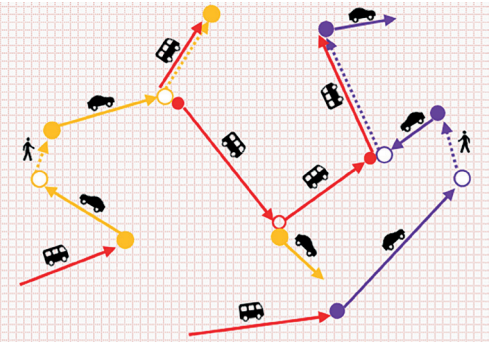
Isabella 2.0

Automobile logistics in sea and inland ports: Integrated and user-oriented control of device and load movements through artificial intelligence and a virtual training application



Left: Control logic for moving vehicles on an automobile compound, Figure: BIBA | Above: Bird's eye view of an automobile compound, Photo: © Kalyakan/adobe stock.com

Motivation

The results from the research project Isabella generate first improvements of the initial situation and show further starting points for additional improvement. Our motivation is to take up these points and further improve the logistic performance of the control algorithm and to optimize it according to the specific situations. Moreover, an extension of the applicability of the control algorithm to the transhipment processes at different transport modes offers great potential to further improve the overall performance. In addition, it must not be ignored that the introduction of the solution approaches will be accompanied by radical changes in the work situations for the employees. Therefore, we are furthermore motivated to integrate the employees into the development of the new solutions such that overall we gain better acceptance of the final solution.

Objective

The aim is to optimize the parameterization of the control algorithm and to extend the approach regarding multi-criteria optimization so that the optimization performance can be further improved taking into account the prevailing situation such as terminal filling level, vehicle mix, personnel availability, etc. A further goal is the systematic extension of the control algorithm to the processes for loading and unloading the modes of transport (ship, train and truck) and the creation of a virtual training application. It will take up the psychological aspects regarding work and organization that result from the process redesigns, facilitate the changeover for the employees and finally ensure the acceptance of the new solution.

Approach

By means of event-discrete simulation, we will investigate the performance of the control algorithm under different environmental conditions and parameter settings. To this end we will use methods of sensitivity analysis and artificial intelligence and aim to draw conclusions between performance, terminal situation and parameter settings. As a result, it will be possible to adjust the control algorithm to the respective terminal situation and to increase the predictability of the operative processes. In addition, new data analysis methods and artificial intelligence approaches will be applied to systematically derive relevant process parameters from operationally acquired data, such as the duration of individual process steps or track utilisation. For the extension of the applicability of the control system to the modes of transport (train, ship, truck), a concept for data reception in ships and railway wagons will be designed. To this end, we will consider ad-hoc and mesh networks in combination with suitable radio standards such as WLAN, Bluetooth or LoRa.

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PROJECT PARTNERS:

BLG LOGISTICS

2:APPS SOFTWARE

ISABELLA 2.0

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BIBA is an engineering research institute located at the University of Bremen. It is committed to basic research as well as to application-oriented development projects and engages itself in practice-oriented implementations, whereby it relies on cross-national, -institutional and interdisciplinary cooperation and transfer. BIBA always considers the entire value-added chain: from the idea, concept and production, through to the use and the end recycling of a product.

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