

## **Ulysses Research Group's thematic focus**

**Research Problem: Intelligent Cognitive Manufacturing**

**Research Topic: Logistics Chain Optimization**

**Vision holder – TUKE IH:** Prof. Gabriel Fedorko, Prof. Ivo Petráš

**The main area of research:** From the point of view of current logistics, logistics chain management is an integrated tool that connects plans, collection, and evaluation of data from actual logistics processes into a complex unit. Currently, the logistics chain process is confronted with challenges that have a massive potential for its development to increase efficiency and reliability and change traditional management models regarding digital transformation. The logistics chain must, therefore, be able to implement new digital technologies that will develop and support its digital transformation process. Process management related to logistics chain management at all corporate levels requires a proactive approach to ensuring logistics transparency and reliability.

**Existence of Excellent Digital Center (EDC):** Excellent Digital Center (EDC) focused on the field of smart and automated logistics. It has software tools to support the optimization and simulation of logistics chains. It enables visualization with the support of virtual and augmented reality. The software equipment enables a detailed analysis of a wide range of logistics processes.

### **Specific research problems & objectives:**

- traceability and reliability of logistics chain management
- new models of control and organisation of logistics chain management
- automatised logistical systems for the realisation of processes within the logistics chain
- monitoring of logistics chain operations for the need of digital transformation
- control of logistics chain processes with the use of software and hardware tools
- optimisation of processes within logistics chain management
- implementation of a simulation approach based on dynamic simulation with the support of the tools of virtual and augmented reality
- development of exponential technologies in the context of projection, control, and operation of the logistics chain
- And many more 😊

### **Expertise requested:**

- Experience in the field of the logistics chain, using digital twin, simulation and optimization approaches.
- Experience with using additional programming and designing logistics systems with internal transport.
- Overview of exponential technologies and automated logistics associated with AGV AMR systems.
- Control of processes in the field of production, storage, and distributive logistics with the specialisation of discrete and continuous production
- Interest in building a European transactional data living lab.

In the case of interest, we would like to arrange some meetings with more detailed presentations and discussions on creating domain-specific research groups and managing cooperation and high-impact R&I results.

5 most relevant publications of the TUKE team with regard to the Ulysses activity:

[1] M. Ďuriška, H. Neradilová, G. Fedorko, V. Molnár, N. Mikušová, Use of Non-Fungible Tokens

for Proof of Ownership and Originality of Simulation Model in Logistics, Simul. Model. Pract. Theory (2024) 102949. <https://doi.org/https://doi.org/10.1016/j.simpat.2024.102949>.

[2] A. Mares, D. Sabadka, V. Molnar, G. Fedorko, Improving competitiveness of an assembly line by simulation based productivity increase - A case study, J. Compet. 15 (2023) 43–59. <https://doi.org/10.7441/joc.2023.03.03>.

[3] J. Tkac, J. Hajnys, O. Mizera, V. Molnar, G. Fedorko, L. Cepova, Additive technologies use to create structures for technical fabric replacement, J. Ind. Text. 54 (2024) 15280837241245120. <https://doi.org/10.1177/15280837241245121>.

[4] G. Fedorko, V. Molnár, N. Mikušová, J. Strohmandl, T. Kižik, Simulation of Handling Operations in Marine Container Terminals for the Purposes of a Profession Simulator, J. Mar. Sci. Eng. 11 (2023). <https://doi.org/10.3390/jmse11122264>.

[5] L. Hrabovsky, T. Mlcak, V. Molnar, G. Fedorko, P. Michalik, Experimental measurement of a pulling force and determination of a friction coefficient during driven transport rollers' movement, Measurement 217 (2023) 113092. <https://doi.org/https://doi.org/10.1016/j.measurement.2023.113092>.

5 most relevant projects of the TUKE team with regard to the Ulysseus activity:

- [1] Research the possibility of digital transformation of continuous transport systems
- [2] Research of continuous transport systems for the purpose of increasing the productivity and efficiency of automated logistics processes in accordance with the Industry 4.0 concept
- [3] Design of digital twin for research of the selected operating indicators of pipe conveyors in accordance with cleaner production using experimental measurements and simulation approaches.
- [4] New possibilities and approaches of logistics processes optimization in the field of transport and transport systems

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