Master Thesis

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ICEBE
IMAGINEERING NATURE

Modelling and simulation tools comparison - on safety by design

Imagine using virtual experiments through simulation and modelling tools. Every day, a multitude of reliable tools is harnessed to strategise processes on both small and large scales—micro to macro, from individual processes to entire supply chains, and even the intricate material and energy flows spanning nations and global regions. But here's the catch: Safety, risks, and uncertainties tend to take a backseat during the planning phase, where their consideration could profoundly shape the overall design. It's a puzzle waiting to be solved!

Thesis goal: Comparative profiles for jointly selected representative simulation tools for a qualitative discussion of opportunities and barriers to integrating safety by design.

Methods: Desktop research and literature analysis. The analysis can either encompass tools from diverse categories or concentrate on a single, carefully selected tool, including a real-world case study.

Thesis impact: This work facilitates the cross-pollination of methodologies between various research fields on numerical experimentation.

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Availability: Fall semester 2023-2024

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Modelling and simulation tools comparison - on network characteristics

Imagine using virtual experiments through simulation and modelling tools. Every day, a multitude of reliable tools is harnessed to strategise processes on both small and large scales—micro to macro, from individual processes to entire supply chains, and even the intricate material and energy flows spanning nations and global regions. While many of these systems can be described as networks, characteristics used in planning tools rarely go beyond edges, and nodes neglecting potentially relevant issues related to topology, connectivity, and centrality.

Thesis goal: Comparative profiles for jointly selected representative simulation tools for a qualitative discussion of opportunities and barriers to integrating metrics from network and graph theory.

Methods: Desktop research and literature analysis. The analysis can either encompass tools from diverse categories or concentrate on a single, carefully selected tool, including a real-world case study.

Thesis impact: This work facilitates the cross-pollination of methodologies between various research fields, especially on process and system integration, industrial symbiosis, sector- and multi-sector coupling.

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Bridging Disciplines: Understanding Climate Change Through Disciplinary Jargon Awareness

Climate change's impact on our future is a puzzle that many scientific fields are trying to solve. But it's like the story of blind men and an elephant—each discipline sees just a piece. To truly understand this complex issue, we require open and humble interdisciplinary exchange. The challenge? Our main tool for exchange—language—is dynamic and highly subjective and each field cultivates its own jargon.

Thesis goal: A multidisciplinary catalogue including a glossary, concept hierarchies, relationship mappings, and cardinality metrics of predefined key terminologies. The focus is on the key terms ‘risk’, ‘uncertainty’, ‘resilience’ and ‘flexibility’, alongside their myriad synonyms.

Methods: Use web-scraping tools, including new AI tech if you like, to collect information from the web. Build a database of scientific literature and analyse language patterns in texts via corpus and discourse analysis.

Thesis impact: The catalogue has the potential to boost interdisciplinary jargon awareness and facilitate literature research and exchange in follow-up projects.

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