ODIN

WELCOME TO THE 3rd ODIN NEWSLETTER!

June 2022

In this issue

DISCOVER ODIN

The challenge

While robots have proven their flexibility and efficiency in mass production and are recognized as the future production resource, their adoption in lower volume, the diverse environment is heavily constrained. The main reason for this is the high integration and deployment complexity that overshadows the performance benefits of this technology.

If robots are to become well accepted across the whole spectra of production industries, real evidence is needed that they can operate in an open, modular and scalable way.

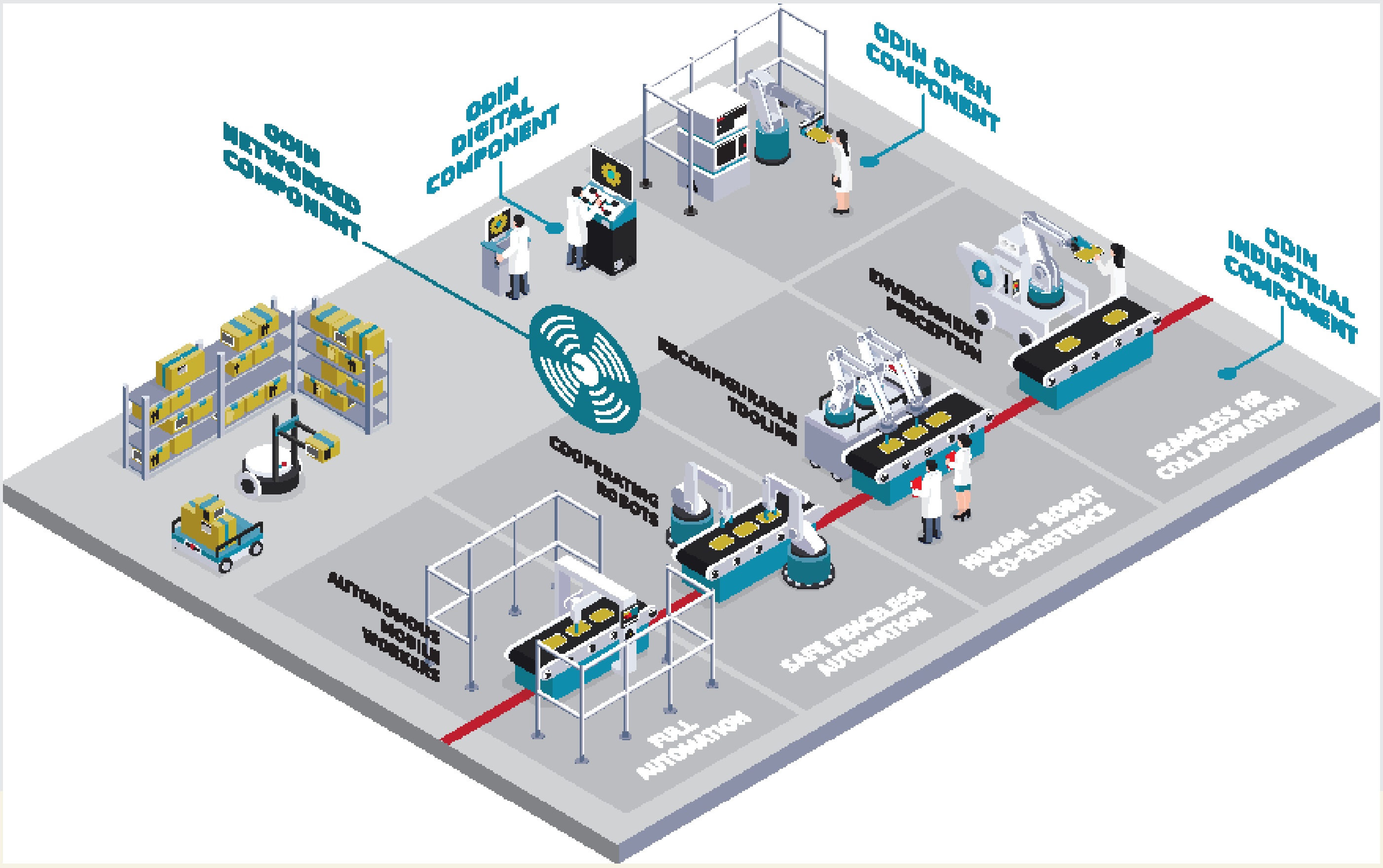
Project Overview

ODIN will bring technology from the latest ground-breaking research in the fields of:

- collaborating robots and human-robot collaborative workplaces
- autonomous robotics and AI-based task planning
- mobile robots and reconfigurable tooling
- Digital Twins and Virtual Commissioning and
- Service-Oriented Robotics Integration and Communication Architectures.

To strengthen the EU production companies' trust in utilizing advanced robotics, the vision of ODIN is:

"to demonstrate that novel robot-based production systems are not only technically feasible but also efficient and sustainable for immediate introduction at the shopfloor".



READ OUR LATEST BLOG POSTS

DESIGNING THE SOFTWARE ARCHITECTURE FOR A HUMAN-ROBOT COLLABORATIVE SYSTEM

The Global Robotics Market is growing fast. It was valued at USD 27.73 billion in 2020 and is expected to reach USD 74.1 billion by 2026, registering a CAGR of 17.45%, during the period of 2021-2026 . Robots, have been used in manufacturing since the last century, however their market is on the rise the last years. The rise can be attributed to new applications and new technologies. One of the most promising new applications is the human robot collaboration and the advances in software and computing hardware is one of the key factors that enable these applications.

A brief definition of the “robot” is key to understand the importance of the underlying software and software architecture in a robotic system.

Read the full blog post here

SAFETY, SECURITY AND ADVANCED SENSORS: THE KEYS TO THE AUTOMATION OF THE PRESENT AND FUTURE

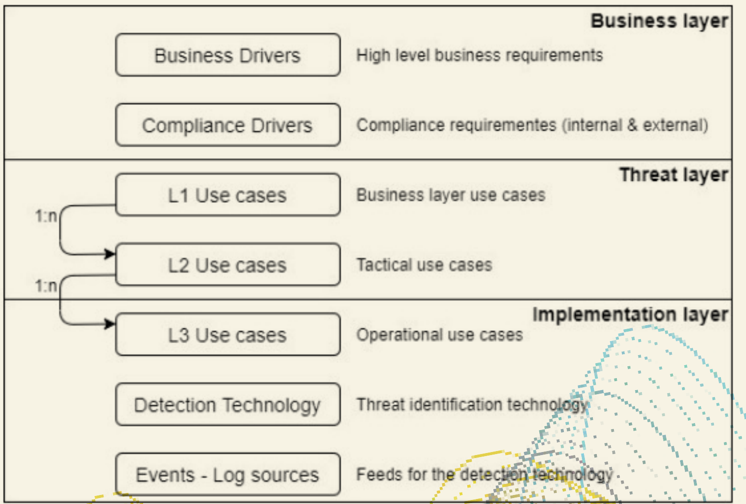
As a long-time Safety leader, PILZ is constantly keeping up with the advances in the industry and paying attention to the topics that will shape the future of machinery. We know this future includes interconnected machines, data-driven processes and more autonomous systems. However, with them comes the ever important topic of Security.

What's the difference between Safety and Security?

At a high level, we can describe safety as the protection of people from the hazards that emanate from plant and machinery. In contrast, security can be seen as the protection of plant and machinery from manipulation and misuse.

Read the full blog post here

MAGMA, A SECURITY INCIDENT MANAGEMENT FRAMEWORK PROPOSAL



As the need for security incident management has grown, the responsibility has gone from partial dedications of IT managers or Sysadmins to the most evolved form of the SOC or Security Operation Center, dedicated departments, many times externalized, that handle all the related activities. In this situation, it has become necessary to organize the way the environment is handled. Although this is true for traditional cybersecurity management systems, in industrial environments as envisioned in the ODIN project, require a more structured approach that help define how cybersecurity should be treated.

Read the full blog post here

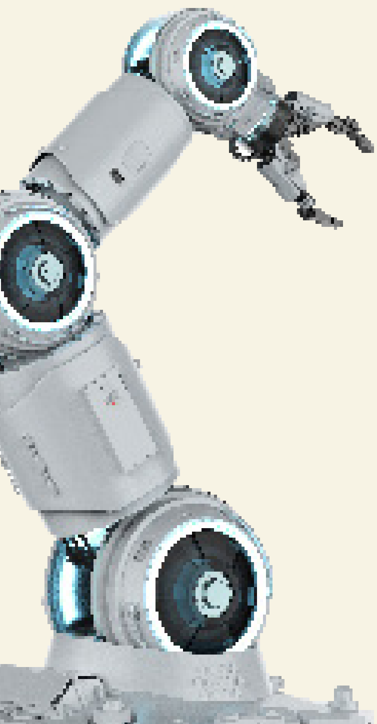
INDUSTRIAL AND COLLABORATIVE ROBOTS, "FRIENDLY" TOOLS FOR THE FACTORIES OF THE FUTURE WITH THE DGH TRAJECTORY MANAGER

Since the beginning of DGH activity more than 30 years ago, our company has been carrying out turnkey projects focused on robotics, mainly for OEMs from automotive sector always involved within all industrial trends that took place meanwhile.

In 2014, an exciting time for DGH started out from robotic topic point of view. The release of edge cutting technologies like collaborative robots and different reliable industrial artificial vision products, make us think outside the box regarding how we can do with this flexible and robust tool which are robots, no matter the brand they are from.

Read the full blog post here

VERSATILITY AND FAST RECONFIGURABILITY, THE KEY SOLUTION FOR IMPLEMENTING AUTOMATION IN THE AERONAUTICS MANUFACTURING SECTOR



As integral manufacturer for the aerospace sector, Aerotecnic provides comprehensive management of aerostructures and aeronautical components, committing itself to competitiveness through innovation, ensuring:

- Quality and conformity assured and total control of production and products
- Ability to offer a complete manufacturing service integrating multiple production steps in an efficient production and business model
- Provide rapid industrialization and lead times with robust start-up processes and the ability to integrate changes in them in an agile manner without disrupting production

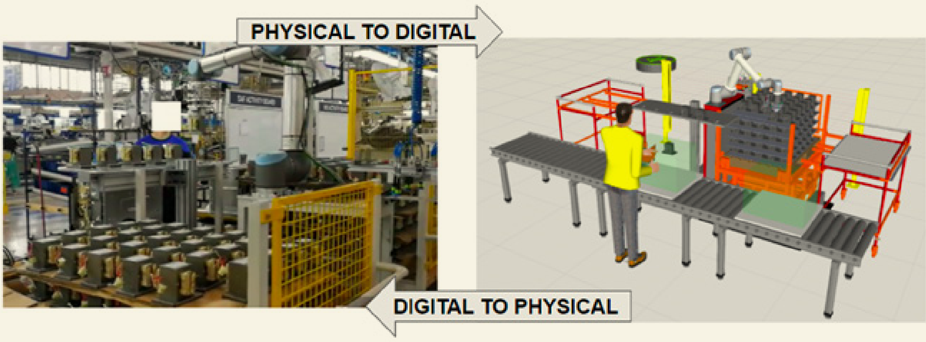
Read the full blog post here

WHIRLPOOL EMEA & ODIN PROJECT

Whirlpool EMEA has a historical experience into Research and Innovation European funded projects as the Horizon program and EIT Manufacturing, as an important part of its digital transformation roadmap, taking advantage from the knowledge intake driven by these activities and offering the industrial experience that is required to develop the project solution to higher levels of technological readiness.

The H2020 ODIN project represents a typical example of this virtuous exchange, allowing the industrial end users acquiring knowledge about the digitalization, virtual simulation and virtual commissioning of a workstations installed in the production lines and, on the other side, ensuring research organization the possibility to capture the real industrial business needs and face the reality of the industrial environment with its constraints and opportunities.

Read the full blog post here

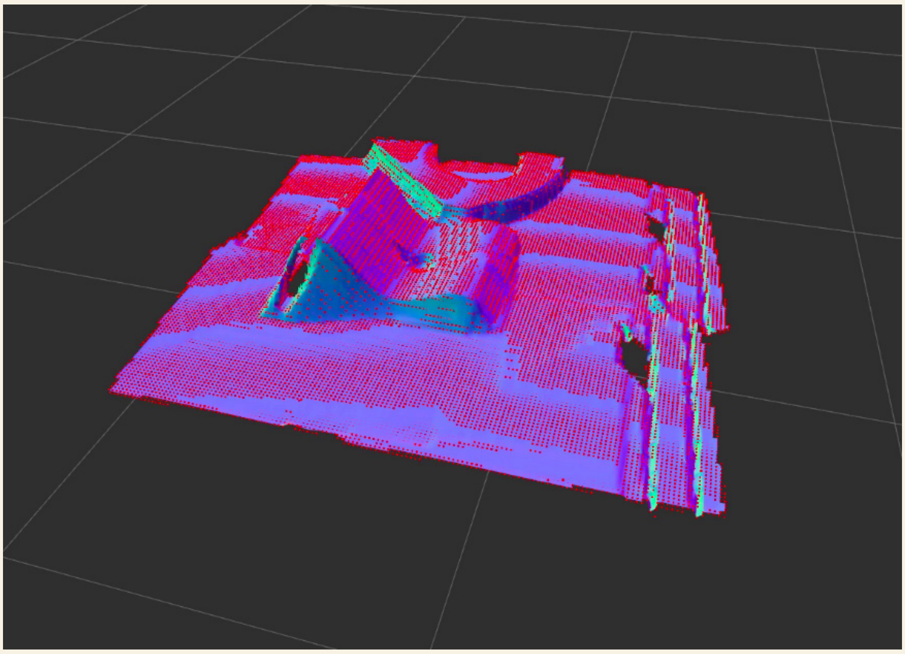


3D MODEL CREATION FOR INSPECTION

To create the ODIN dimensional / geometrical inspection system, we are working to produce a fine grain detailed full 3D reconstruction (also known as digitalization or scan) of the part to be inspected. We call this phase 3D Model Creation. The resulting representation (usually a pointcloud) can be then matched against an existing 3D CAD model, and discrepancies are then reported as quality control issues.

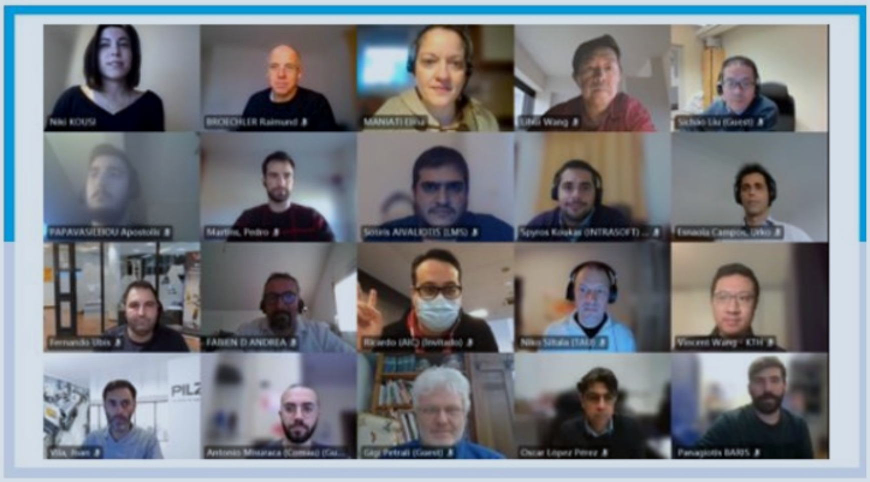
The inspection system will create a 3D reference model of a part which is classified as correct, and that reference model will be used to be checked against new scans of the target object to be inspected. The objective is to have an easy-to-configure system that can correctly detect presence/absence of parts being mounted into the target object, and to verify that the mounting position (and orientation) is according to specification. Instead of relying on ad-hoc rules to check for the large number of possible components, we target the easiness of use by providing a teaching procedure, in which the system is shown a good example. Thus, adding new components to be checked does not require additional programming, but just the generation of a new reference model.

Read the full blog post here



EVENTS

ODIN HAD ITS 2nd GENERAL ASSEMBLY MEETING



ODIN had its 2nd General Assembly meeting online on January 11-12, 2022 to discuss the progress towards the targets and important milestones of the ODIN project and decide on the next steps for the upcoming period.

ODIN PARTICIPATES AT THE VISION TRADE SHOW IN GERMANY

05-10-2021 to 07-10-2021, Stuttgart, Germany

VISION trade fair in Stuttgart is one of the most renowned events in the machine vision industry. Roboception was present as a sub-exhibitor at the booth of a distribution partner. A robot demo was used to explain the innovative 3D stereo sensor rc_visard and the associated software suite rc_reason to the visitors. The use cases detailed in ODIN excellently reflect the needs of the industry and the visitors were extremely interested in Roboception's participation in ODIN.

ODIN AT THE CAG PRODUCTIVITY SYMPOSIUM

The CAG Productivity Symposium in the picturesque town of Neu-Ulm in southern Germany connects startups with decision-makers from SMEs in Baden-Württemberg. Following the slogan "Quo vadis production - sustainability as an opportunity?", startups from the region had the chance to present their innovative products and their work for sustainable improvements in the production process. Roboception's presented ODIN to rural SMEs which are responding to the major challenge of shortage of qualified skilled staff with targeted automation solutions. In many face-to-face discussions, ODIN the project goals for smart automation solutions were presented.

07-10-2021, Neu-Ulm, Germany

ODIN AT FACTORY BOOSTER DAY 2021 IN POISSY, FRANCE

13-10-2021, Poissy, France

The Factory Booster Day 2021 took place in Poissy (France) on the 13th October 2021. The event was organized by STELLANTIS including several exhibitors from invited organizations/companies and live virtual sessions to connect remotely with STELLANTIS factories outside France and EU.

Laboratory for Manufacturing Systems & Automation (LMS) from University of Patras and STELLANTIS had the opportunity to introduce ODIN in representatives from different STELLANTIS factories, discussing on the objectives and the targeted outcomes of the project. A dedicated virtual session for ODIN was hosted during the event, giving special focus in the automotive use case, capturing both the interest and valuable feedback from the audience.

ODIN PARTICIPATES AT THE MONTHLY WEBINAR “EYES AND BRAINS FOR YOUR ROBOT”

ROBOCEPTION’s monthly webinar, “Eyes and Brains for Your Robot,” aims to educate integrators, end users, and research institutions about sensory augmentation capabilities for robots in general and ROBOCEPTION’s innovative solutions in particular. Participants come from very different domains and often work for SMEs. The application possibilities of sensory extensions for robots are clearly highlighted in ODIN’s use cases, which is very helpful in the webinar to better communicate the topic as a whole.

ODIN - WHITE GOODS PILOT WORKSHOP MEETING

On May 19th 2022, Laboratory for Manufacturing Systems & Automation , Visual Components, ROBOCEPTION , PILZ, KTH Royal Institute of Technology and Tampere University visited the WHEMEA Microwave Plant in Italy. ODIN partners had the opportunity to discuss on the progress of the ODIN white goods pilot case and co-create the plan of next steps.

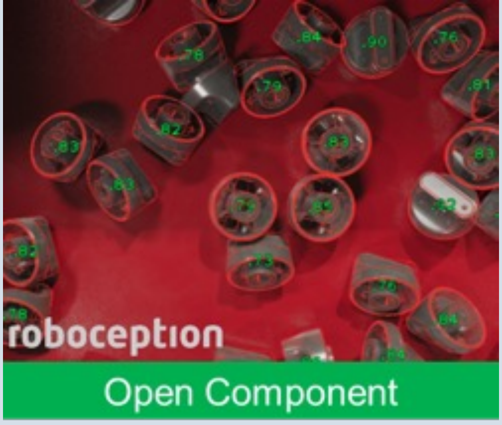
ODIN - AERONAUTICS PILOT WORKSHOP MEETING

On April 27th 2022, Laboratory for Manufacturing Systems & Automation, TECNALIA, PILZ and ROBOCEPTION visited the AEROTECNIC facilities in Spain to review the ODIN aeronautics pilot case and discuss on the next steps.

ODIN COMPONENTS - INITIAL PROTOTYPES

ODIN focuses on the implementation of Large Scale Pilots composed by 4 technical components namely: a) Open component, b) Digital component, c) Network component, and d) Industrial component which will be demonstrated in three different industrial sectors, automotive, aeronautics and white goods.

Open Component (OC): The Open Component of ODIN focuses on the development, testing and integration of core robotics technologies such as mobile manipulators, reconfigurable tooling, perception systems and human interfaces using an open approach before their deployment in industry.



Digital Component (DC): ODIN Digital Component focuses on the digital simulation and control tools (Digital Twin, AI based decision making, Virtual Commissioning) to allow optimization and robust operation of ODIN system in a modular and reusable way.

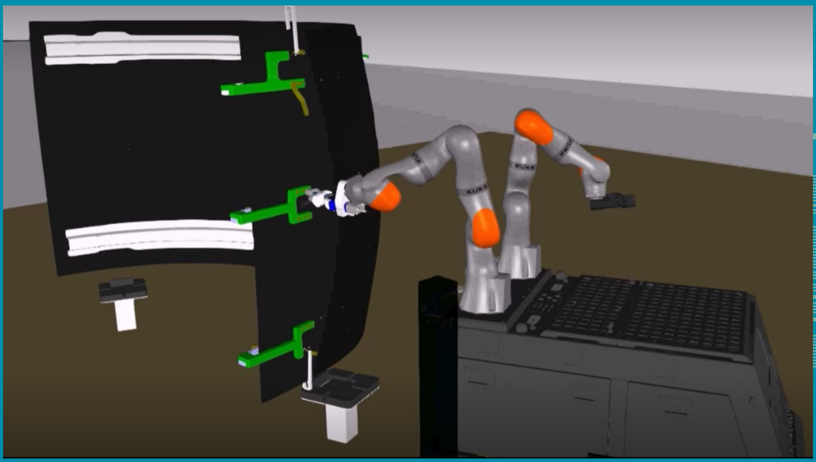
Networked component (NC): This component's target is to provide a standard and robust platform for ODIN technologies' integration and linking them either to their OC and DC or other pilot instances running in the enterprise environment. Additionally, a cybersecurity threat analysis tool will be developed under this component.

Industrial Component (IC): This component focuses on the validation of the integrated solution at full scale and in realistic conditions but also its interoperability with OEM and legacy systems. It is responsible to provide real time data flow to the OC and DC for reconfiguration and optimization purposes.

ODIN AERONAUTICS PRELIMINARY DEMONSTRATOR

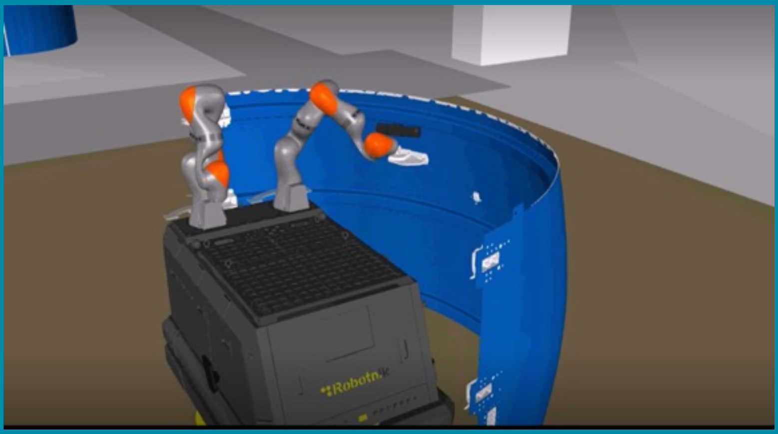
Technology development has been the focus of the project during the last months. The aeronautics final use case consists of three operations which are:

FAN COWL DRILLING



FAN COWL TRANSPORTATION

FAN COWL INSPECTION



PRELIMINARY TECHNOLOGY DEVELOPMENT

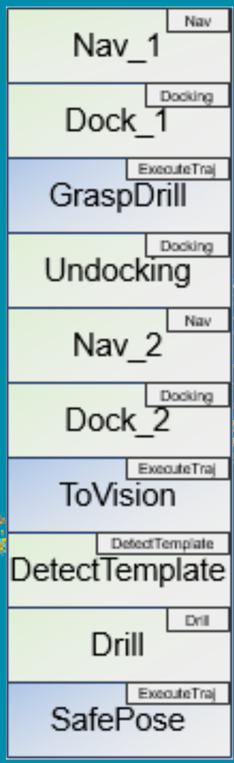
The following technologies are being developed to fulfill the AERONAUTICS use case technology needs.

OISP - ONSITE INTERACTIVE SKILL PROGRAMMING

ODIN provides technologies, not only to correctly perform the operations, but also, and most importantly, to make them easy to be programed. The goal is the programming to be an interactive process where the operator helps the robot to learn the parameters required for previously acquired skills. This has been named Onsite Interactive Skill Programming (OISP).

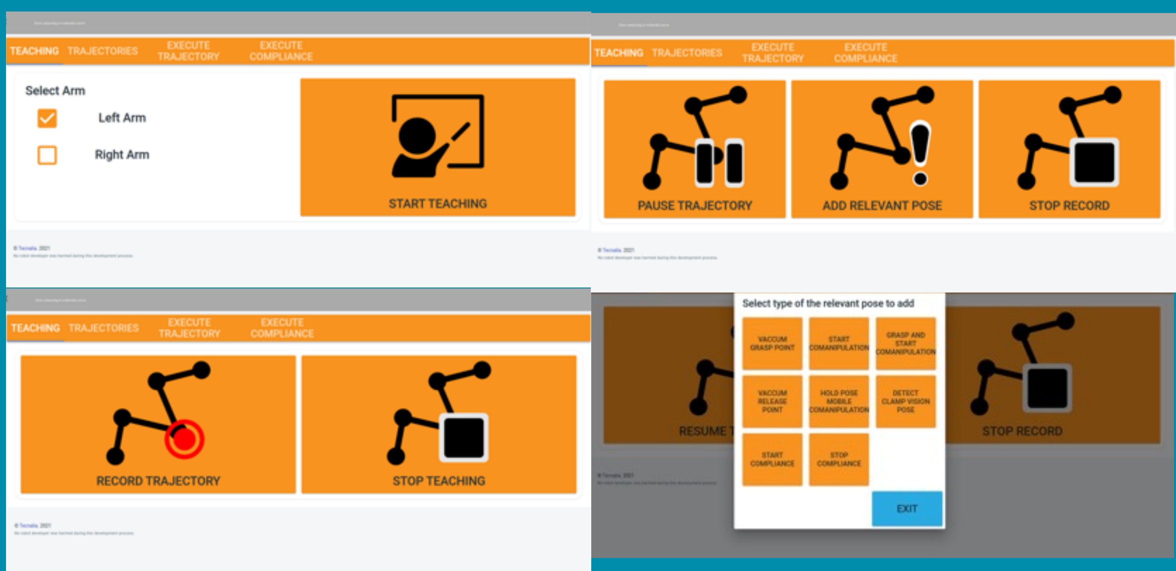
During this period the first base technological infrastructure for the OISP system has been developed. For the preliminary testing the process of drilling has been chosen.

The operator creates a recipe for the sequence of skills that are needed to be used. In the case of the drilling operation this includes the skills of Navigation, Docking, GraspDrillTool, Undocking, TemplateDetection, Drill.



With this recipe the robot asks the parameters required for each block. For example for the first navigation skill Nav_1 the robot asks the operator to bring the robot to the place where it needs to navigate to, for the graspDrill operation the robot asks the operator to move the arm to a place where the robot camera mounted on the robot arm can detect the drilling machine and register this position etc. This way the robot and the operator specify all the parameters needed in the operation and the robot will be ready to perform it by itself afterwards.

An intuitive and easy to use GUI has been developed for skill programming.



Between the skills involved in the drilling operation is worth to mention the drilling template detection skill and the navigation skill.

DRILLING TEMPLATE DETECTION

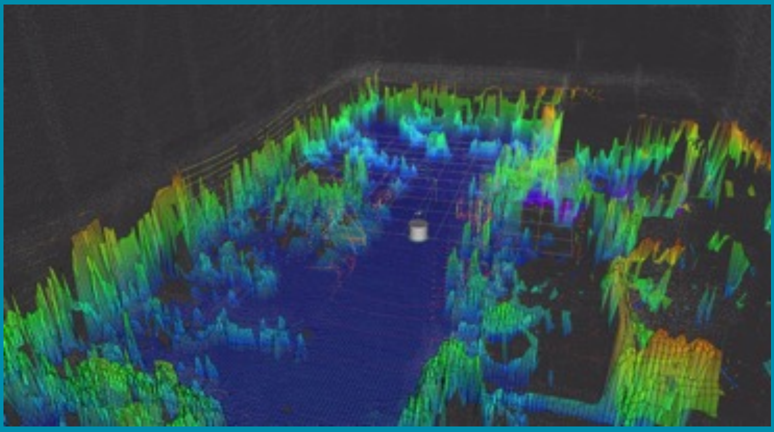
Preliminary tests have been done with a mockup drilling template with good detection results.

3D NAVIGATION

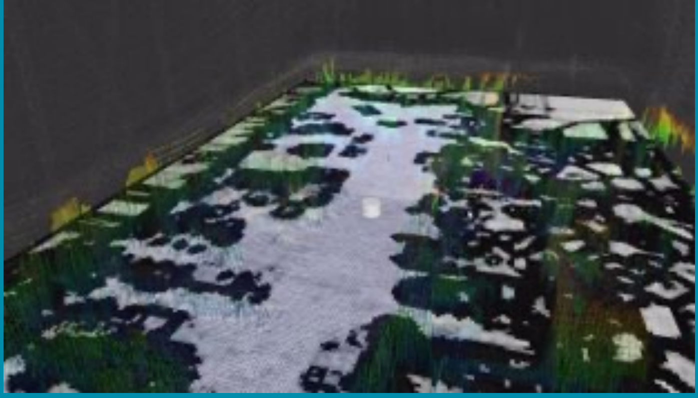
3D Navigation has been incorporated to the system. The robot creates a 3D map of the environment and it calculates its trajectories based on this 3D information.

- 3D mapping and localization

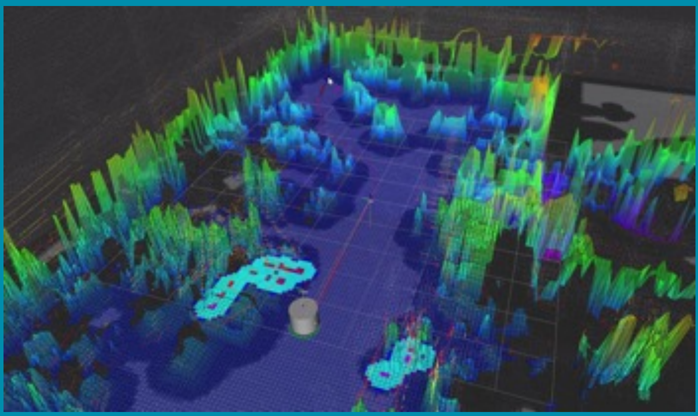
- Elevation (2.5D) map extracted from the point cloud.



- 2D traversability map



- 2D path planning



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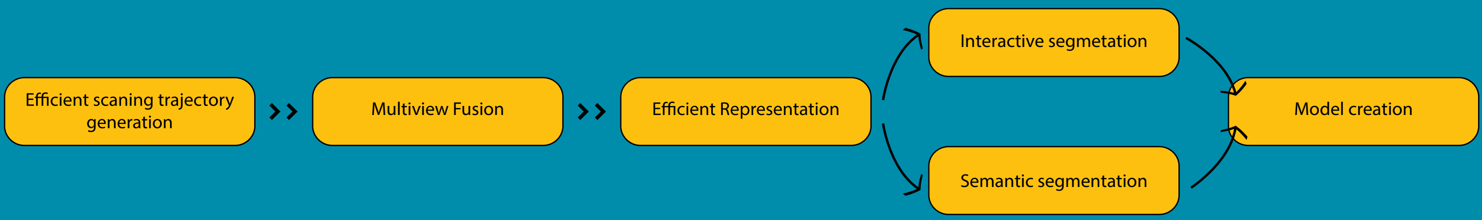
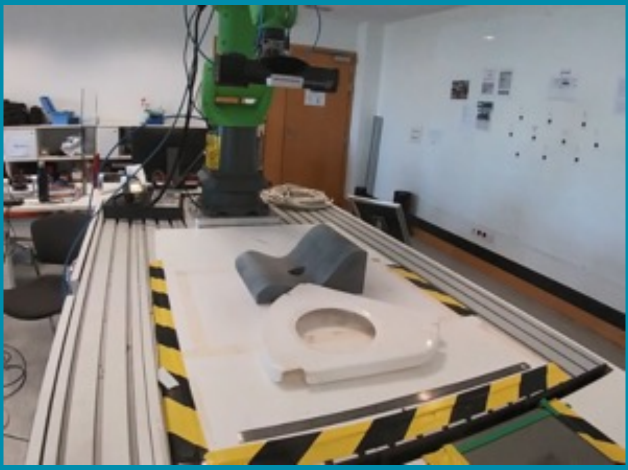
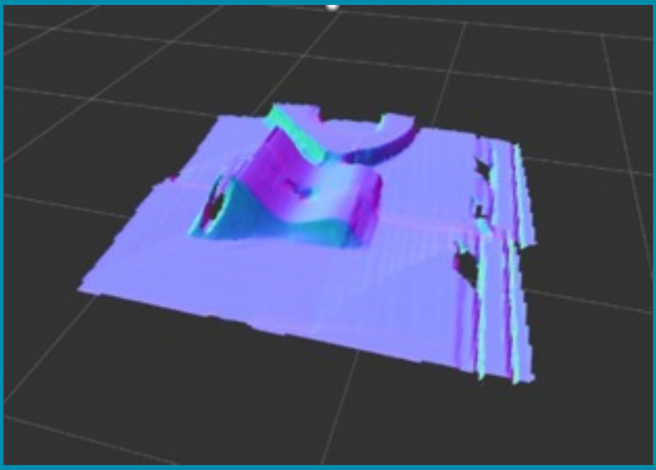
The model creation consists of the following steps:



Preliminary tests with smaller parts than the FAN COWL have been successfully conducted.





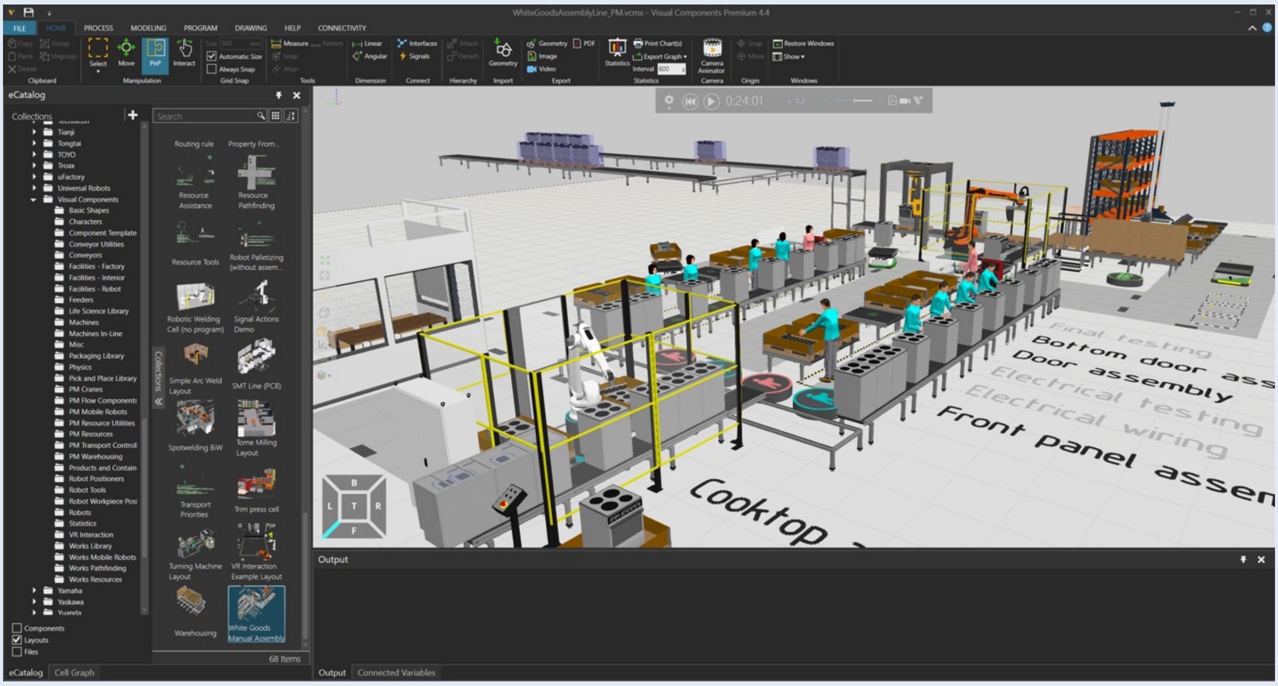
LOCALIZED INSPECTION

Inspection of specific features such as rivet insertion height, porosity, or painting will be done by a dedicated inspection method that uses specific hardware, for example a dedicated 2D camera sensor. The ODIN robot will be able to grasp the inspection sensor and place it in the positions where the inspection must be done. The setup phase to teach the robot the relevant position for each specific inspection will be done using the easy to program features to make it intuitive and friendly for the operator.

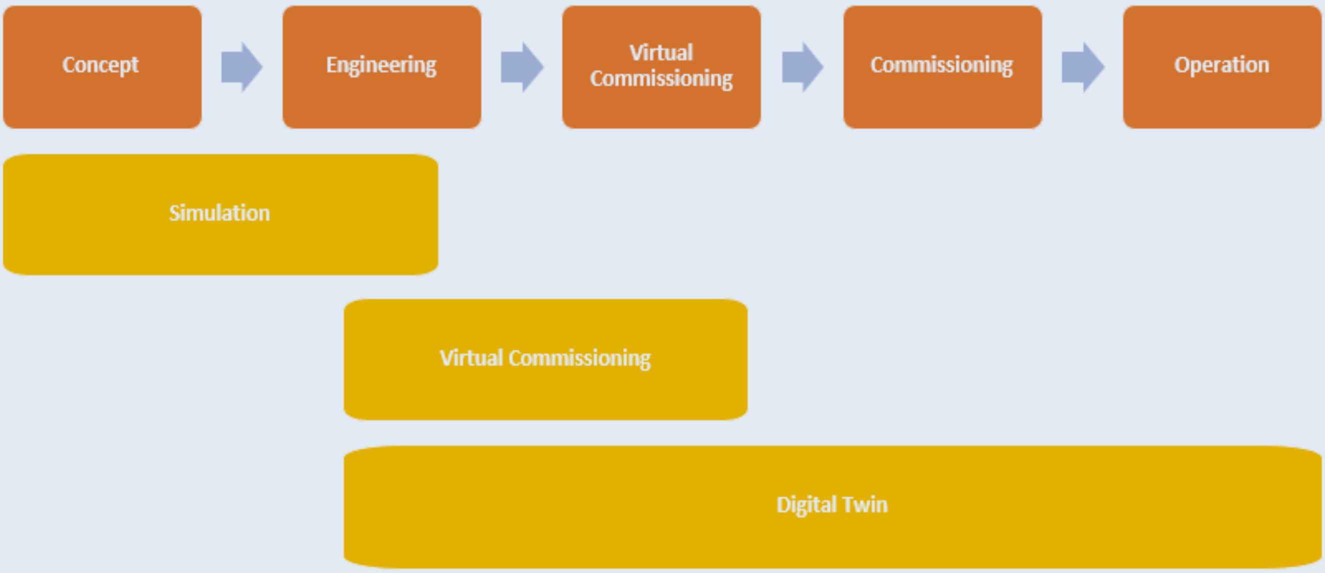
FROM CONCEPT TO OPERATION, HOW THE ODIN DIGITAL COMPONENT ENHANCES PRODUCTIVITY

ODIN Digital Component brings a new perspective for developing and deploying the new production system or enhancing the existing one. The digital component extends the integration of digital tools enabling the interoperability of the data models through the utilization of the digital description. The digital description contains the description of the components in a unified format used to create the simulation models.

The 3D simulation models are created in Visual Components 4.4, which provides the digital environment to build from user requirements and digital description of the virtual manufacturing system. Furthermore, Visual Components 4.4 deploys a library of commercial solutions available in the VC's online repository. The open interfaces extend the capabilities to tailor the digital components to the end-user requirements.



To deploy the process in ODIN, the implementation of digital simulation for the adaptable process verification follows a workflow parallel to the manufacturing system life cycle. During the concept phase, the requirements of the manufacturing systems, new or existing, are compiled, and the first digital models are created. The simulations are created during the concept phase, and the system's validity is verified within the simulation environment to reach requirements. Once the requirements have been met, the engineering phase starts combining simulations with the utilization of existing data sets available through historical data or connection to real and virtual systems to enable the digital twin. The connectivity to virtual and real controllers of the automation systems and robots enables the validation of code, initiating the virtual commissioning.
As a result, using the data models under development in ODIN in combination with the communication interface provided by OpenFlow provides an integrated environment to accelerate design, minimizing errors and enhancing productivity.



ODIN

Open-Digital-Industrial and **Networking** pilot lines using modular components for scalable production

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