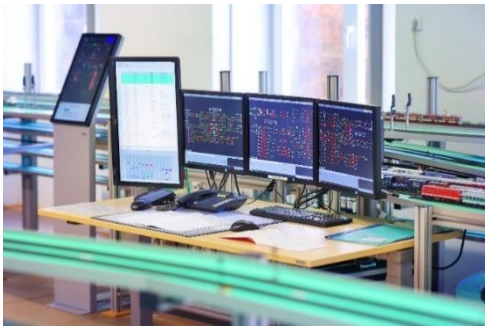
TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Verkehrswissenschaften „Friedrich List"
Institut für Bahnsysteme und Öffentlichen Verkehr, Professur für Betrieb Von Bahnsystemen



Thesis project: Developing advanced human-computer Interfaces for rail dispatchers

Problem description

Rail dispatchers are at the heart of railway operations, responsible for managing train movements, ensuring safety, and maintaining efficiency across complex rail networks. Traditionally, their work has been predominantly manual, relying on experience, situational awareness, and paper-based or radio communication systems (Chen et al., 2021). However, with the increasing complexity of rail systems and the growing demand for operational efficiency, decision support tools, such as automatic rescheduling models, are being introduced to assist dispatchers. These tools leverage advanced algorithms and real-time data to optimize train scheduling and routing, reducing delays and conflicts.

Despite their potential, integrating decision support tools into the dispatching workflow presents significant challenges. One of the primary concerns is how dispatchers will interact with these tools. The design of the interface is critical, as it must facilitate seamless human-computer interaction (HCI) while supporting quick and accurate decision-making. Questions arise regarding the type and frequency of information to be provided, the balance between presenting a single solution versus multiple alternatives, and how to ensure the interface reduces cognitive load rather than overwhelming the dispatcher.

This research aims to address these challenges by exploring how decision support tools could be effectively integrated into rail dispatching workflows. It will focus on designing intuitive interfaces that present relevant information, support decision-making, and improve the overall efficiency and reliability of rail operations.

.**Assignment**

- Conduct a literature review on current practices in rail dispatching and decision support tools.
- Investigate human-computer interaction principles in complex decision-making environments.
- Explore existing interfaces for rail dispatching systems and automatic rescheduling models, and study best practices for information presentation in decision support systems.
- Identify common challenges and difficult decisions faced by rail dispatchers.
- Develop a conceptual interface for a rail dispatching decision support tool.
- Write a comprehensive report detailing research findings and design recommendations.

Background

The student should have a strong background in have a solid understanding of railway operations. Having experience and/or willingness to learn dispatching operations and the challenges faced by dispatchers is an advantage. Effective communication skills are necessary for presenting findings clearly in reports and presentations, and experience or willingness to engage with railway professionals through interviews. The research topic can be suitable as MSc/diploma thesis project.

Reference

Chen, Z., Guo, Z., Feng, G., Shi, L., & Zhang, J. (2021, July). A qualitative study on the workload of high-speed railway dispatchers. In International Conference on Human-Computer Interaction (pp. 251-260). Cham: Springer International Publishing.

Dietsch S., Huth M., Meier H., Naumann A., Schöne E. J., (2015, April). Evaluation einer Dispositionsoberfläche im Dresdner Eisenbahnlabor. In SIGNAL + DRAHT.

Thomas-Friedrich B., Nesterenko W, Grippenkoven J. (2019, September). Expertenstudie zur Untersuchung innovativer Bedienoberflächen für Stellwerke, In ETR.

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