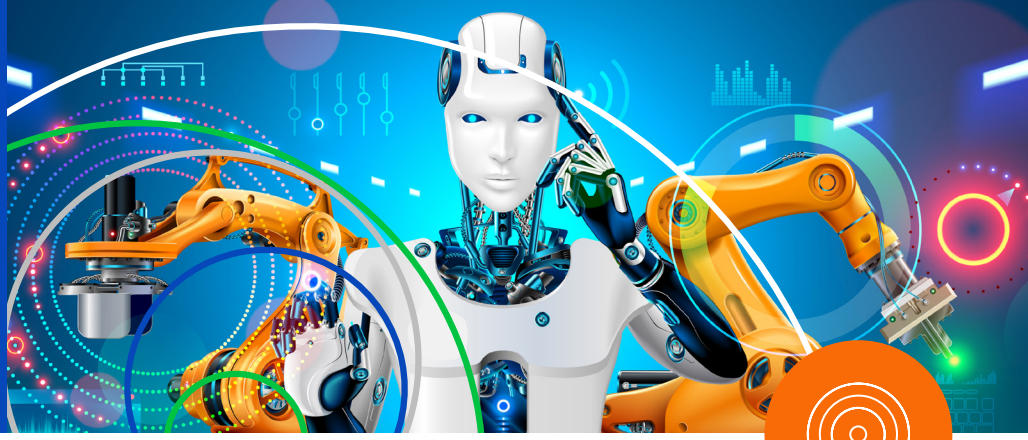
ITEA 4

Project Profile



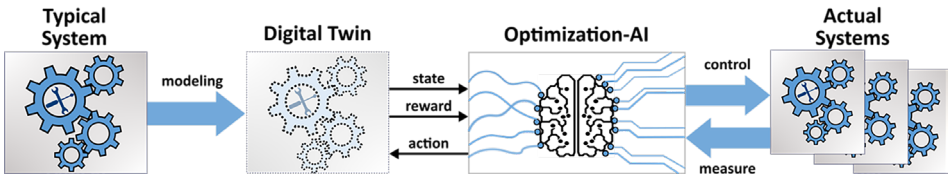
ASIMOV

The power of digital twins and AI for cyber-physical systems

As cyber-physical systems (CPS) grow more complex, self-optimisation becomes increasingly desirable. The Joint AI Call 2020 project ASIMOV (AI training using Simulated Instruments for Machine Optimisation and Verification) aims to realise this via the combination of innovative digital twinning and AI technologies.

Addressing the challenge

High-tech CPS are used by an increasing number of companies and industries and are growing in complexity – particularly systems that interact with uncertain environments. This can create a tension with the need for high uptimes and ease of use, as suppliers must ensure that their CPS deliver optimal quality in customer environments without difficult optimisation tasks that require highly-skilled staff and take up large amounts of time. The solution lies in high-tech systems that can select their optimal settings autonomously with minimal effort and external expertise.



The ASIMOV principle. By modeling relevant aspects of a CPS into a physical realistic digital twin, an Optimisation-AI can be trained to control the CPS without need of training time on the actual CPS. Once trained, the AI can operate a range of CPS's and keep them in optimised state.

Proposed solutions

To enable such self-optimising CPS, ASIMOV will combine digital twinning technology (including simulation technology and multi-modal modelling) with AI technology to develop digital twins on which the system optimisation AI can be trained. This will result in generic methodologies and tools for AI-based system optimisation. The trained AI can then perform tuning and calibration tasks on machines during manufacturing, installation and operation via direct interaction with the system and a digital twin of the system-under-configuration. The use of Digital Twins avoids excessive on-system training times and the large amounts of data traditionally required for AI learning by simulating the system and its environment and generating synthetic data.

ASIMOV's approach will be validated in two different industrial system domains for which optimisation is crucial to system performance: electron microscopy and automated vehicles.

Projected results and impact

A cornerstone of the ASIMOV project is that its technologies will be reusable by other industries and applications, such as robotics, biomedical, healthcare, agri-food, semiconductor equipment and aerospace. The consortium will therefore focus on evaluating commonalities between the two use-cases. For both OEMs and SMEs, a key benefit is greater efficiency and reduced costs in providing customised and (self-)optimised products.

Through the exploitation of the project's results, partners estimate a growth of their own revenues ranging from 5% to 30%. The project will also allow companies to create new business cases in established and fast-growing domains: the global electron microscopy market, for instance, was valued at USD 3.2 billion in 2017 and will expand at a compound annual growth rate of 7.4% up to 2025. All in all, ASIMOV will greatly enhance the accessibility and usability of high-tech CPS, increasing European competitiveness on the global stage.

Project partners

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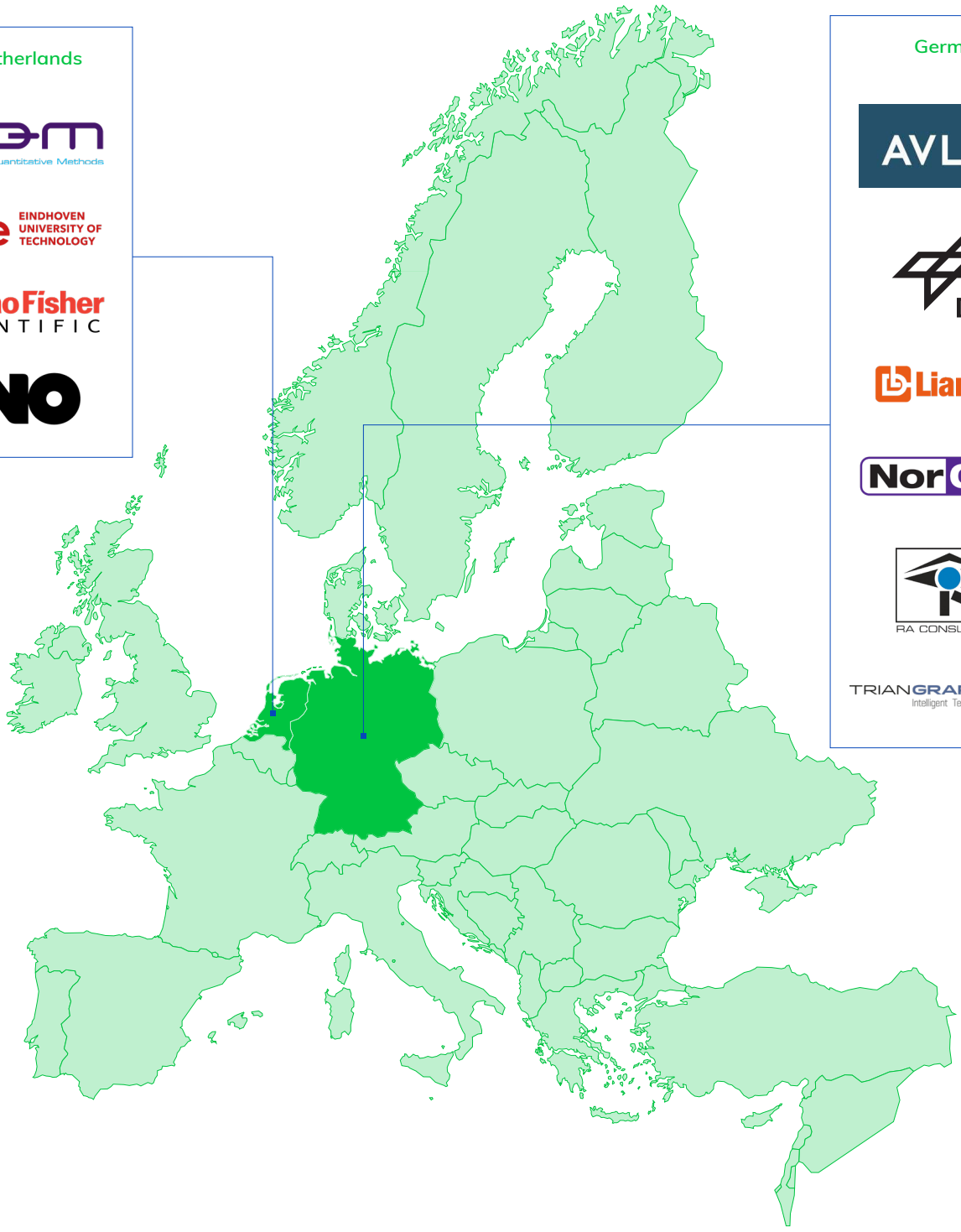
The Netherlands

- CQM – Consultants in Quantitative Methods
- TU/e Eindhoven University of Technology
- ThermoFisher Scientific
- TNO



Germany

- AVL
- DLR
- LiangDao
- NorCom
- RA Consulting
- TrianGraphics – Intelligent Terrain Solutions

Project start
June 2021

Project end
June 2024

Project leader
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Project website
https://itea4.org/project/asimov.html

ITEA is the Eureka R&D&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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