the sessions. Additionally, you are welcome to join:

- any of the 14 sessions of the 5<sup>th</sup> International Conference on Dynamics in Logistics – LDIC 2016 from Tuesday, 23<sup>rd</sup> February to Thursday, 25<sup>th</sup> February 2016,
- the special session highlighting recent project results in the *LogDynamics* Lab on Thursday, 25<sup>th</sup> February 2016, or
- the Internet of Things (IoT) Workshop, which takes place on Wednesday, 24<sup>th</sup> February 2016. Due to limited capacity of the tutorial rooms, we kindly ask you to register with the organizers of the satellite event.

The abstracts of the MCPL program can be found in this brochure. Moreover, all final versions of papers presented at MCPL 2016 are electronically available on USB flash drives. Similar to the previous conferences, proceedings of the conference will be published by IFAC-PapersOnLine.

At the end of this booklet, you can find some maps displaying the university area with the conference sites, the locations of the conference rooms and the destination of the conference dinner. We wish you a pleasant stay in Bremen and enjoy the conference.

Bremen, February 2016

Jürgen Pannek  
Florin Gheorghe Filip

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## Program MCPL 2016

Monday, February 22 <sup>nd</sup> , 2016		
12:00	<b>Registration MCPL Day 1</b>	
12:30	<b>Lunch</b> (Uni Bremen – Mensa)	
14:00	<b>Welcome, Introduction and Keynote Day 1</b> (BIBA Auditorium) Chair: Jürgen Pannek	
14:45	Rolf Drechsler, Head of Cyber-Physical Systems Research Group, German Research Centre for Artificial Intelligence (DFKI) & Head of Computer Architecture Research Group, Bremen University: Safe Cyber-Physical Systems in Production and Logistics	
15:30	<b>Coffee Break</b> (BIBA Hall)	
16:00	<b>D1S1T1: MCPL Day 1, Slot 1, Track 1</b> (BIBA Auditorium) Chair: Wajih Ezzeddine Co-Chair: Ulises Martinez-Araiza  <b>Probabilistic and Statistical Modeling</b>  Wajih Ezzeddine, Jérémie Schutz, Nidhal Rezg: Test for Additive Interaction in Proportional Hazard Model Applied to Pitot Sensors Reliability and Survivability  Ulises Martinez-Araiza, Ernesto Lopez-Mellado: CTL Model Repair for Inter-Organizational Business Processes Modelled as oWFN  Shiva Darabi, Jafar Heydari: An Interval-Valued Hesitant Fuzzy Ranking Method Based on Group Decision Analysis for Green Supplier selection	<b>D1S1T2: MCPL Day 1, Slot 1, Track 2</b> (BIBA Conference Room) Chair: Bernd Nieberding Co-Chair: Yipeng Zhang  <b>Urban Freight Distribution and City Logistics</b>  Andy Apfelstädt, Sergey Dashkovskiy, Bernd Nieberding: Modeling, Optimization and Solving Strategies for Matching Problems in Cooperative Full Truckload Networks  Jörn Schönberger: Multi-Period Vehicle Routing with Limited Period Load  Yipeng Zhang: Correlated Storage Assignment Strategy to Reduce Travel Distance in Order Picking
17:30	<b>Get Together</b> (BIBA Hall)	

Tuesday, February 23 <sup>rd</sup> , 2016	
8:30	<b>Registration MCPL Day 2</b>
9:00	<b>Welcome LDIC &amp; Keynote Day 2</b> (BIBA Auditorium) Chair: Herbert Kotzab
9:05	Klaus-Dieter Thoben, Head of Research Group Applied Information and Communication Technology for Production (IKAP), BIBA, and Spokesman LogDynamics
9:45	Sven Hermann, PTS Logistics GmbH, Head of Solutions, Marketing and IT Strategy: Digital Business Transformation of SME Logistics Service Providers
10:30	<b>Coffee Break</b> (BIBA Hall)
11:00	<b>D2S1: MCPL Day 2, Slot 1</b> (BIBA Conference Room) Chair: Neil Jami Co-Chair: Breno Barros Telles do Carmo  <b>Planning, Scheduling and Decision Support</b>  Breno Barros Telles do Carmo, Manuele Margni, Pierre Baptiste: Social Impacts Profile of Suppliers: A S-LCA Approach  Christina Reuter, Felix Brambring, Melanie Luckert, Philipp Hünnekes: Approach for the Prediction of Production Segmentation Potential  Neil Jami, Michael Schroeder, Karl-Heinz Kuefer: A Model and Polynomial Algorithm for Purchasing and Repositioning Containers
12:30	<b>Lunch</b> (Uni Bremen – Mensa)
14:00	<b>D2S2: MCPL Day 2, Slot 2</b> (BIBA Conference Room) Chair: Christian Mascle Co-Chair: Alena Puchkova  <b>Advanced Process Control and Wireless Automation</b>  Othmane Dayi, Arash Afsharzadeh, Christian Mascle: A Lean Based Process Planning for Aircraft Disassembly  Karl Worthmann, Philipp Braun, Michael Proch, Jörg Schlüchtermann, Jürgen Pannek: On Contractual Periods in Supplier Development  Alena Puchkova, Julien Le Romancer, Duncan Campbell McFarlane: Balancing Push and Pull Strategies within the Production System
15:30	<b>Coffee Break</b> (BIBA Hall)
18:30	<b>Conference Dinner</b> (Bremer Ratskeller, Am Markt 11, 28195 Bremen)

Wednesday, February 24 <sup>th</sup> , 2016		
8:30	<b>Registration MCPL Day 3</b>	
9:00	<b>Introduction and Keynote Day 3</b> (BIBA Auditorium) Chair: Michael Freitag	
9:05	Gisela Lanza, Karlsruhe Institute of Technology, Head of Institute for Production Systems: Towards Robust Production Networks – Reconfiguration Strategies in Global Production Networks	
9:45	Bernhard Eberl, PTC ThingWorx, Team Lead Academic Program: The Internet of Things and its Role in Education	
10:30	<b>Coffee Break</b> (BIBA Hall)	
11:00	<b>D3S1T1: MCPL Day 3, Slot 1, Track 1</b> (BIBA Conference Room) Chair: Tobias Buer Co-Chair: Elham Behmanesh  <b>Supply Chain &amp; Green Supply Chain Management 1</b>  Andreas Barz, Tobias Buer, Hans-Dietrich Haasis: A Study on the Effects of Additive Manufacturing on the Structure of Supply Networks  Elham Behmanesh, Jürgen Pannek: Modeling and Random Path-based Direct Encoding for a Closed Loop Supply Chain Model with Flexible Delivery Paths  Tatiana M. Pinho, João Paulo Coelho, António Paulo Moreira, José Boaventura Cunha: Modelling a Biomass Supply Chain Through Discrete-Event Simulation	<b>D3S1T2: MCPL Day 3, Slot 1, Track 2</b> (IPS-Lab) Chair: Marco Lewandowski  <b>IoT Workshop, Session 1</b> <b>Industrial Internet of Things – Enabler for smart connected business</b>
12:30	<b>Lunch</b> (Uni Bremen – Mensa)	
14:00	<b>D3S2T1: MCPL Day 3, Slot 2, Track 1</b> (BIBA Conference Room) Chair: Tatiana M. Pinho Co-Chair: Matthias Parlings  <b>Life Cycle &amp; Green Supply Chain Management 2</b>  Tatiana M. Pinho, João Paulo Coelho, José Boaventura Cunha: Forest-Based Supply Chain Modelling using the simPy Simulation Framework  Matthias Parlings, Katja Klingebiel, Patrick Oschmann: An Integrated Innovation Life Cycle Model for Supply Chain Adaption  Jonathan Ullwer, Juliana Kucht Campos, Frank Straube: Waste and Pollution Management Practices by German Companies  <b>Closing</b>	<b>D3S2T2: MCPL Day 3, Slot 2, Track 2</b> (IPS-Lab) Chair: Marco Lewandowski  <b>IoT Workshop, Session 2</b> <b>PTC ThingWorx Tutorial</b>



Wednesday, February 24 <sup>th</sup> , 2016			
15:30	<b>Bremen City Tour with Bus</b>	15:30	<b>Coffee Break</b> (BIBA Hall)
		16:00	<b>D3S3T1: MCPL Day 3, Slot 3, Track 1</b> (IPS-Lab) Chair: Marco Lewandowski  <b>IoT Workshop, Session 3</b> <b>Hands-On Experiments</b>
17:30	<b>Get Together</b> (BIBA Hall)		

## Book of Abstracts

**Monday, February 22<sup>nd</sup>, 2016**

### **D1K: Welcome, Introduction & Keynote Day 1**

Chair: Jürgen Pannek

#### **Safe Cyber-Physical Systems in Production and Logistics**

Rolf Drechsler, Head of Cyber-Physical Systems Research Group, German Research Centre for Artificial Intelligence (DFKI) & Head of Computer Architecture Research Group, Bremen University

Cyber-Physical Systems (CPS) merge the virtual world and the real, physical world. They are embedded into their environment, adapting to it and controlling it. They operate autonomously, or cooperate with human users. Their application areas are very diverse: they can be found operating in cars, trains, or airplanes, or they can control the production facilities of a smart factory. CPS have been made possible by advances in system architecture allowing us to manufacture very powerful yet compact systems capable of running sophisticated algorithms.

However, the complexity of these system strains the currently existing design flows in system development. This is a particular problem in safety-critical application areas, where erroneous systems may lead to loss of life. The talk will give an overview on the application of CPS, the challenges encountered when developing these systems and a novel design flow capable to keep up with the increasing complexity.

### **D1S1T1: MCPL Day 1, Slot 1, Track 1: Probabilistic and Statistical Modeling**

Chair: Wajih Ezzeddine

Co.Chair: Ulises Martinez-Araiza

#### **Test for Additive Interaction in Proportional Hazard Model Applied to Pitot Sensors Reliability and Survivability**

Wajih Ezzeddine, Jérémie Schutz, Nidhal Rezg

Cox proportional hazards model is one of the most common methods used in analysis of time to event data. Estimation of proportional hazards models when covariates are time independent increase the power of significance of the model. Techniques to release this assumption of proportionality allow researchers to test whether the effects of covariates change over time and also permit a more nuanced understanding of the phenomenon being studied. The current paper presents an extension for the Cox model in case of non-proportional risk. This new model will be applied in the Pitot Sensor's reliability function to study the covariates interaction with time. A simulation study is used to illustrate the model and to show its new performances. This paper focuses in the determination of the Pitot sensor reliability and survivability Function. However, the same process can be generalized to study the reliability function of other standby systems.

#### **CTL Model Repair for Inter-Organizational Business Processes Modelled as oWFN**

Ulises Martinez-Araiza, Ernesto Lopez-Mellado

Computation tree logic (CTL) model repair is an approach that extends the model checking technique to obtain new admissible models that can represent the correct design of business processes. Open workflow nets (oWFN) have shown to be adequate to model inter-organizational business processes; this formalism allows performing formal analysis such as model checking. In this work, we adapt a CTL model repair method for bounded and deadlock free Petri nets, to enable it to work with oWFN. The method is illustrated through an example of a placing purchase order process updated by adding a new supplier.

## An Interval-Valued Hesitant Fuzzy Ranking Method Based on Group Decision Analysis for Green Supplier Selection

Shiva Darabi, Jafar Heydari

Selecting the most suitable green supplier is one of the main issues for companies. In this paper, an interval-valued hesitant fuzzy ranking method is proposed to rank the candidates green suppliers under conflicted criteria. Hence, the weight of each expert is obtained by extended entropy method based on interval-valued hesitant fuzzy set (IVHFS) approach. In addition, the criteria weights are determined based on preference judgments of experts and the effect of experts' weights. Considering the IVHFS which allows to experts determine some interval-values membership degrees for each green supplier under a set and also applying the criteria and experts weights could lead to a precise approach. Finally, an illustrative example about the green supplier selection is provided to show the validity and applicability of the proposed method.

## D1S1T2: MCPL Day 1, Slot 1, Track 2: Urban Freight Distribution and City Logistics

Chair: Bernd Nieberding

Co-Chair: Yipeng Zhang

### Modeling, Optimization and Solving Strategies for Matching Problems in Cooperative Full Truckload Networks

Andy Apfelstädt, Sergey Dashkovskiy, Bernd Nieberding

A formal description of processes in cooperative full-truckload networks is developed. Based on this a matching concept between transport routes is introduced to prevent empty runs. As an application of this framework an optimization problem is formulated to find matchings, which guarantee a maximal number of matched transports. A solution of this optimization problem and strategies and algorithms for data reduction and augmentation are presented as well.

### Multi-Period Vehicle Routing with Limited Period Load

Jörn Schönberger

We investigate a vehicle routing problem, in which the total workload associated with a given request portfolio must be distributed over a sequence of periods. The realization of economies of scale by compiling routes serving a high number of requests is compromised by an upper bound of the payload quantity that is allowed to be served in one period. We propose a mixed-integer linear problem for the representation of this complicated decision task. Within computational experiments, we analyze the impacts of differently mixed request portfolios with respect to the minimization of the total sum of travel distances over all periods and other performance indicators.

### Correlated Storage Assignment Strategy to reduce Travel Distance in Order Picking

Yipeng Zhang

Diverse solutions of a correlated storage assignment strategy (CSAS) are developed in this paper to reduce the travel distance in the picker-to-parts order picking system in a single-block warehouse. The correlation among stock keeping units (SKUs) is considered for the storage location assignment. Because the correlation can be used in both the item clustering and the improvement of the results of other storage assignment strategies, a methodology, which includes a pre-process and two branching processes, is firstly proposed to develop algorithms of the CSAS. For the clustering-based CSAS, the sum-seed and the static-seed clustering algorithms are presented to find the itemsets, and four algorithms of sequencing itemsets and single SKUs are developed. For the improvement-based CSAS, the insertion algorithm searches the solution iteratively. In the experiment, the average travel distance per picking is used to measure the improvement of the CSAS. Compared with the full-turnover storage, the CSAS reduces maximal 2.08% of the average travel distance per picking.

**Tuesday, February 23<sup>rd</sup>, 2016**

## **D2K: Welcome LDIC & Keynote Day 2**

Chair: Herbert Kotzab

Klaus-Dieter Thoben, Head of Research Group Applied Information and Communication Technology for Production (IKAP), BIBA, and Spokesman LogDynamics

### **Digital Business Transformation of SME Logistics Service Providers**

Sven Hermann, PTS Logistics GmbH, Head of Solutions, Marketing and IT Strategy

Current and new technologies, innovations and business models are pushing Logistics Service Providers (LSP) into a digital future. A future often called digitize or die. SMEs have the potential to adjust and innovate at a pace for quicker than large global companies but the disadvantage of limited resources and partly lacks in strategic and organizational competencies. Given the increasing speed of the digital transformation these disadvantages are critical barriers for competitiveness and future of SME LSPs. Especially for these companies it will be necessary to define a digital vision and strategy based on an evaluation of the current digital competencies of the organization. This evaluation has to include possible digital impacts of the existing business model. There is a necessity of more extensive and new forms of advanced training. And particularly for the development of digital innovations SMEs have to collaborate more with universities, partners and temporarily competitors. Not temporary is the digital transformation. It is more a perpetual disruption challenge for the whole organization. SMEs should enter the digital vortex the sooner the better or may hit by it sooner as they thought.

## **D2S1: MCPL Day 2, Slot 1: Planning, Scheduling and Decision Support**

Chair: Neil Jami

Co-Chair: Breno Barros Telles do Carmo

### **Social Impacts Profile of Suppliers: A S-LCA Approach**

Breno Barros Telles do Carmo, Manuele Margni, Pierre Baptiste

There is a large scientific literature that addresses the Supplier Selection Problem (SSP). However, the majority of the papers are focused in the economic dimension and do not consider the other dimensions of the sustainability, the environmental and the social ones. Evaluate the environmental and the social dimensions is hard to be done and it is necessary to use the appropriate tools to realize it. The Life Cycle Assessment (LCA) can be applied for this purpose. This paper aims to present a model to generate the social suppliers' profiles in order to support the decision-making process. This model allows the identification of the issues that must be addressed to improve the benefits of the biodiesel use in social dimension. The environmental dimension was not included in this paper. This model was created to analyze the biofuels' suppliers of a transportation society in Canada.

### **Approach for the Prediction of Production Segmentation Potential**

Christina Reuter, Felix Brambring, Melanie Luckert, Philipp Hünnekes

Effects of production planning and scheduling measures on the logistical capabilities of a company are limited by the production structure. The segmentation of production can help to improve logistical capabilities but is costly to implement. This paper researches opportunities to foresee the magnitude of possible improvements in logistical variables through segmentation by means of structural parameters as predictors. An approach is described to quantify segmentation potentials of numerous data sets and correlates those to potential predictors. Eight data sets are simulated concerning logistical capabilities in different structures to validate the approach.

## A Model and Polynomial Algorithm for Purchasing and Repositioning Containers

Neil Jami, Michael Schroeder, Karl-Heinz Kuefer

We study the management of containers in a logistic chain between a supplier and a manufacturer in a ramp-up scenario with deterministic non-decreasing demand. We consider a periodic review system with  $T$  periods of  $R$  time steps. The supplier sends full container at every step and orders containers back every period. To face demand increase, the manufacturer can purchase containers at a setup cost while the supplier can buy single-use disposables. We assume positive delivery times. We formulate our problem as a fixed-plus-linear cost flow and solve it under a realistic assumption in  $O(R^2 \cdot T^4 \cdot \log [R \cdot T]^2)$  time by adapting the Wagner-Within algorithm.

## D2S2: MCPL Day 2, Slot 2: Advanced Process Control and Wireless Automation

Chair: Christian Mascle

Co-Chair: Alena Puchkova

## A Lean Based Process Planning for Aircraft Disassembly

Othmane Dayi, Arash Afsharzadeh, Christian Mascle

Each year, 300 aircraft are taken out of service, and because of the development of the aerospace industry, this number is constantly increasing (approximately 12,000 airplanes which are currently in service for different purposes will be removed from service in the next 20 years). Otherwise, the increased demands for recycling, reusing and remanufacturing or refurbishing attract the interest of researchers to improve the aircraft end of life treatment.

This article presents a process planning with Lean paradigm perspective to improve the recovery of parts and the maintenance of aircraft on which the parts are reused showing the approach for the optimal disassembling and dismantling based solely on the Aircraft Maintenance Manual (AMM).

## On Contractual Periods in Supplier Development

Karl Worthmann, Philipp Braun, Michael Proch, Jörg Schlächtermann, Jürgen Pannek

We consider supplier development within a supply chain consisting of a single manufacturer and a single supplier. Because supplier development usually requires relationship-specific investments, firms need to safeguard against the hazards of partner opportunism. Generally, contracts are viewed as the primary formal means of safeguarding transactions. However, long-term contracts also entail certain risks, e.g. a lack of flexibility, particular in a dynamic and uncertain business environment. We propose a receding horizon control scheme to mitigate possible contractual hazards while significantly increasing the overall supply chain profit. Our findings are illustrated by a numerical example.

## Balancing Push and Pull Strategies within the Production System

Alena Puchkova, Julien Le Romancer, Duncan Campbell McFarlane

This paper presents an approach for achieving a trade-off between pull and push production control principles. A mathematical model of the operation of a production system is suggested, which incorporates different options for inventory control strategies. The model covers several types of disruptions: resource breakdown, product quality loss and demand fluctuation. The optimal solution minimizes the total cost objective function and can be push, one of the classic pull control systems (kanbans, conwip, basestock) or any possible combination/ superimposition of them. The approach is illustrated in an example, for which optimal pull/ push combination is found and its evolution is shown under several scenarios with disruptions.

**Wednesday, February 24<sup>th</sup>, 2016**

**D2K: Introduction and Keynote Day 3**

Chair: Michael Freitag

**Towards Robust Production Networks – Reconfiguration Strategies in Global Production Networks**

Gisela Lanza, Karlsruhe Institute of Technology, Head of Institute for Production Systems

Modern globalization puts companies into a discontinuous business environment. Particularly, global production networks are subject to volatile external factors. Still, producing companies attempt to increase their efficiency by streamlining production and logistics, which increases the effect of changing factors on the network. Hence, unplanned changes of external factors have a significant influence on the performance of the production network. The robustness of production systems becomes ever more crucial in this environment. It provides the optimal compromise between stability and efficiency. The concept of robustness is theoretically introduced and illustrated through an industrial case study. For this purpose a four step methodology for the identification of reconfiguration strategies in global production networks is presented. This examples shows how robustness facilitates the competitiveness and sustainability of global acting companies in today's discontinuous business environment.

**The Internet of Things and its Role in Education**

Bernhard Eberl, PTC ThingWorx, Team Lead Academic Program

This presentation will discuss how the Internet of Things and smart connected products is transforming the business world and organizational structures. Using real world examples, this presentation will also describe how the Internet of Things is changing how products are designed and built. As companies increasingly build smart connect products and change their operations, they need to hire students with an IoT education. Academic institutions are critical to preparing job candidates and to a successful transition to the smart connected world. Many disciplines including computer science, electrical, mechanical engineering, systems engineering as well as business will be impacted and will need to adjust. PTC is addressing these challenges, has tools that can help and examples of success.

## **D3S1T1: MCPL Day 3, Slot 1, Track 1: Supply Chain & Green Supply Chain Management 1**

Chair: Tobias Buer

Co-Chair: Elham Behmanesh

### **A Study on the Effects of Additive Manufacturing on the Structure of Supply Networks**

Andreas Barz, Tobias Buer, Hans-Dietrich Haasis

With the ongoing development of additive manufacturing (AM) the technology has the potential to increase the efficiency of production processes or to replace classical subtractive production technologies. This will impact the structure of supply networks. In order to quantify this impact, this paper studies to what extent AM may influence a two stage supply network consisting of source nodes, production nodes and customer nodes. Three stylized instances of this model, which differ in the distribution of these nodes as well as the improvement of the resource efficiency through AM have been created. To study the impact of AM on the structure of supply networks, a computational study has been performed. Four indicators are used, i.e. the total costs, tonne-kilometres per customer on the second stage (production site to customer site), number of open production sites, and the proportion of transport costs on the first and the second stage are compared. All indicators improve by using AM and the production sites move closer to the customers.

### **Modeling and Random Path-Based Direct Encoding for a Closed Loop Supply Chain Model with Flexible Delivery Paths**

Elham Behmanesh, Jürgen Pannek

Due to business and environmental issues, industrial players are under a pressure to take back the product after its use. Moreover, the significance of transportation cost and customer satisfaction spurs an interest to develop a flexible network design model. This paper proposes an integrated logistics network model with three kinds of delivering paths. Minimizing the total costs reveals a mixed integer linear program. As a solution methodology for the proposed NP hard problem, memetic algorithm is considered with a neighborhood search mechanism and a novelty in chromosome representation as one of the major issues can affect the performance of memetic algorithm.

### **Modelling a Biomass Supply Chain through Discrete-Event Simulation**

Tatiana M. Pinho, João Paulo Coelho, António Paulo Moreira, José Boaventura Cunha

The organizational structure of the companies in the biomass energy sector, regarding the supply chain management services, can be greatly improved through the use of software decision support tools. These tools should be able to provide real-time alternative scenarios when deviations from the initial production plans are observed. To make this possible it is necessary to have representative production chain process models where several scenarios and solutions can be evaluated accurately. Due to its nature, this type of process is more adequately represented by means of event-based models. In particular, this work presents the modelling of a typical biomass production chain using the computing platform SIMEVENTS. Throughout the article details about the conceptual model, as well as simulation results, are provided.



## **D3S2T1: MCPL Day 3, Slot 2, Track 1: Life Cycle & Green Supply Chain Management 2**

Chair: Tatiana M. Pinho

Co-Chair: Matthias Parlings

### **Forest-Based Supply Chain Modelling using the simPy Simulation Framework**

Tatiana M. Pinho, João Paulo Coelho, José Boaventura Cunha

Proper management of supply chains is fundamental in the overall system performance of forestbased activities. Usually, efficient management techniques rely on a decision support software, which needs to be able to generate fast and effective outputs from the set of possibilities. In order to do this, it is necessary to provide accurate models representative of the dynamic interactions of systems. Due to forest-based supply chains' nature, event-based models are more suited to describe their behaviours. This work proposes the modelling and simulation of a forestbased supply chain, in particular the biomass supply chain, through the SimPy framework. This Python based tool allows the modelling of discrete-event systems using operations such as events, processes and resources. The developed model was used to access the impact of changes in the daily working plan in three situations. First, as a control case, the deterministic behaviour was simulated. As a second approach, a machine delay was introduced and its implications in the plan accomplishment were analysed. Finally, to better address real operating conditions, stochastic behaviours of processing and driving times were simulated. The obtained results validate the SimPy simulation environment as a framework for modelling supply chains in general and for the biomass problem in particular.

### **An Integrated Innovation Life Cycle Model for Supply Chain Adaption**

Matthias Parlings, Katja Klingebiel, Patrick Oschmann

Supply chains of innovative products are subject to significant change requests during the first phases of the product life cycle. To support the proactive realignment of the supply chain strategy and structure, the early detection of transitions from one life cycle phase to another is crucial. On this account, this paper provides the necessary mathematical foundations based on the life cycle model by Parlings and Klingebiel (2012). The underlying functions and their parameters are derived and analysed to obtain the characteristics that can be used for quantitatively defining phase transitions and early warning areas in an innovation's life cycle.

### **Waste and Pollution Management Practices by German Companies**

Jonathan Ullwer, Juliana Kucht Campos, Frank Straube

This paper focuses on waste and pollution management practices within a group of German companies from various industries. A content analysis was conducted using an integrated framework for managing sustainable supply chain practices as a background. To evaluate companies' initiatives publicly available documents were used. The findings were organized into three topics: reuse and recycle, waste disposal and pollution control and practices implemented (or not) by each of the researched companies presented in details. The results shows that sustainability practices are more related to companies' culture, values and strategies rather than to industry specific characteristics.



## Notes









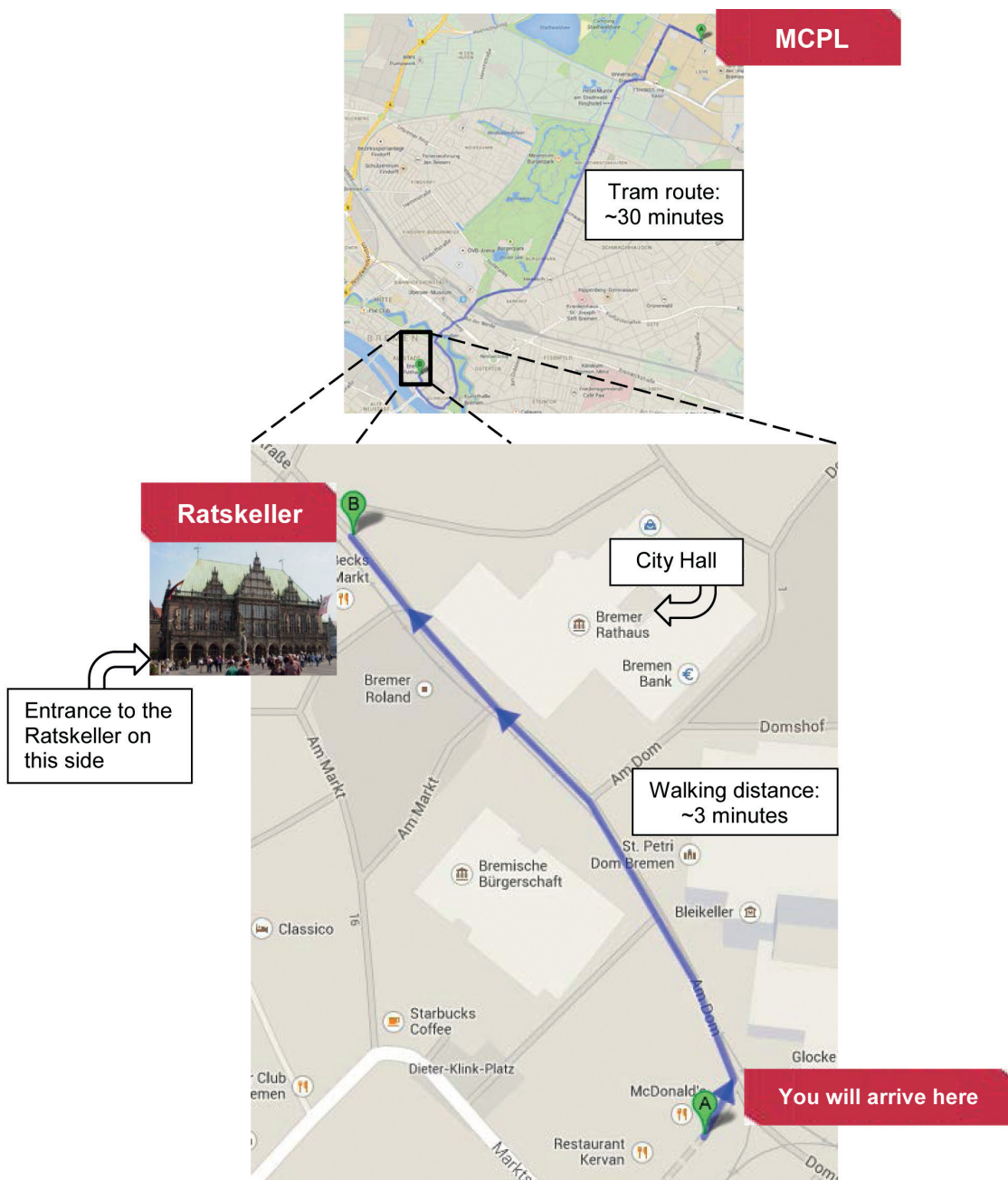
## Conference Dinner

This map shows how to get to the Bremer Ratskeller, where the conference dinner takes place.

### How to get to the Bremer Ratskeller

1. Take the tram (line no. 6, direction „Flughafen/Airport“) at the “Klagenfurter Straße” (tram stop next to the BIBA building). The transfer takes approx. 30 minutes.
2. Get off at the stop “Domsheide / City Center”.
3. Turn left at McDonalds and follow the tracks until you reach the Bremer Ratskeller (see picture below).

Address: Am Markt 11, 28195 Bremen





## Conference Rooms

All sessions of MCPL 2016 take place in BIBA on the first floor (Auditorium and Conference Room 1020 - 1040).

