Program pitching day 01-10-2024 Leuven

Park Inn by Radisson Leuven, Martelarenlaan 36, 3010 Leuven (near Leuven Station)

09:30 Welcome coffee

10:00 Plenary session: introduction to our new project idea pitches

10:20 **Project idea pitches – session 1**

11:00 Coffee break

11:20 **Project idea pitches – session 2**

12:00 Lunch

13:00 Plenary session: guest speaker

14:00 Plenary session: introduction to our new project idea pitches

14:20 **Project idea pitches – session 3**

15:00 Coffee break

15:20 **Project idea pitches – session 4**

16:00 Reception

	ERASMUS 1	ERASMUS 2	ERASMUS 3
	Operator training & support	**Production, manufacturing**	**Smartness, sustainability and performance of mechatronics and powertrains**
10:20	Regenerating digital content for flexible components in manual assembly ReFlex_IRVA	Process mining and flow anomaly monitoring for Flexible Manufacturing Enterprises ProMinEnter_IRVA	Control relying on models synchronized during operation CoMoDo_IRVA
10:40	Intelligent Flow Manager enabling multi-device & multi-user DWI MultiFlow_IRVA	Controlled robot-assisted manufacturing by using measurements in the loop RoboLoop_IRVA	Control Mapping of setpoints based on high level operator choices ControlMaSC_IRVA
11:00	break	break	break
	Production, manufacturing	**Operations Scheduling - Maintenance**	**Smartness, sustainability and performance of mechatronics and powertrains**
11:20	Automatic Generation and Evaluation of Assembly System Design Models for Tactical Decision Making AGEAS_SBO	Agile Personnel Scheduling in Production Volatile Environments AGIPROVE_IRVA	Efficient Inverter and DrivEtrain Tuning In Commissioning EIDETIC_IRVA
11.40	Automated automatic robotic assembly from engineering data CAD2RI_IRVA	Machine learning for maintenance planning and Spare PARTs mANagement SPARTAN_IRVA	Bi-directional E-PTO and electrical implements BIDIREPTO_IRVA
12:00	Lunch	Lunch	Lunch
13:00	Guest speaker	/	/
	Operator training & support	**Smartness, sustainability and performance of mechatronics and powertrains**	**Skills for autonomous work vehicles**
14:20	Capture expert knowledge for accelerated training and problem solving EXPATS_SBO	Intelligent Fleet-Level Condition & Health Monitoring INFLEET_IRVA	Situation-aware robust optimal vessel navigation and control AUTOSHIP_IRVA
14:40	Accelerating Skill Development through Conceptual Knowledge Transfer SKILL-LM_IRVA	Framework for automatic creation of a design and operations body of knowledge FABRIK_SBO	Realistic simulation of perception for autonomous working vehicles in all conditions REALISTIC_IRVA
15:00	break	break	break
	Production, manufacturing	**Matching Product Design & Manufacturing**	**Skills for autonomous work vehicles**
15:20	Knowledge Extraction and Reasoning From Manufacturing Process Documents KnowEx_MPD_IRVA	Generative Design for Assembly GenDfA_SBO	Framework for the Development of Complex Robot Skills AVAS_SBO
15:40	/	Automatic Design-for-Assembly ADFA_IRVA	Artificial Intelligent Remote OperatorS AIROS_IRVA

ERASMUS 1

Operator training & support

10:20 **Regenerating digital content for flexible components in manual assembly** ReFlex_IRVA

Non-rigid components (springs, electrical wiring, penumatics, etc.) are omnipresent in manual assembly. Due to the complexity & required dexterity for this assembly, it often remains a manual task. Operator Guidance systems could help in increasing the productivity and quality of these tasks, but content creation is difficult. In CAD drawings, flexible parts are either oversimplified or completely lacking. This hampers the automatic creation of DWI & training tools.

The project goal is to set up a toolchain for (semi-)automated regeneration of flexible components, to be used in authorable and adaptive DWIs for assembly & quality inspection and to create realistic training tools that take into account the flexible behaviour of parts. This will enable faster modelling of flexible components (+50%), smoother transition from training to work (50% less errors) and a higher degree of automated DWI content creation (+10%)

10:40 **Intelligent Flow Manager enabling multi-device & multi-user DWI** MultiFlow_IRVA

Current DWI platforms, and Operator Guidance in general, is limited to a single operator working on one device and execution all the steps from beginning till the end of the instruction. He either needs to manually confirm a step is completed or it needs to be configured in the instructions that a specific device or action can confirm the correct step execution. However, in practice multiple operators are often collaborating on a single assembly and stepping in to finish the job in time. Due to the varying nature of assembly activities some steps might require different devices: i.e. projection systems for top-down assembly, tablets for quality inspection, wearables for difficult to reach areas, etc. A more dynamic system is needed to open up operator guidance to those more complex but real-life scenarios.

This project will deliver an externally accessible flow manager, that can manage multiple UI devices, multiple operators & multiple inputs: (1) Synchronize the content of instructions over multiple devices (for the same operator), (2) Distribute the load dynamically over multiple operators (working on the same assembly), (3) Assess the step execution based on multiple input mechanisms (manual or automatic). This requires development of (1) a flow manager, allowing to be accessed by several devices at once, (2) a reasoning system to support parallel process state tracking & load distribution and (3) a multi-input state tracking algorithm as input towards the flow manager.

FLANDERS MAKE
DRIVING INNOVATION IN MANUFACTURING

Production, manufacturing

11:20 **Automatic Generation and Evaluation of Assembly System Design Models for Tactical Decision Making** AGEAS_SBO

Companies are confronted with a tendency towards shorter product life cycles and higher product variety.
This increasingly forces them to design and re-design their assembly systems.
In order to reduce the inherent inefficiencies in the ramp-up & ramp-down-phase (capital, surface), the design of their assembly systems should allow maximum flexibility & scalability

Factory simulation models are a powerful tool to evaluate what-if scenario's that can help companies in their regular decision making about resource selection, allocation and planning. However, creating and maintaining factory simulation models is a labor intensive task of a human modeling expert.
Development of automatic design models for assembly cells & systems (including material flow to & in the cell/system) based on a combination of generic models and company-specific data.
Integration of design & simulation models for tactical & operational decision making and continuous system improvement.

11.40 **Automated automatic robotic assembly from engineering data** CAD2RI_IRVA

Are you struggling with the complexities of managing a high mix of product variants of the same product family in your manufacturing process? Imagine the ease of automating production when each variant part, despite its differences, doesn't force you to reprogram your robots from scratch.
Within this project we focus on product families with large variability. Programming the robot cell hence involves a lot of manual configuration per new variant. One should be able to deal with different variants of pieces (eg with different hole patterns), but also variants in assembly step (eg screw vs click connection). The amount of robot programming grows significantly with the amount of possible variants which requires a huge configuration time needed. Furthermore, when considering minor R&D changes, the last thing you want is to lose valuable production time with manual reprogramming.

The goal of the project is to go towards automated configuration of robotic assembly, for a large variation in products within a product family, based on available R&D data (such as CAD) of the assembly. The project results will enable faster configuration times and faster changeover times.

Operator training & support

14:20 **Capture expert knowledge for accelerated training and problem solving** EXPATS_SBO

Many industrial companies still heavily rely on different kinds and levels of experts (process engineers, process developers, quality engineers, maintenance technicians) in order to reach the required level of quality & OEE (overall equipment effectiveness).
Operator support systems are already existing (and being further developed) for 'normal operation' but still have to be developed for advanced problem solving, especially when multi-domain knowledge is required (eg process knowhows, mechanical design, control design, quality methods, …)
In order to reduce the dependency on expert operators, the expert knowledge should be easily captured (implicitly & explicitly), integrated into already existing knowledge graphs and automatically updated.
This combined expert knowledge should be made available in an intuitive way to all kinds of

operators (production, quality, maintenance, logistics, …) in order to increase the speed of problem solving and reduce the dependency on the availability of the experts

Development of methods to automatically capture expert domain knowledge and integrate it in already existing knowledge graphs.
Develop of methods to explicitly provide information & problem solving support in an intuitive and comfortable manner to all employees.

14:40 **Accelerating Skill Development through Conceptual Knowledge Transfer** SKILL-LM_IRVA

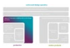
Shortage of human operators with required craftsmanship skill for jobs
→ Employees need to be trained correctly with minimal effort of experienced colleagues
Flexibility demand results in lower experience and skill
→ Employees need sufficient insight in their craftsmanship to gain flexibility
Limited output quality and speed due to inexperience of workers
→ Employees need to be trained faster with an acceleration of the learning curve

Training novice workers efficiently in certain skills can be time consuming. This project aims to (further) develop and implement an interactive training tool to achieve faster learning and provide insight in skills for novice workers.
By implementing models of specific skills of experts, procedural and conceptual knowledge can be embedded in an interactive craftsmanship training tool. This information can originate from various sources within a company such as articles, instruction manuals, videos, etc. A novice employee can use this tool to interactively learn skills by asking questions to the model and get feedback based on the trained data provided. This allows a new employee to have a custom learning experience.

An extension to this is envisioned so that self assessment and self evaluation of the task can be embedded in the training tool. The goal is to bring this technology to the companies so that they can train novice workers faster while guaranteeing that they can quickly obtain insight in the process which can be (but is not limited to) skills needed for production, (dis)assembly and maintenance. This approach allows the novice to be trained at his/her own pace with limited need of a trainer or experienced colleague to oversee the learning process, making the training process more efficient.

Production, manufacturing

15:20 **Knowledge Extraction and Reasoning From Manufacturing Process Documents** KnowEx_MPD_IRVA



Knowledge Sharing Tool to reason at factory level allowing to make powerful root-ca use analysis, be more actionable and accessible to a broader range of people.

Recently, it is seen that attention has been drawn to efficient knowledge construction, extraction, and management of documents for industrial production systems. However, the manual extraction of information might be time-consuming and error-prone. In this direction, the proposed project aims for automatic knowledge extraction to enable easy-to-understand models by all the stakeholders and enable the management of huge and diverse data sets.

FLANDERS MAKE
DRIVING INNOVATION IN MANUFACTURING

ERASMUS 2

Production, manufacturing

11:20 **Process mining and flow anomaly monitoring for Flexible Manufacturing Enterprises**
ProMinEnter_IRVA

- Gain a better understanding of manufacturing processes by process visualizations
- Get insight in the process steps contributing to certain manufacturing errors or delays (e.g. which orders/products take significantly longer than average, which process steps are involved)
- Gain insights in potential correlations among different process steps/activities
- Make better predictions (completion time)

Research and validate process mining approaches in the context of manufacturing.
Create guidelines, a demonstrator, and protocol adapters to enable the adoption of conformance checking, case prognostics and root cause analysis in a flexible manufacturing context.

10:40 **Controlled robot-assisted manufacturing by using measurements in the loop** RoboLoop_IRVA
RoboLoop intends to help companies handle challenges in 3 aspects: a) 3D printing: Robots are needed in 3D printing to enable 5-6 degrees of freedom, but they encounter more disturbances than table-top 3D printers leading to a repeatability and accuracy issues. In addition robot-assisted printing might lead to some printing errors. b) in SPIF (Single point incremental forming): Robots encounter disturbances due to the high forces involved and the springback effect, leading to a repeatability and accuracy issues. c) in robot-assisted inspection: Robots encounter disturbances leading to a repeatability and accuracy issues

RoboLoop will use in-process advanced geometrical measurements to improve accuracy, precision and repeatability of the robot motion as needed for robot-assisted manufacturing. This FM IRVA project will bring value to companies along the value chain:
-To the robot manufacturer or integrator: Improved control strategies for the robot leading to more stable, accurate and repeatable robot motion; new markets for their robots
-To the metrology provider: Improvement of the measurement technique through specific application cases; offering software and/or services to manufacturing companies
-To robot-assisted manufacturing companies: Precise control of position of the robot, both in terms of accuracy and repeatability as needed for high quality robot-assisted manufacturing.

Operations Scheduling

11:20 **Agile Personnel Scheduling in Production Volatile Environments** AGIPROVE_IRVA
Companies in dynamic manufacturing environments urgently need solutions to address critical challenges in implementing sufficient flexibility in resource planning and scheduling. Existing software packages exacerbate these issues with isolated reasoning (at strategic, tactical, or operational level), insufficient support for proactive decision-making, and a lack of support for desired agility policies and dynamic scheduling. Furthermore, work planning is not always integrated with resource (workforce) scheduling, leading to suboptimal solutions. Finally, there is a lack of implemented mechanisms for proactive and reactive recovery and decision support.
A comprehensive solution is needed to improve the operational efficiency of flexible work and resource scheduling and planning.
AGIPROVE aims to design a decision support planning scheduling engine for agile task/job and personnel planning and scheduling in dynamic and volatile production environments. We aim to study the impact of implementing multiple ways of adding flexibility at the strategic, tactical, and operational levels of decision-making encompassing proactive and reactive (either event-driven,

periodic, or hybrid) scheduling (e.g. task swapping) in response to demand fluctuations and schedule disruptions. The decision support tool will optimally introduce flexibility/agility into resource management Additionally, it will calculate the impact of strategic (e.g. such as skill mix, overtime, annualized hours, overtime, …) and tactical decisions (e.g. capacity and time buffering) on operational outcomes. The analysis will consider the trade-off between agility and economic factors. It will further evaluate/balance personnel satisfaction proxies. The goal is to help companies optimize personnel resources, enhance competitiveness, and streamline operations for resilience and adaptability.

Maintenance

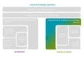
11.40 **Machine learning for maintenance planning and Spare PARTs mANagement** SPARTAN_IRVA

State-of-the-art machines generate data by which their degradation can be assessed to optimally plan preventive maintenance. Cost-effective maintenance also requires a proper spare parts management strategy. Companies require strategies and smart algorithms to improve spare parts management while optimizing the maintenance planning by leveraging degradation data.

The overarching objective is to develop algorithms that leverage real-time data to improve spare parts and maintenance decision making. These algorithms are the analytics functionality of OEMs' service control towers to support their maintenance and spare parts decision making processes.

Smartness, sustainability and performance of mechatronics and powertrains

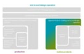
14:20 **Intelligent Fleet-Level Condition & Health Monitoring** INFLEET_IRVA



As companies increasingly monitor their hardware devices, significant data is generated, which must be processed on the edge or cloud. This process is costly and inefficient. The INCADD project has already demonstrated possibility of data reduction through an intelligent edge-cloud framework for a single device, further reduction and agile maintenance can be achieved through fleet-level data processing by enabling edge devices to learn from one another.

The project will implement federated learning among edge devices, using self-supervised machine learning models. This approach will allow devices to monitor their operation and condition intelligently. The ultimate objective is to enable predictive maintenance of the hardware, minimizing data exchange between edges and the cloud, which will improve efficiency, speed, and latency while avoiding the need to send large volumes of data to the cloud.

14:40 **Framework for automatic creation of a design and operations body of knowledge** FABRIK_SBO



The need for this project arises from the growing demand for more durable (in the sense of extended lifetime) mechatronic systems. Current systems often fail prematurely due to insufficient insights into their real operational use and failure modes during the various design stages. To address this, the project aims to develop tools that improve both the understanding of system use and failure mechanisms. By leveraging real-world data, the project will enable design optimizations and operational adjustments to enhance system longevity. This will not only improve product durability but also offer adaptive strategies to prolong the life of mechatronic machines, benefiting Tier 1 suppliers and OEMs striving for high-performance, longer-lasting products in industries such as automotive and advanced manufacturing.

The goal of this project is to create a novel framework that automatically generates a comprehensive design and operations body of knowledge for durable mechatronic systems. By continuously mining data from various sources—such as design models, field data, and expert knowledge—the project will integrate this information into the product development lifecycle.

This approach will enable more efficient designs, faster product iterations, and optimized operation strategies, all aimed at maximizing system durability. The framework will support cross-domain collaboration, improve decision-making, and provide actionable insights for (predictive) maintenance, load modeling, and design adjustments. Ultimately, the project seeks to deliver longer-lasting, economically viable products while reducing time-to-market for advanced mechatronic systems.

Matching Product Design & Manufacturing

15:20 **Generative Design for Assembly** GenDfA_SBO

Traditional designs of mechatronic systems consist of the integration of various modular components. Nowadays, there is a trend towards highly integrated designs that lead to more performant and compact systems. However, this leads to additional challenges to predict the full physical behavior of these systems (w.r.t. vibrations propagation, heat transfer, electromagnetic compatibility, optical aberrations, ...), to ensure the proper assemblability of these (sub)assemblies, and to identify proper work instructions. Moreover, many of these issues only manifest themselves during the final prototyping and pre-production stages, and hence are very costly to resolve. Therefore, there is a clear need for product developers to gain access to improved analysis and synthesis tools to ensure these complex assemblies meet their various requirements.

This project aims to develop advanced tools and workflows for analyzing and designing integrated mechatronic assemblies. This will be achieved through a new combination of generative AI methods, (reduced) co-simulation methods and advanced computer-aided manufacturing approaches. Data-driven methods will be developed to identify important prototype interactions. This will support Tier 1 suppliers and OEMs in:
• Multidomain Analysis: Enable accurate and efficient simulation and analysis of interactions like vibrations, heat transfer, and electromagnetic compatibility within complex assemblies.
• Design Optimization: Streamline design workflows to enhance component integration across mechanical, electrical, thermal, and optical domains.
• Assembly Issue and Work Order Detection: Identify assembly challenges earlier, reducing costly revisions during prototyping and pre-production.
These improvements will ensure advanced mechatronic assemblies meet performance, cost, and reliability standards throughout development.

15:40 **Automatic Design-for-Assembly** ADFA_IRVA

Are you often encountering design changes or process changes to enable an efficient (dis)assembly process? Are you designing products but wondering if they can be easily be (dis)assembled? Or are you a software provider wanting to add Design-for-Assembly (DfA) functionality to your solution? Incompatibility between a product design and an assembly environment leads to time-consuming and costly iterations between production and design, e.g. changing part connections, redesigning jigs or changing assembly sequences. Joining this project will enable you to reduce the time it takes to prepare a product design for production.

The goal is to set up an automatic, CAD-based Design-for-Assembly (DfA) assessment of product designs, while taking into account the assembly environment. The assessment consists of a set of DfA rules that evaluate the fitness for assembly, the time and the cost of the assembly process. The assembly environment is captured in these rules to reflect the specifics of your production process. We will enable you to apply state-of-the-art DfA principles on your CAD design leading to a faster and cheaper product development process. We will develop algorithms that can automatically evaluate DfA rules based on a product CAD. These algorithms can be integrated into an open-source FreeCAD tool or a CAD plugin for the commercial CAD software you use.

ERASMUS 3

Smartness, sustainability and performance of mechatronics and powertrains

10:20


Control relying on models synchronized during operation CoMoDo_IRVA

For complex tasks it is often not sufficient to rely on classical PID controllers to achieve sufficient performance. It can instead be needed to coordinate multiple actuators, to anticipate on upcoming events, to adjust settings due to unknown disturbances, etc ..

In this project we propose to achieve this by using a simple control-oriented model. We will use an estimator to keep this model synced with the machine status during operation, so it can be used by controllers to make optimal control choices for complex problems.

10:40


Control Mapping of setpoints based on high level operator choices ControlMaSC_IRVA

Operators play a critical role in ensuring that industrial systems operate efficiently and meet high-level KPI targets (e.g. productivity, quality, running costs, ...). Many machines require operators to choose settings in non-intuitive and indirect ways, like choosing setpoints for several actuators, hoping to find a mode of operation that achieves their underlying KPIs (or often trade-offs between them). As these systems become more sophisticated, manually tuning them for optimal performance becomes increasingly difficult for operators. They often rely on experience and time-consuming trial-and-error approach to find the adequate settings.

In this project we aim to build an overarching controller with a more intuitive interface, where the operator manages trade-offs between different high-level KPIs. This controller will then be made to coordinate a set of underlying low-level controllers to steer the machine to the desired performance. This will enable operators to make informed decisions without needing deep technical knowledge of the underlying control systems.

11:20


Efficient Inverter and DrivEtrain Tuning In Commissioning EIDETIC_IRVA

The industrial need at hand is the optimization of control parameter tuning, specifically inverter controllers and low-level drivetrain controllers. Existing solutions rely on expert intuition, rule-of-thumb guidelines, linear auto-tuners, and standardized inverter-motor combinations with pre-tuned parameters. However, these approaches face significant challenges due to the variability in application load and environmental conditions, the complexity of interdependent controller loops, and safety limitations. Additionally, the lack of modularity in configuration and the proliferation of variants, given the diversity of inverters and motors, result in inefficiencies. This industrial need demands innovative solutions that can adapt to changing conditions, enhance control parameter tuning efficiency, and ensure safety while accommodating a wide range of configurations.

1.Shorten time to market: Streamline the commissioning process by reducing the time required for control engineers to fine-tune inverter and drivetrain control parameters.
2.Enhance tuning efficiency: Develop tools that capture and transfer tuning knowledge, facilitating more efficient tuning procedures. This will minimize the need for expert intervention and allow for the tuning of a class of similar problems.
3.Improve robustness of autotuning: Ensure autotuners and tuning rules can handle systems with significant variability, converging on different applications, even in diverse environmental conditions.
4.Enhance system performance: Find better tuning approaches to improve system performance, particularly under conditions of temporary overloading. This involves developing superior configuration tools and more accurate estimations of short start times while constraints are active.

The project will employ a range of approaches, including (but not limited to) formalized application knowledge, AI methods, physics-inspired models, and the integration of offline and online data for efficient tuning. The focus is on developing robust, adaptable, and efficient solutions for the industrial sector.

11:40 **Bi-directional E-PTO and electrical implements** BIDIREPTO_IRVA

The electrification of commercial and off-highway vehicles is ongoing. Being Electric, they also need PTO's (Power-Take-Off) that will need an electrical variant, that can both take off or supply electrical energy. Many different implements and add-ons exist that are or will be electrified, where there is today no standardized way to implement the E-PTO. This is an important barrier to reliably integrate these solutions for different brands with a re-usable interface and implementation.

BIDIREPTO plans to define and validate potential implementations of a standard for electrified PTO's and engage with the industry for its adoption. The electrified link can handle about onboard production (PV, hydrogen,...), energy sharing (battery extension) or consumption (cooling system, accessory loads, implements, ...)

Skills for autonomous work vehicles

14:20 **Situation-aware robust optimal vessel navigation and control** AUTOSHIP_IRVA

Increased utilization and further expansion of its already dense inland waterway infrastructure is a policy priority of the Flemish government. This decision is driven by the recognition of Inland Waterway Transport (IWT) as a key driver in a sustainable modal shift of freight transport, where sustainability of IWT, as compared to other means of transport, is characterized by less accidents, air pollution, noise, congestion, and a lower impact on climate in general.

Contrasting these commitments is a reduction of the Inland Surface Vessel (ISV) fleet (both in number, capacity and diversity) over the past decade, while many of the ISVs in use have become outdated. A primary focus, to enable a shift of freight transport to IWT, should be competitiveness (with attention to sustainability), and this can be accomplished by (i) introduction of next generation ISV's, (ii) modernization of the current ISV fleet and (iii) reduction of crew costs. This project focusses on (i) and (ii) by developing, implementing and experimentally validating technologies required to realize automated and sustainable inland shipping: 1) real-time hydrodynamic model identification, 2) semantic maps for robust perception & localization, 3) robust and optimal predictive navigation, maneuvering and control.

The AUTOSHIP project will develop and experimentally validate safe and robust perception, navigation and maneuvering control solutions for inland waterway (IWW) vessels. They will enable IWW vessels to autonomously navigate inland waterways accounting for upcoming and proximate vessels and traffic rules, and maneuver in the proximity of fixed or slowly moving objects (e.g., locks, river banks, junctions for IWW vessels), in an energy and/or time efficient manner, while taking into account the presence of environmental disturbances such as wind, water currents, hydrodynamics interactions between vessels, banks and other objects. The realization of the project objective hinges upon three key aspects.

14:40 **Realistic simulation of perception for autonomous working vehicles in all conditions**
REALISTIC_IRVA

In the context of validation of perception systems for autonomous systems, there is a potential to reduce validation cost and time by reducing experimental testing and maximizing virtual validation. However it is unclear which scenarios should be simulated and how reliable the simulatoin results are.

Make virtual validation a more reliable method of testing perception systems for autonomous systems.

15:20 **Framework for the Development of Complex Robot Skills** AVAS_SBO

When it comes to using autonomous mobile robots (AMRs), drones or self-driving agricultural machines, it's currently difficult to develop and describe new complex tasks they need to perform. There's no clear or common language to define these tasks or the skills needed to complete them. If we had such a language, it would make these systems easier to understand, reuse, and adapt to new tasks.

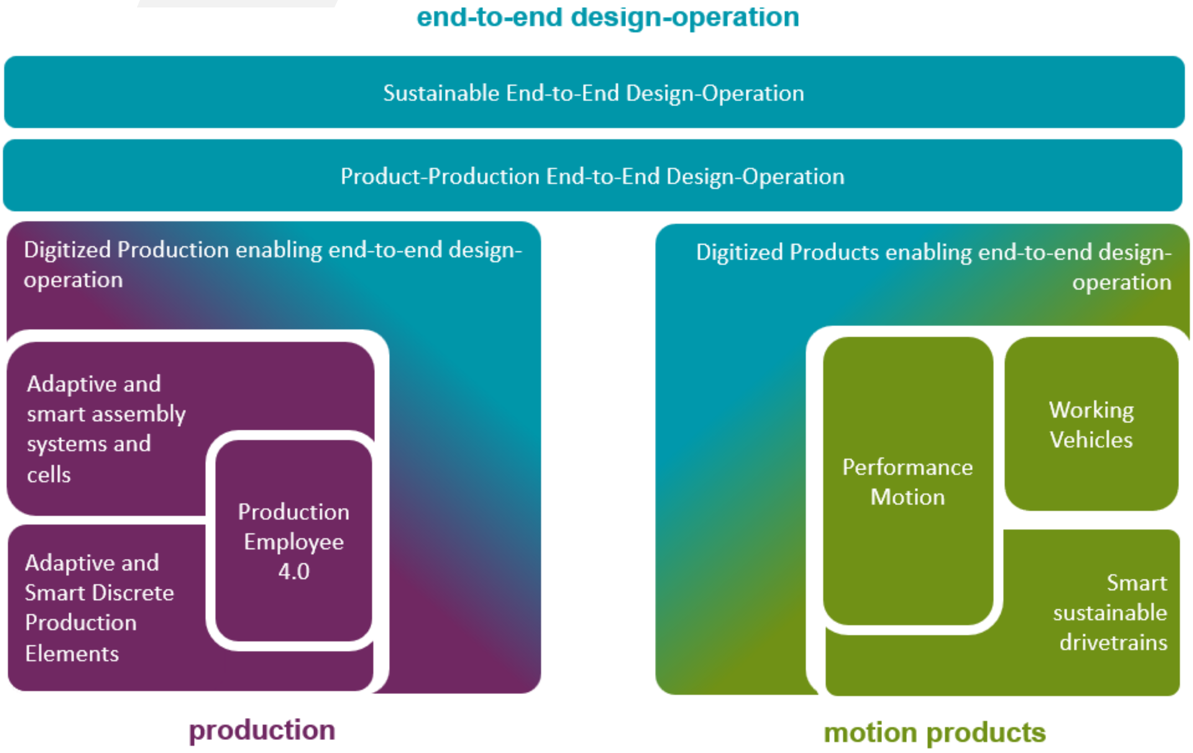
Currently, the skills that robots and vehicles use are developed in a way that doesn't allow their reuse; each skill is mostly built from scratch, and there are no frameworks to support skill composition. For example, an infrastructure inspection task for a drone needs multiple skills: navigation to a location, stabilizing in windy conditions, and actively moving to vantage positions to analyze infrastructure features in detail. However, there's no best practice, design pattern or solution to easily reuse and combine individual skills with operational and safety interdependencies.

Enable companies to easily design, develop, deploy and operate a combination of (motion and task-specific) skills on different robot platforms with sufficient capabilities. To this purpose, a proof-of-concept framework containing best practices, design patterns and support tools for development and operation will be developed.

15.40 **Artificial Intelligent Remote OperatorS** AIROS_IRVA

Internal coordination of a fleet of drones piloted by virtual pilots is missing. Lower cost (CAPEX and OPEX) for drone-based solutions for various specific tasks

Extend the VITRO framework to enable coordinated missions piloted by virtual operators and defined using using high level task descriptions. Easy to deploy and (re) configure off-board virtual piloting software replacing or assisting a human in executing specific tasks (to be defined by the consortium) and allowing for coordinated multi-drone operations


end-to-end design-operation
Sustainable End-to-End Design-Operation
Product-Production End-to-End Design-Operation
Digitized Production enabling end-to-end design-operation
Adaptive and smart assembly systems and cells
Production Employee 4.0
Adaptive and Smart Discrete Production Elements
Digitized Products enabling end-to-end design-operation
Performance Motion
Working Vehicles
Smart sustainable drivetrains
production
motion products