AUTOWARE

European Commission

TECHNOLOGY CATALOGUE

EXTENDED VERSION

THE PURPOSE OF THIS CATALOGUE IS TO PROVIDE AN OVERVIEW OF THE INDUSTRY 4.0 SOLUTIONS DEVELOPED WITHIN THE AUTOWARE PROJECT

INTRODUCTION

The purpose of this catalogue is to provide an overview of Industry 4.0 solutions developed within the project. The goal is to help SMEs adopt Industry 4.0 technologies. This catalogue is seen as a valuable asset for SMEs that are interested in adopting technologies within Robotics and Automation, Cyber Physical Systems and IoT.

The catalogue will:

1. Provides an overview of the technologies and certifying platform offered by the AUTOWARE partners in the relevant technology areas.
2. Provides detailed descriptions of the technologies and the certification process which will enable SMEs to identify technologies that would be valuable to implement in their organization.

READING GUIDANCE

This catalogue consists of the technologies developed in AUTOWARE, where each technology is described on two pages. On the first page of each technology there is a description, a picture, technology areas, its target sectors, TRL and contact information. On the second page, detailed information about the technologies is presented.

REFERENCE ARCHITECTURE

The Autoware reference architecture illustrates how different technologies are related. The graphical overview of the AUTOWARE reference architecture is illustrated in Figure 1.

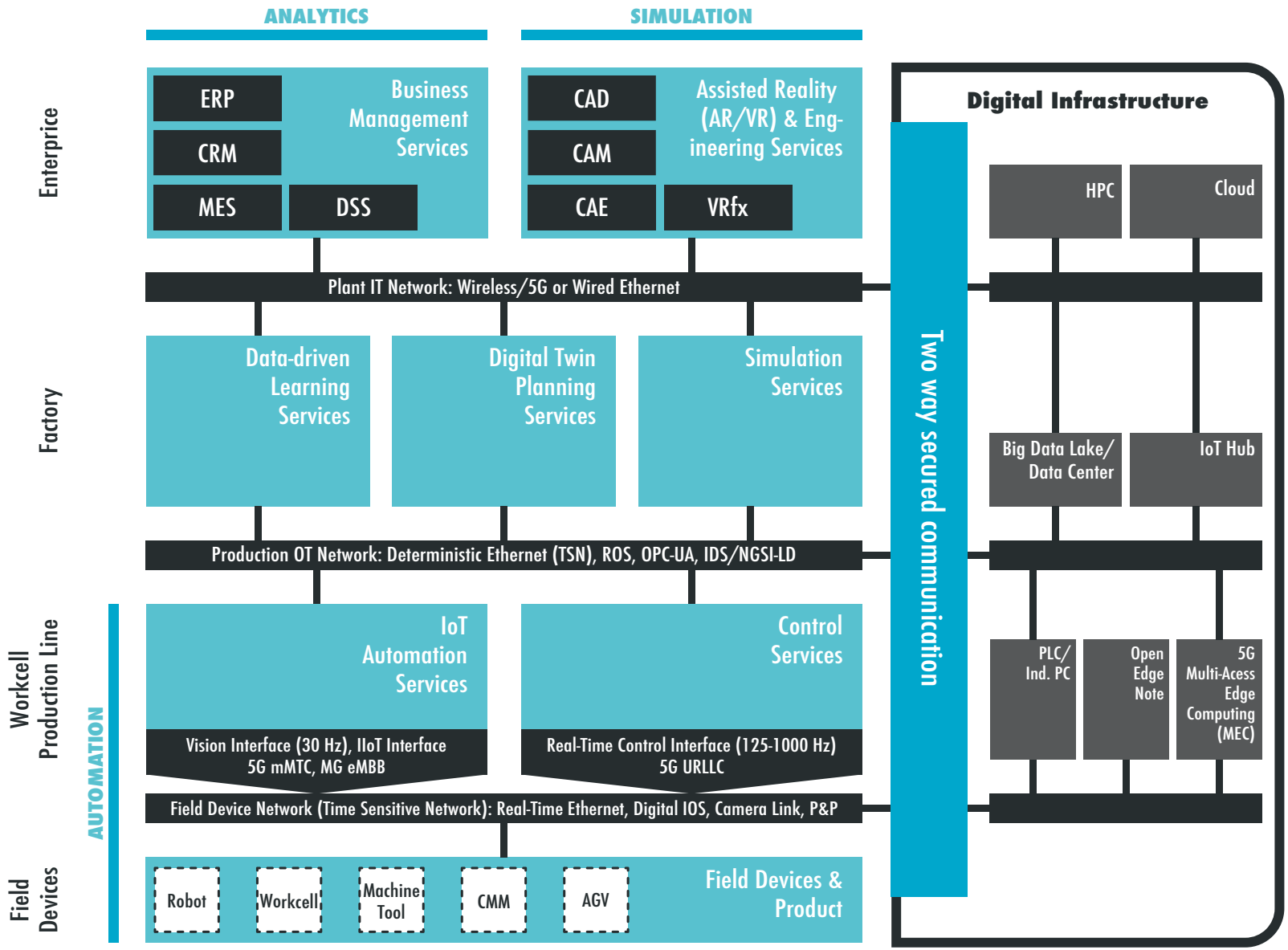

Figure 1: Reference Architecture

TABLE OF CONTENTS

1.0 FOG COMPUTING SOLUTION

PROVIDED BY TTTech

ABOUT THE TECHNOLOGY

The Fog Computing solution is an industrial IoT solution designed to converge and connect automation systems. It provides an open, flexible platform that reduces costs and delivers new value for machine builders, system integrators and plant operators. It can collect, store and analyze machine data and run multiple functions on one device. You can access real-time data from PLC and IO infrastructure. The Fog Computing Solution can manage and deploy software.

The Fog Computing Solution can be integrated in e.g. the robotic work cell as well as in other robotic industrial scenarios, aiming to facilitate intelligent automation.

AREA OF THE TECHNOLOGY

- Big data and analytics
- Augmented Reality
- Cyber-Physical-Systems
- Cloud computing
- Fog/Edge Computing

TARGETED INDUSTRIAL SECTORS

- Manufacturing
- Industrial automation
- Production facilities

TECHNOLOGY READINESS LEVEL

TRL 5 - technology validated in relevant environment

CONTACT INFORMATION

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TECHNICAL SPECIFICATIONS

SOFTWARE

- Operating System Support - Linux and Windows (as Virtual Machine)
- Soft PLC - CODESYS 3.5 (PROFINET Master/Slave, EtherCAT, Modbus TCP/IP)
- Database Time-Series Database locally and in the System Manager
- Datapath - OPC UA Client/Server and OPC UA PubSub
- Cloud Protocols - MQTT (with OPC UA broker), JSON
- Data Visualization - Grafana pre-loaded in System Manager
- Workload Management - VM and container repository in System Manager,
- VM and container management locally and in System Manager,
- Support for CODESYS Application Management
- User Management - Role-Based Access Control in System Manager,
- Local user management
- Displays - Remote Console View; Local and central display of VM, container, base system status
- Updates - OTA patching and bug fixes
- Alarms - RAM, CPU and temperature status alarms,
- Certificate expiry warning
- Security - According to ISO 62443 requirements

EDGE DEVICE (MFN 100)

- CPU - Intel E3940 4 cores, 4GB RAM Intel E3950 4 cores, 8GB RAM
- Storage - 64GB SSD MLC, 256GB SSD MLC, 512GB SSD MLC
- Fieldbus Interfaces - 1 x 10/100/1000 Mbit/s RJ45 (PROFINET, EtherCAT, Modbus TCP/IP)
- Ethernet Interfaces - 4 x 10/100/1000 Mbit/s RJ45
- USB - 2 x USB 2.0 (assignable to Virtual Machines)
- Output - 1 x Display Port (assignable to Virtual Machines)
- Mounting DinRail or wall mount
- Power - 2 x 24V redundant input,
- Maximum power consumption 33.6W
- Environmental - Intended for use in control cabinets,
- Operational temperature: -40°C to +70 °C,
- IP 40 according to IEC 60529,
- Dimensions (H x W x D) 177.5 x 75 x 141mm

ADVANTAGES OF THE TECHNOLOGY

COLLECT, STORE AND ANALYZE MACHINE DATA

- Real-time data access from PLC and IO infrastructure.
- Time-series database integrated in device software and in the system manager.
- Datapath functionality for manipulating and distributing data between different systems.
- Local and web-based user interface for data visualization.

RUN MULTIPLE FUNCTIONS ON ONE DEVICE

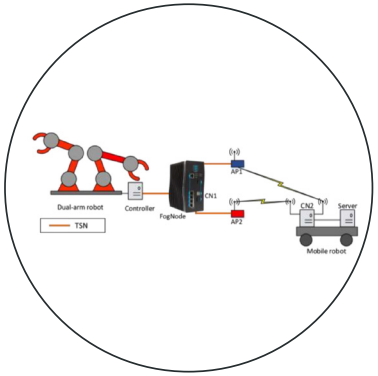
- Virtualized environment running Windows or Linux.
- Virtual Machines.
- Support for lightweight Docker containers.
- Soft PLC (CODESYS).
- Converge hardware based functions in software.

MANAGE AND DEPLOY SOFTWARE

- Central repository for containers, VM and CODESYS programs.
- Simultaneous deployment of workloads to multiple devices and locations.
- User management for device and software configuration.
- Local and web-based UI for software management.

2.0 INTEGRATION OF FOG COMPUTING SOLUTION

PROVIDED BY IK4 TEKNIKER
Research Alliance



ABOUT THE TECHNOLOGY

The open CPPS platform (i.e. Fog Computing Solution) will be integrated as a central station, where the configuration of the open platform will be performed with the usability enablers for programming and controlling the Fog Computing Solution. The Fog Computing Solution will act as a central point, where the different applications (e.g. data management) will be hosted on.

It enables communication between the different components in the production cell and easy multi-platform software communication. Also, it enables you to apply software updates to machines without needing to be on site.

AREA OF THE TECHNOLOGY

- Big data and analytics
- Cyber-Physical-Systems
- Cloud computing

TARGETED INDUSTRIAL SECTORS

- Manufacturing

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

CONTACT INFORMATION

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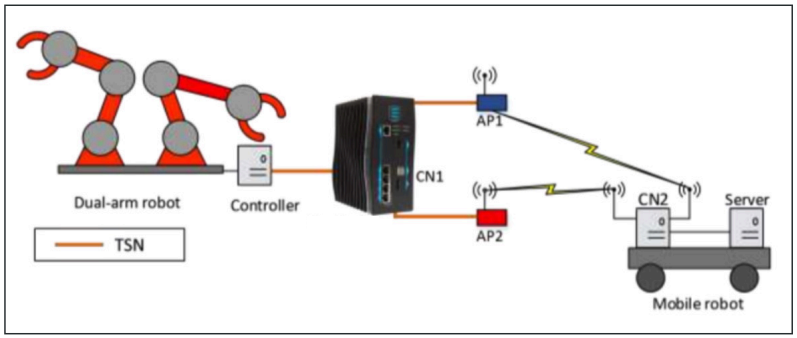
APPLICATION



The Fog Computing Solution is applied as the central point in a production cell, enabling communicating between the differerent components.

ADVANTAGES OF THE TECHNOLOGY

- Enables communication between the different components in the production cell.
- Easy multi-platform software communication (Linux, Windows, ...).
- Central management of device, enabling you to apply software updates to machines without needing to be on site.

PREREQUISITES

- Definition of software requirements/components (e.g. Linux, ROS,...) to be installed in the fog.

3.0 SMART DATA DISTRIBUTION

PROVIDED BY Consiglio Nazionale delle Ricerche

ABOUT THE TECHNOLOGY

Novel smart data distribution technological solutions which cooperate with cloud-based service provisioning and communication technologies. The solutions presented in AUTOWARE determine when it is appropriate to move data towards locations where services can be provided. In this context, AUTOWARE exploits storage and computation resources on various elements of the industrial network. AUTOWARE decentralized data management and distribution proposals also contribute towards the design of automation processes that are more capable to dynamically reconfigure. To achieve these objectives, the designed data management and distribution schemes provide distributed methodologies and smart algorithms to dynamically move data based on the requirements of the applications (e.g., time-sensitive control tasks), while optimizing resources of the manufacturing environment (e.g., the energy consumption of industrial IoT devices).

AREA OF THE TECHNOLOGY

- Internet of Things
- Cyber-Physical-Systems
- Big Data
- Industrial Networks

TARGETED INDUSTRIAL SECTORS

- Manufacturing
- Agriculture
- Asset Tracking
- Production Control

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

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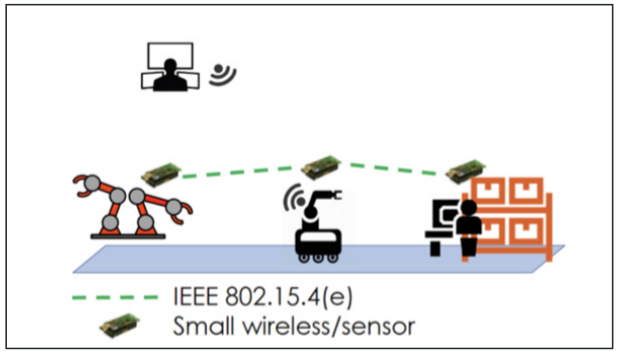


Data management in industrial and manufacturing networks, satisfying the emerging Industry 4.0 requirements

FEATURES

NETWORK COMPONENTS

- IoT-enabled data producers and consumers
- Edge data caching nodes
- Data management layer

ALGORITHMIC MANAGMENT

- Data proxy selection and placement
- Network lifetime and end-to-end data accesslatency optimization
- Dynamic data path reconfiguration

DATA

- Hard/soft data access latency constraints
- Average and maximum latency guarantees
- Different data type support

ADVANTAGES OF THE TECHNOLOGY

- Cost-effective operations
- Fault tolerance
- Dynamic, plug&play smart data distribution solutions

PREREQUISITES

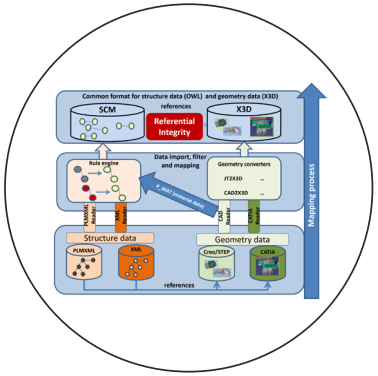
- Existence of an underlying multi-hop network topology
- Diverse networking protocol support
- Centralized and distributed solutions
- Low complexity network-wide data distribution

TRAINING NEEDED

- Training on algorithmic aspects of networks and on practical network configuration technologies.

4.0 SEMANTIC WORKFLOW MODELLING

PROVIDED BY Fraunhofer



ABOUT THE TECHNOLOGY

The semantic workflow modelling service foresees to make existing product engineering and production planning data available for secondary use, namely for cooperative assembly tasks. By retrieving product engineering data (i.e. 3D CAD files) and production planning data (i.e. structured textual data describing the manufacturing execution and the assembly process) from a company's Product Lifecycle Management (PLM) system, the service will generate a semantic description of the assembly process incorporating the 3D representations of the assembly steps.

AREA OF THE TECHNOLOGY

- Cyber-Physical-Systems

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing
- Production facilities
- Computer - Software

TECHNOLOGY READINESS LEVEL

TRL 7 - system prototype demonstration in operational environment

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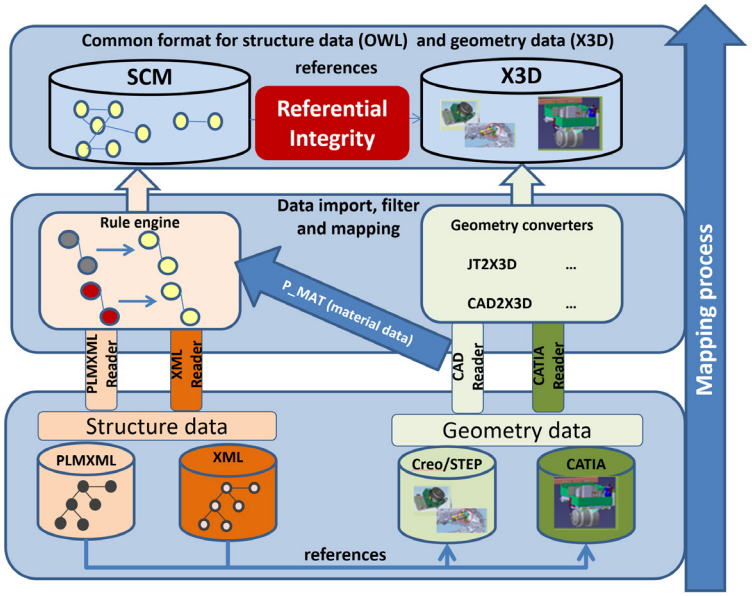


The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

FEATURES

- Automatic extraction of product engineering and production planning data for individualized products or prototypes.
- Provide a consistent semantic mapping of product engineering and production planning data including 3D virtual models of tools and assembly parts on cognitive models.

ADVANTAGES OF THE TECHNOLOGY

- Facilitates cooperative assembly by collecting, managing and processing data from a company's Product Lifecycle Management system.
- Making production data available for secondary use.

PREREQUISITES

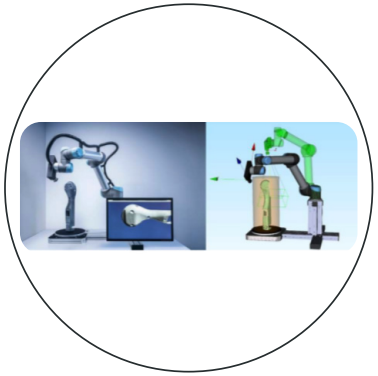
- Usage of Protégé as database management system
- Product Engineering Data
- Production Planning Data

TRAINING NEEDED

- Training in working with Protégé.

5.0 DUAL REALITY MODELLING

PROVIDED BY Fraunhofer



ABOUT THE TECHNOLOGY

The dual reality modelling service allows enriching dynamic virtual environments with virtualized physical production environments (Augmented Virtuality). In doing so, it uses 2D/3D sensor data and relies on a continuous mapping of the current state of the real world onto the virtual world and vice versa. This includes virtualizing the behaviour of objects from the real world and realizing the behaviour of objects from the virtual world. Realizing virtual objects does not necessarily mean to materialize virtual objects using additive manufacturing technologies. Realizing the behaviour of virtual objects can also mean that real physical production environments directly react to virtual objects.

AREA OF THE TECHNOLOGY

- Augmented Reality
- Cyber-Physical-Systems

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing
- Production facilities
- Computer - Software

TECHNOLOGY READINESS LEVEL

TRL 7 - system prototype demonstration in operational environment

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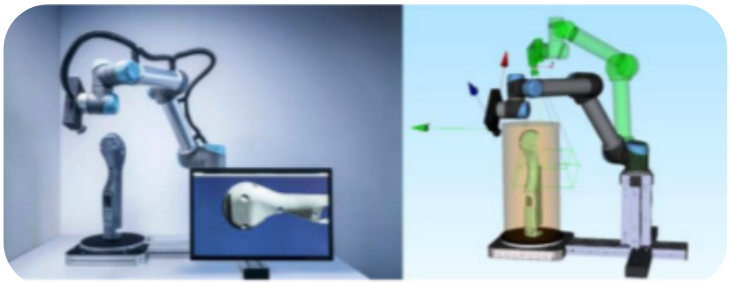

The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

FEATURES

- Synchronization of real physical production environments and the virtual world
- Virtualizing objects from the real world
- Realizing objects from the virtual world

ADVANTAGES OF THE TECHNOLOGY

- Provides a platform facilitating the merging of virtual environments with real physical objects

PREREQUISITES

- Data of virtual environment
- Data of virtual objects
- Sensor to capture environment

6.0 SENSOR PROCESSING

PROVIDED BY Fraunhofer

ABOUT THE TECHNOLOGY

A 3D optical sensor based on structured laser light (line sectioning and space-time analysis) that supports two different scanning modes: the first for coarse and fast scanning of larger parts and the second for slower but precise scanning at marked positions. The technology includes an initial self-configuration of the system and is essential for robot trajectory and view planning that enables autonomous 3D scanning.

The required user interaction is reduced to placing a known calibration target board on the turntable. Then the robot autonomously carries out the calibration procedure. After the calculation, 3D scanning data can be reconstructed and merged within the common turntable coordinate system and forwarded to other processing services.

AREA OF THE TECHNOLOGY

- Autonomous Robots
- Cyber-Physical-Systems
- 3D Scanning

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing
- Production facilities
- Computer - Software

TECHNOLOGY READINESS LEVEL

TRL 4 - technology validated in lab

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APPLICATION

The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

TECHNICAL SPECIFICATIONS

- HxLxW 9cm x 23cm x 14cm
- Weight: about 1 kg
- Payload: 3A
- Power: - +15,- 15, +5, 0 Volt
- Port: USB 3.0

FEATURES

- Software-defined adaptive 3D scanning with high degree of control of what and how to scan: Measurement modes with single scan lines, full or partial 3D scans, and targeted 2D images / illuminated photos of object parts
- Arbitrary lateral resolution, with triangulation accuracy up to ~ 50 micron (0.05 mm)
- Stand-alone usage possible, but superior in combination with the analysis control software and feedback data processing for adaptive scanning and surface analysis

ADVANTAGES OF THE TECHNOLOGY

- Higher flexibility than conventional black box scanners
- Allows adaptive refinement of the scanning process at any point while scanning even for a priori unknown object shapes
- Minimalistic hardware design for optimal near real-time performance
- Optimal use of the limited data transfer bandwidth between optical sensors and processing host to boost scanning time

PREREQUISITES

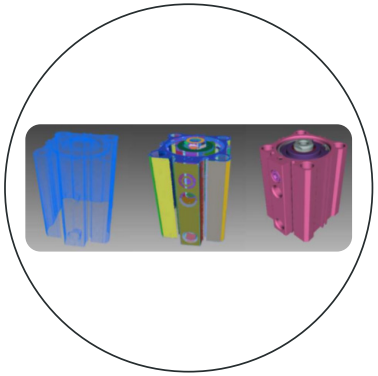
- Compatible robotic system with high timing and positioning accuracy, both affecting the maximum overall system accuracy

TRAINING NEEDED

- Control software for system either in stand-alone mode or coupled with analysis module

7.0 3D OBJECT RETRIEVAL & RECOGNITION

PROVIDED BY Fraunhofer



ABOUT THE TECHNOLOGY

Many existing shape representations describe actual shapes, with visual and material properties. However, applications often require enhanced shape properties. For example, shape structure information, such as segmentation or label information, can help to relate the parts of a shape to each other. The 3D Object Retrieval and Object Recognition service can use engineered but also learned features in order to classify and recognize 3D objects. This involves also semantic segmentation by fitting geometric primitives in discrete geometric representations. This allows for automatic state recognition and enables the alignment of real-world conditions with the digital world.

AREA OF THE TECHNOLOGY

- Big data and analytics

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing
- Production facilities
- Computer - Software

TECHNOLOGY READINESS LEVEL

TRL 4 - technology validated in lab

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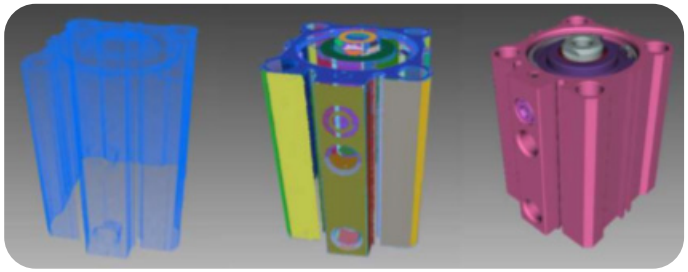


The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

FEATURES

- Extraction & description of geometric features for CAD models and 3D scans
- Classification of 3D scans

ADVANTAGES OF THE TECHNOLOGY

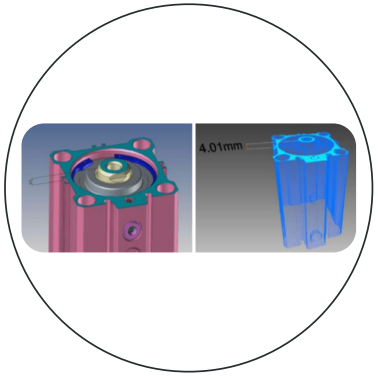
- The system provides enhanced shape properties required by various applications, allowing for automatic state recognition and thus the alignment of analog conditions with the requirements of the digital world.

PREREQUISITES

- 3D CAD model reference database representing the 3D geometry of parts and tools used in the assembly process
- 3D scan of object

8.0 3D QUALITY CONTROL

PROVIDED BY Fraunhofer



ABOUT THE TECHNOLOGY

With this service, the user is relieved from doing a manual check of dimensions after the completion of assembly steps. The quality control service requires an annotated 3D CAD model with measurement details and a 3D point cloud of the real object. The service automatically retrieves the measurement details, which are involved primitives e.g. planar segments, the expected distance between the primitives and allowed tolerances. Therefore, this service realizes the automatic transfer of information embedded in CAD models to qualify the services. As an output, the user receives the results of the measurement and a statement of whether the measurement result is in the predefined tolerance range.

AREA OF THE TECHNOLOGY

- Big data and analytics
- Cyber-Physical-Systems

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing
- Production facilities
- Computer - Software

TECHNOLOGY READINESS LEVEL

TRL 4 - technology validated in lab

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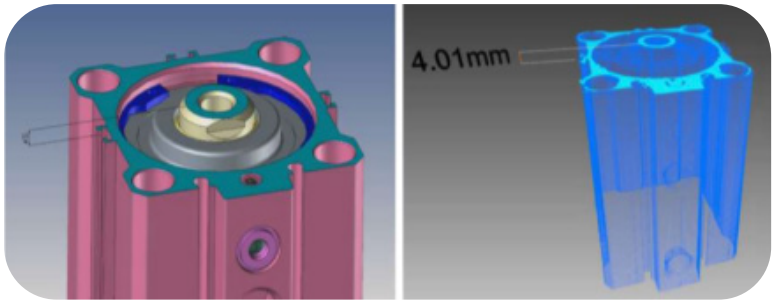
APPLICATION



The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

FEATURES

- Segmentation of annotated 3D CAD models
- Extraction of annotations, e.g. product manufacturing information (PMI)
- Segmentation of 3D scans
- Correspondence analysis: registration and mapping
- 3D measurement in 3D scan

ADVANTAGES OF THE TECHNOLOGY

- Relieving the human from cognitive demanding examining tasks
- Objective quality assessment
- Higher product quality through automated measurements

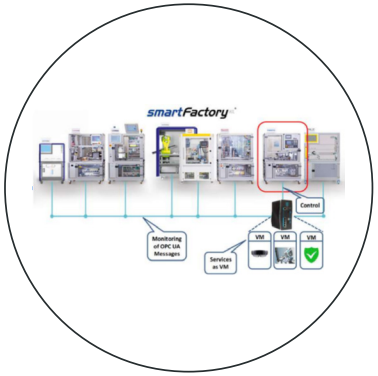
PREREQUISITES

- Annotated 3D CAD Model with measurement details, e.g. PMI
- 3D scan of object

TRAINING NEEDED

- Introduction on describing model quality requirements

9.0 NEUTRAL COGNITIVE DIGITAL AUTOMATION PROCESS EXPERIMENTATION INFRASTRUCTURE



PROVIDED BY smartFactory KL

WILLKOMMEN IN DER ZUKUNFT DER INDUSTRIELLEN REVOLUTION

ABOUT THE TECHNOLOGY

In the neutral test factory SmartFactoryKL, the Fog Computing Solution is attached in the edge layer. This is integrated with the infrastructure of the individual production modules, more precisely with the industrial M2M (Machine-to-Machine) communication protocol according to the OPC (Open Platform Communication) specification, with which the production modules communicate with the higher-level MES (Manufacturing Execution System) system. These transmitted messages can be evaluated and processed in the Fog Computing Solution.

AREA OF THE TECHNOLOGY

- Big data and analytics
- Augmented Reality
- Cyper-Physical-Systems
- Cloud computing

TARGETED INDUSTRIAL SECTORS

- Research & Development
- Manufacturing

TECHNOLOGY READINESS LEVEL

TRL 5 - technology validated in relevant environment

CONTACT INFORMATION

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APPLICATION

The technology can be applied in:

- Flexible manufacturing systems
- Industrial experimentation site
- Digital modelling and design of CPPS

ADVANTAGES OF THE TECHNOLOGY

- Real-time capable visualization of the production plant (a “digital twin” of the plant) and can be accessed via compatible web browsers at any time and from any location. This makes it possible to obtain information remotely about the current status of the system.
- A data goggle (in this case a Microsoft Hololens) is used to provide the operator with an insight into the internal processes of the modules without having to actively shut them down and open them.

10.0 ACTIVE PRODUCT MEMORY

PROVIDED BY smartFactory KL

WILLKOMMEN IN DER ZUKUNFT DER INDUSTRIELLEN REVOLUTION

ABOUT THE TECHNOLOGY

The Active Product Memory services as an extension of the common product memory used in SmartFactory. This consists of an RFID chip attached to the test product. This product memory stores all the information required to manufacture this individual product when an order is received. In the further course of production, RFID readers/writers are attached to the processing stations, which are divided into production modules in the SmartFactory. They read the RFID chip of the product and check which production step they have to carry out and whether they are capable of doing so. Once the associated machining process has been completed, this is recorded in the locally stored product memory of the associated product. In this way, the product independently finds its way through the production process. Missing or superfluous processing steps can therefore not happen. Likewise, no information can be lost or incorrect processes carried out on the product.

AREA OF THE TECHNOLOGY

- Big data and analytics
- Cyber-Physical-Systems
- Internet of Things

TARGETED INDUSTRIAL SECTORS

- Agile manufacturing

TECHNOLOGY READINESS LEVEL

TRL 5 - technology validated in relevant environment

CONTACT INFORMATION

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APPLICATION

The Active Product Memory can be applied in agile manufacturing facilities, where the goal is to reduce errors and at the same increase swiftness of the production process.

ADVANTAGES OF THE TECHNOLOGY

- Error reduction in the production processes, due to the active product memory ensuring that all necessary process steps will be carried out
- Reducing the need for human intervention in the production process

11.0 MACHINE LEARNING

PROVIDED BY

ABOUT THE TECHNOLOGY

Deep learning based computer vision - ROBOVISION has configured deep learning systems and associated tools to create novel machine vision systems, which are applied in the use-cases. More specifically, in a first phase, the machine learning system data needs to be collected related to the process. This data can be separated into two categories: human annotation (labels) and associated image data. Obtaining relevant labels is a costly process, for this ROBOVISION has developed solutions in its RVAI platform. In a second phase, the system needs to be trained, for which ROBOVISION uses the latest deep learning advances. This novel technology offers the possibility to use vision-based algorithms based on combinations of complex features such as shape, form, colour and can be reconfigured to recognize new products, as demonstrated in the STORA ENSO simulation use case.

AREA OF THE TECHNOLOGY

- Machine and Deep Learning Applied
- Vision Technology
- Artificial Intelligence

TARGETED INDUSTRIAL SECTORS

- Recycling industry
- Carton Sorting and Picking
- Generalized anomaly detection to support process quality control

TECHNOLOGY READINESS LEVEL

TRL 7 - system prototype demonstration in operational environment

CONTACT INFORMATION

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APPLICATION

This novel technology offers the possibility to use vision based algorithms based on combinations of complex features such as shape, form, colour and can be reconfigured to recognize new products, as demonstrated in the STORA ENSO use case.

ADVANTAGES OF THE TECHNOLOGY

- Cognitive vision distinction between different objects in the materials to recycle inflow.

PREREQUISITES

- Stable light conditions working environment
- Models need to be trained with reference data/images (500+) corresponding to the target environment
- State-of-the-art CPU/GPU system
- Camera system (and lights) suited to the particular application

12.0 GPFLOWOPT

PROVIDED BY imec

ABOUT THE TECHNOLOGY

IMEC has developed GpflowOpt, a novel Python framework for Bayesian optimization, which can be viewed as a modern spin-off of the widely used SUMO-toolbox.
GpflowOpt allows the user to speed up expensive simulations or the tuning of deep learning vision systems. In the latter case, it achieves this by replacing such as grid-search by optimized sequential parameter tuning, drastically reducing the training time of such systems while achieving better or equivalent performance.
The software has been adopted to allow more accurate paper-cardboard separation by among others more efficient tuning of deep learning vision technology and the ability to process diverse compositions of paper-cardboard of varying quality by rapid reconfiguration.

AREA OF THE TECHNOLOGY

- Machine Learning
- Surrogate modelling
- Bayesian Optimization
- Hyperparameter tuning of machine learning systems

TARGETED INDUSTRIAL SECTORS

- Engineering
- 3D printing
- Automotive
- Recycling industry

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

CONTACT INFORMATION

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APPLICATION

Briefly, the envisioned main outcome of the use case is the adoption of AUTOWARE technologies to allow more accurate paper-cardboard separation by among others deep learning vision technology and the ability to process diverse compositions of paper-cardboard of varying quality by rapid reconfiguration of such systems to the incoming batches.

ADVANTAGES OF THE TECHNOLOGY

- Drastically reduce expensive simulation wall-time
- Efficiently hypertune deep learning architectures

PREREQUISITES

- Python software package

TRAINING NEEDED

- Tutorials available online

PRICE

Apache License 2.0

13.0 PROGRAMMING BY KINESTHETIC TEACHING

PROVIDED BY Institut "Jožef Stefan"

ABOUT THE TECHNOLOGY

Programming by kinesthetic teaching allows for specifying and editing complex robot trajectories in a natural, user-friendly way. With the help of incremental learning, only certain parts of the trajectory can be changed. Using this technology does not require any special knowledge of robotics.

AREA OF THE TECHNOLOGY

- Robotics

TARGETED INDUSTRIAL SECTORS

- Automotive
- Aerospace
- Electronics
- White goods
- Footwear and textile
- Research & Development

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

CONTACT INFORMATION

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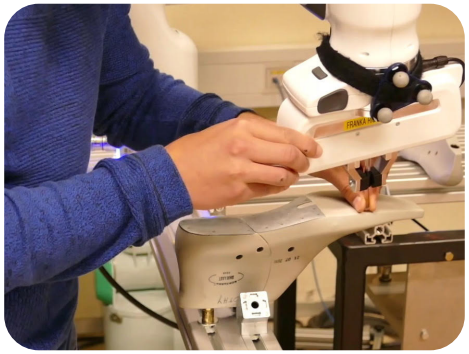
APPLICATION



The enablers are implemented in the JSI neutral facility cell and the applicability is demonstrated and presented in various use cases provided by manufacturing companies. Nonetheless, the nature of the enablers make them useful and operable in any CPPS scenario using ROS based control and involving robots.

ADVANTAGES OF THE TECHNOLOGY

- Faster deployment of new tasks/skills in a robotized work cell.
- Enables the integration of advanced digital technologies into the production processes of manufacturing companies.

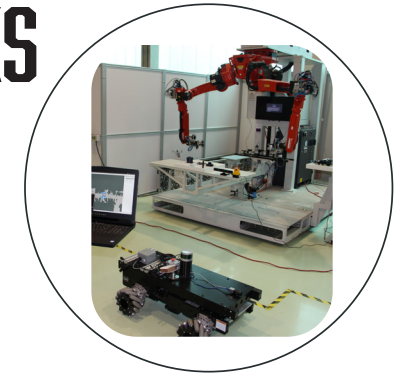
PREREQUISITES

- This technology can be applied to most of the existing collaborative robots
- A collaborative robot, for example Franka Emika Panda, Kuka LBR iiwa, e-Series Universal Robots, etc.
- Speed-Scaled Cartesian Dynamic Movement Primitives software package

PRICE

1000 EUR

14.0 RELIABLE INDUSTRIAL WIRELESS NETWORKS



PROVIDED BY

UNIVERSITAS Miguel Hernández

ABOUT THE TECHNOLOGY

This service provides reliable wireless communications for industrial IoT applications. The designed solution includes the dimensioning, planning and deployment of WiFi-based industrial wireless networks with the reliability and deterministic latency levels demanded by industrial IoT applications. To this aim, the solution exploits diversity and redundancy to establish diverse wireless links between industrial nodes. The developed solution can be configured to select the link with best communication quality between nodes (diversity) or to establish redundant links for additional robustness (redundancy). Both approaches augment reliability, reduce latency and reduce loss of coverage in industrial environments. The designed solution can also support reliable and low latency communications with mobile nodes in industrial IoT networks. The designed solution includes the integration of Communication Nodes (CN) with the industrial nodes in the shop-floor that must be connected.

AREA OF THE TECHNOLOGY

- Industrial Wireless Communications
- Industrial Internet of Things
- Cyber-Physical-Systems

TARGETED INDUSTRIAL SECTORS

- Agile manufacturing
- Manufacturing
- Production facilities
- Industrial automation

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

CONTACT INFORMATION

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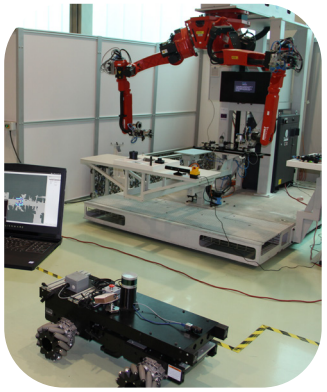
APPLICATION



The reliable and robust wireless communication service is developed to support mobile industrial applications that require a reliable and robust communication link between fixed robot/controller and mobile robots.

TECHNICAL SPECIFICATIONS

- IEEE802.11 technology at the 2.4GHz or 5GHz band.
- Deployed communication nodes (CN) operating under Linux.
- CN nodes operating with two wireless interfaces.

ADVANTAGES OF THE TECHNOLOGY

- Provides reliable wireless communications in industrial environments
- Supports deterministic communication latency levels
- Facilitates agile and reconfigurable industrial environments.
- Supports wireless connectivity with mobile industrial nodes
- Eliminates link outages in harsh industrial environments
- Combats possible wireless interference.

PREREQUISITES

- Availability of Internet connectivity in the shopfloor.
- Capacity to deploy several Access Points (APs) in the shopfloor.
- Possibility to integrate external communication nodes (CN) at the industrial nodes that must be connected. An Ethernet interface is necessary for the integration.

15.0 DIGITAL AUTOMATION

PROVIDED BY

ABOUT THE TECHNOLOGY

Digital automation solutions put stress on safe and secure operation of future workplaces. Traditional certification approaches are not well suited for modular production lines and collaborative reconfigurable robotic cells. Existing standards need to be adapted to the new 4.0 reality. Fast and cost-effective validation, verification and certification of new developed technologies for manufacturing 4.0 is a must for their integration in a factory. The certification laboratory takes advantage of previously developed frameworks (e.g. Q-mobile, Mango Apps) and it is fully compliant to ISO 17025 operational procedures. It is flexible to validate performance, scalability, OT/IT safety and security of Industry 4.0 base technologies and can be customized to the validation of application specific deployments in any industrial sector.

AREA OF THE TECHNOLOGY

- Industrial Communications
- Fog/Edge Computing
- Robotic Systems
- Cybersecurity & Safety
- Computer Vision Technologies
- Cloud Computing
- Big data and analytics
- Mobile Solutions

TARGETED INDUSTRIAL SECTORS

- Manufacturing
- Production Facilities
- Metrology
- Industrial Automation
- Railway
- Pharma

TECHNOLOGY READINESS LEVEL

TRL 6 - technology demonstrated in relevant environment

CONTACT INFORMATION

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APPLICATION

Q-Digital automation validates autonomous solutions and infrastructures for a specific use under certain conditions, normatives, standards etc., ensuring safe operation of customised deployments and reducing the ramp-up time of digital shopfloor services implementation.
Q-Digital Automation reports include all information and documentation related for its correct configuration, programming, execution and maintenance, as well as their validation for purpose profiles.

FEATURES

- Mango Apps
- Q-mobile
- Q-VAL
- AgileRec

ADVANTAGES OF THE TECHNOLOGY

The certification framework advocates for a modular approach, where core components are certified for concrete usage scenarios and the specific adaptation to tailor the solutions deployed is actually validated or certified at the factory shopfloor. The certification framework therefore reduces certification time of complex adaptive production lines from years to a matter of weeks or months. Remote managing of the certification process.

PREREQUISITES

- Solutions that are ready to be used and certified.

TRAINING NEEDED

- Tutorial available online

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