fortiss

Danish-Bavarian Workshop on Robotics/ICT in Horizon 2020

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fortiss

fortiss
Landesforschungsinstitut des Freistaats Bayern
An-Institut Technische Universität München

A brief overview of fortiss

Bavarian research institute with a focus on computer science

Research Institute of the Free State of Bavaria

Affiliated Institute of the Tech. Univ. Munich

Research on methods of

- Software development
- Systems & service engineering
- Robust AI-based solutions
- Reliable, secure cyber-physical systems

Transfer to industry, in particular SMEs

Bavarian Center for Applied AI

IBM fortiss Center for AI

DIH Munich

Innovation Hub for Applied AI

3
offices in Munich

180
employees

60
running research projects

150
current research partners

AI-related services of fortiss

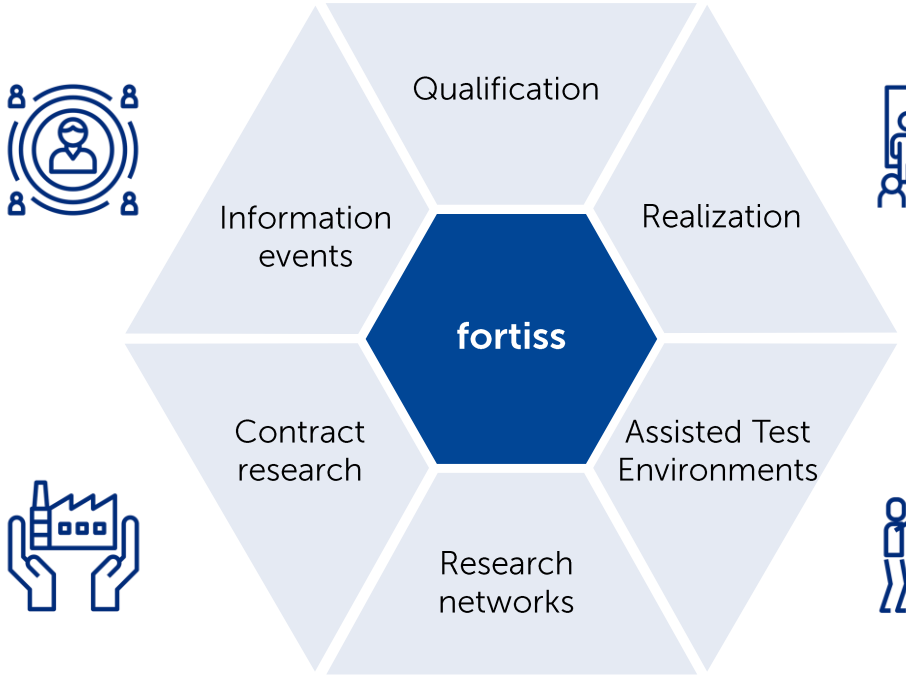
Overview

Training courses, seminar series, hands-ons, tutorials

Events to impart theoretical knowledge and practical experience on current technologies

Meet-Ups, Symposia

Open event with lectures about the latest research results, demonstrations, hands-ons and networking opportunities. Example: Conference “AI for SMEs” with 160 participants



Coachings, quick checks, analyses of AI solutions' potential

Company-specific workshops for the individual further development of employees and discussion/exploration of problems and its solutions

Individual solution

Individual company solutions - with a research character - such as the development of prototypes can also be developed specifically for companies.

Developing own solutions/Prototyping

Provision of hardware and software infrastructures for companies to try out and test new technologies

Public funded projects

Research partner for companies within the framework of joint research projects and support for research-relevant issues

DIH Munich

Munich Innovation Hub for Applied AI

Co-financed by the Connecting Europe Facility of the European Union

Vision and mission

The DIH Munich provides AI-related services from exploration to business solution to foster digital expertise

Jointly operated by

fortiss

UNTERNEHMER TUM

MSRM TUM

Key AI expertise

Machine Learning
Deep learning, reinforcement learning

Reasoning & decision making
Planning/scheduling, search/optimization, knowledge representation

Robotics
Control, perception, sensors and actuators, integration in cyber-physical systems

Key AI services

- Consulting
- Start-Up creation and support
- Qualification
- Realization
- Assisted test environments
- Contract research
- Research networks
- Partner platform activities
- Information events
- Exchange & education
- Engineering
- Analyses of AI solutions' potential

https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool/-/dih/12409/view

Robotics

- Natural human-robot interaction
- Intuitive instruction for users without expert knowledge in robotics
- Flexible production of small lot sizes
- Knowledge-based Digital Engineering
- Software & systems engineering for robotics

Research topics

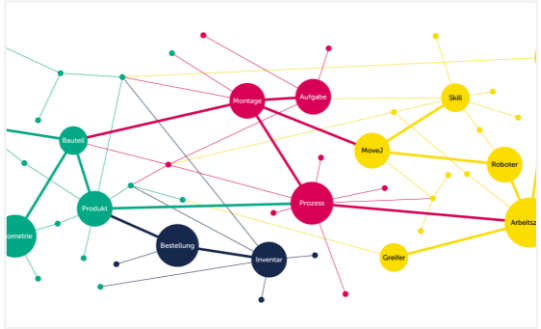
From high-level reasoning to low-level control

Human-centric robot instruction

Robust recognition of human input through fusion of various input modalities

Intention recognition & dialog management

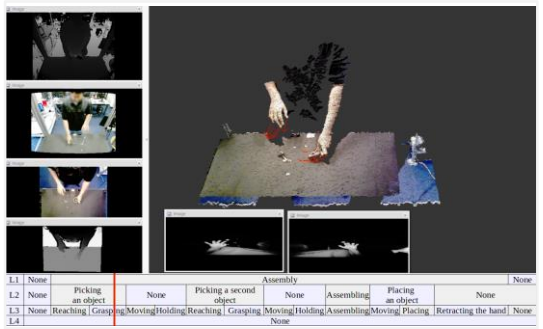
Social aspects of HRI



Semantic integration of heterogeneous engineering data

Linking of data for automatic generation of robot programs

Rich semantic context information of all aspects from design, engineering, and execution

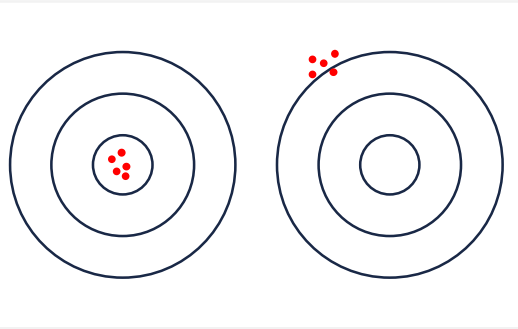


Integration of symbolic & subsymbolic AI techniques

Bridging the gap between different reasoning approaches

Plausibility checking on subsymbolic decision making

Leveraging symbolic models in subsymbolic learning



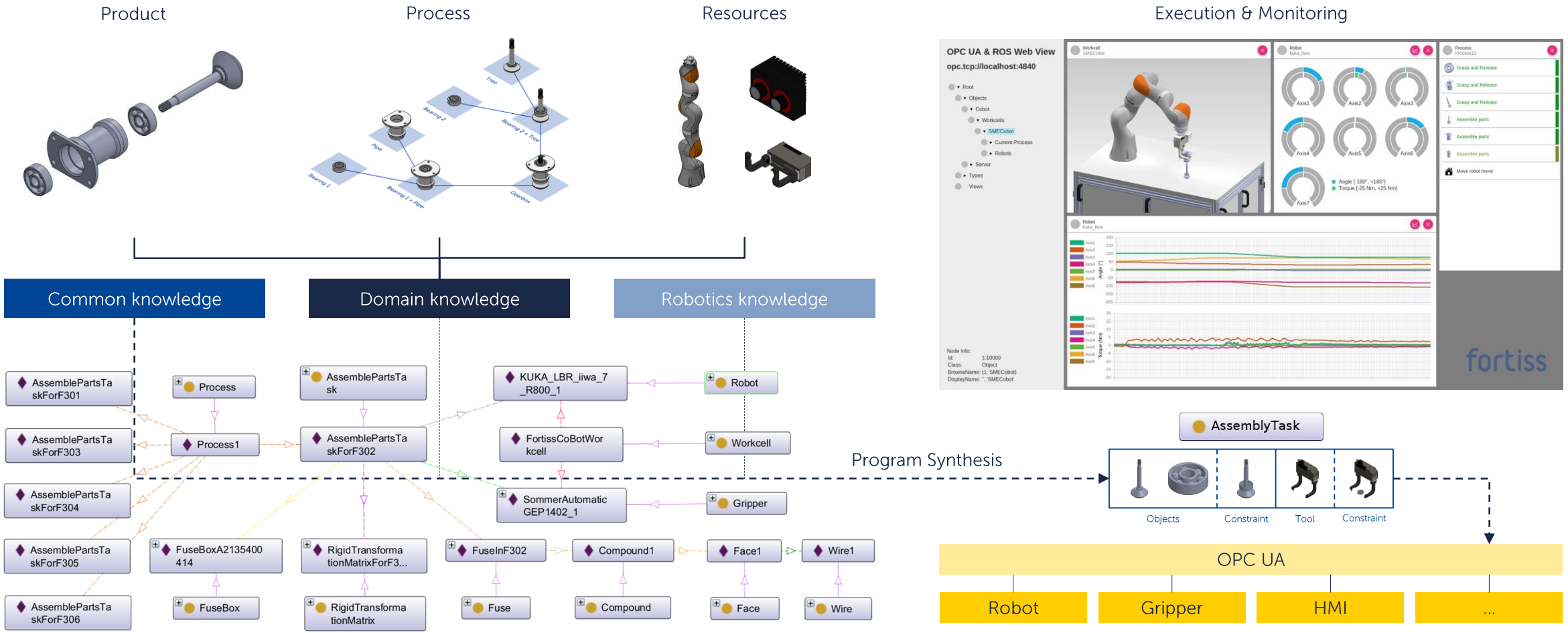
Generation of robust robotic control programs

Handling of uncertainty in product models, sensor signals, algorithms, and actuators

Unstructured and uncertain environments

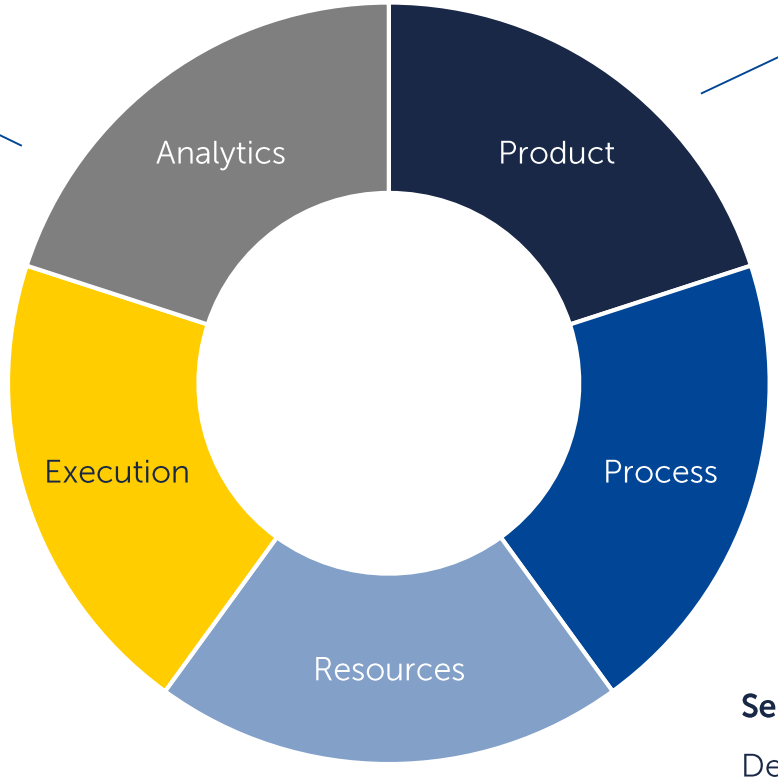
Example: Product-centric instruction of robots

Knowledge-based program synthesis for small lot production



Digital engineering

A model-driven development approach



Semantic Data Acquisition

Process & Raw Data Model

Sensor Fusion

Semantic Product Models

Geometric Model

Variant Models

Semantic Process Models

Task Taxonomy

Task Sequence

Partial Ordering

Task Requirements

Synthesis & Deployment

Skill Composition

Program Synthesis

Workcell Simulation

Semantic Resource Models

Device Taxonomy

Resource Capabilities

Geometric & Kinematic Model

Layout & Topology Model

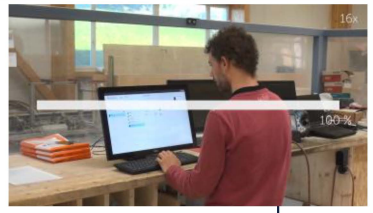
Applications & evaluation

Recent use cases

Gearbox assembly

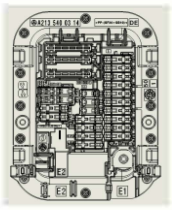
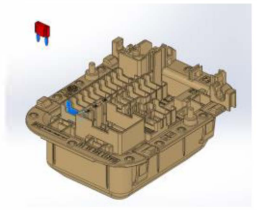
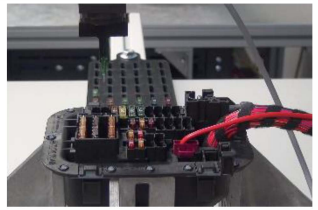

	TeachPad	Intuitive
Programing of assembly task from scratch (4 parts)	**48 min.**	**8 min.**
Adaptation of object positions in existing program	23 min.	0 min.
Adaptation of process parameters (approach pose for 2 objects)	5 min.	2 min.

Woodworking

	TeachPad	Intuitive
Programming of process of wood domain from scratch (2 pick & place operations, 10 nailing lines, 4 sawing lines)	**47 min.**	**14 min.**
Adaptation of order of existing program	1.5 min.	0.2 min.

Fuse insertion

Project "Data Backbone" (ZD.B/StMWi Bavaria)
Partner: Lisa Dräxlmaier GmbH
Semantic integration of relevant data along value chain
Automatic generation of process models based on incoming orders and available knowledge
Automatic deployment, execution, and monitoring of modelled processes in automation workcells

What we are looking for

Project partners, end users, use cases

In particular for the following open calls and topics:

ICT-46-2020 (RIA)

- AI and Cognition
- Socially cooperative human-robot interaction
- Model-based design and configuration tools

ICT-46-2020 (IA)

- Agile production

ICT-47-2020

- Development of variable autonomy systems that significantly extend and enhance the operator's awareness of the working environment. Sharing autonomy between a human operator and a robot can speed up operations and raise productivity.

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