

A cordial invitation to the opening talk of the
Brown Bag Seminar
Recent Developments in Data Science:

The order and rack sequencing problem in robotic mobile fulfillment systems

by
Prof. Dr. Erwin Pesch

Date: 13.10.2023 (Friday) at 10:15

Location: R 301 WIWI

Link and further
information: Course 39740 Seminar: Doctoral Seminar "Recent
Developments in Data Science" in Stud.IP

Abstract:

In robotic mobile fulfillment systems, which are warehousing technologies that follow the parts-to-picker concept, the order picking process involves two inter-connected decisions. First, there is the decision of how to schedule the processing of orders. Second, there is the decision of how to sequence the racks that are lifted and transported by automated guided vehicles (robots) to the picking station in order to supply the requested items (referred to as rack-visits). Existing literature demonstrates that minimizing the number of rack-visits is highly effective for operating a picking station efficiently. This approach reduces robot utilization and the overall time required for processing customer orders (makespan). In this study, we propose a heuristic solution approach for solving the order-scheduling and rack-sequencing problem at a single picking station.

Our approach utilizes column generation to partition the set of orders into batches. The goal is to minimize the number of rack assignments to these batches, which in turn minimizes the rack-visits. The generated batches possess a specific property that allows for the straightforward derivation of an order-processing schedule and rack sequence.

To further improve the solution, we refine the heuristic approach by rearranging the processing of batches and their assigned racks. We conducted a comprehensive and comparative computational study to evaluate the performance of our approach.

Speaker:



Erwin Pesch is a full professor at the Faculty of Economics and Business Administration of the University in Siegen and director of the Center for Advanced Studies in Management (CASiM) at the HHL Leipzig Graduate School of Management. He is area editor of INFORMS Journal on Computing, Omega, Annals of OR and Journal of Heuristic and associate editor of 9 other scientific journals and was responsible for the organization of EURO 2009 conference in Bonn that attracted 2500 delegates. He received In 1985 the Federal Award for Distinct Young Scientists of the German federal state Hessen. In 2008 the Minister Scientific Award of the Polish Minister for Research and Education. In 2012 the Copernicus Award of the German National Science Foundation (Deutsche

Forschungsgemeinschaft – DFG) and in 2017 the Science Award (Wissenschaftspreis) of the German Operations Research Society (GOR) (the highest distinction of the society) since 2019 Member of the Board of Curators of the Polish Academy of Sciences since 2020 Extraordinary Professor, Faculty of Industrial Engineering, University of Stellenbosch, South Africa.