
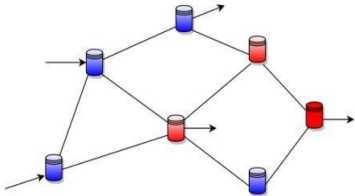
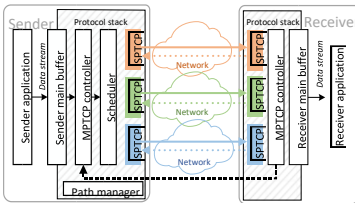




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<p>name of the unit:</p> <p style="text-align: center;"><b>DIVISION OF NETWORK SYSTEMS</b> Institute of Information Technology, Lodz University of Technology</p>		<p>symbol:</p> <p style="text-align: center;"><b>I-72</b> <a href="http://it.p.lodz.pl/">http://it.p.lodz.pl/</a></p>
<p>head of the unit:</p> <p style="text-align: center;">Dr hab. inż. Przemysław Ignaciuk</p>	<p>potential promoters:</p> <p style="text-align: center;">Dr hab. inż. Przemysław Ignaciuk Dr hab. inż. Michał Morawski</p>	<p>contact person:</p> <p style="text-align: center;">Przemysław Ignaciuk tel.: 42-631-27-96 <a href="mailto:przemyslaw.ignaciuk@p.lodz.pl">przemyslaw.ignaciuk@p.lodz.pl</a></p>
<p>scope of activities:</p> <p>The research activities concentrate on the current challenges of Information Technology and Optimization:</p> <ul style="list-style-type: none"> <li>• Models and algorithms in networked systems – design and optimization</li> <li>• Diagnosis and control of industrial processes and time-delay systems</li> <li>• Analysis and countermeasures of disturbances in distributed architectures</li> <li>• Quality of Service in data transmission and logistic networks</li> <li>• Sustainable development of resource management systems</li> </ul>		<p>graphic material:</p> 
<p>present activities:</p> <p>In recent years, one may observe significant progress achieved in the development of applications combining data transmission networks, distributed and automatic control systems, e.g., intelligent transport, or Internet of Things. The undertaken research work encompasses the analysis of existing networked systems and design of new protocols and algorithmic schemes. The objective is to ensure an adequate performance level despite inopportune phenomena obstructing the physical system implementation, e.g., delay, disturbances, or data loss in network transmission.</p> <p>Both formal – incorporating advanced tools of control and optimization theories – and practical – involving real devices and data transfer networks – activities are undertaken to meet the current challenges in the field. The scope of conducted research encompasses design and deployment of digital control and diagnostic solutions with the emphasis placed on achieving high operational efficiency while retaining robustness to delay, data loss, and equipment faults.</p>		 
<p>Future activities:</p> <p>Analysis of complex, multi-channel systems of resource and information exchange, e.g., communication networks governed MPTCP and QUIC protocols, and multi-mode transport systems.</p>		



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[Publications/patents, awards, projects:](#) Publications:

- P. Ignaciuk, M. Morawski: Discrete-time sliding-mode controllers for MPTCP networks. **IEEE Transactions on Systems, Man, and Cybernetics: Systems**, Vol. 51, 2021
- M. Morawski, P. Ignaciuk: Choosing a proper control strategy for multipath transmission in Industry 4.0 applications. **IEEE Transactions on Industrial Informatics**, Vol. 18, 2022
- P. Ignaciuk: Linear-quadratic optimal control of multi-modal distribution systems with imperfect channels. **International Journal of Production Research**, Vol. 60, 2022

Grants:

- **Robust control solutions for multi-channel networked flows**, NCN, currently realized research project in the OPUS program, Lodz University of Technology, 2022–2024
- **Application of artificial intelligence for optimization of truck transportation solutions**, NCBiR, currently realized research project in the framework of Smart Growth Operational Program in cooperation with Inelo company, Lodz University of Technology, 2020–2023

[Keywords:](#)

Data transmission networks · Production and logistic systems · Networked control systems · Time-delay systems · Communication protocols · Modelling · Optimization

[List of internship proposal in this research team:](#)

Modelling of modern dynamical systems with distributed architectures, design of resource management algorithms, simulation and experimental verification.