FINNISH LEARNINGS FROM ACTIVITIES IN THE GERMAN MARKET

Smart Factory Germany – Webinar
16.06.2020

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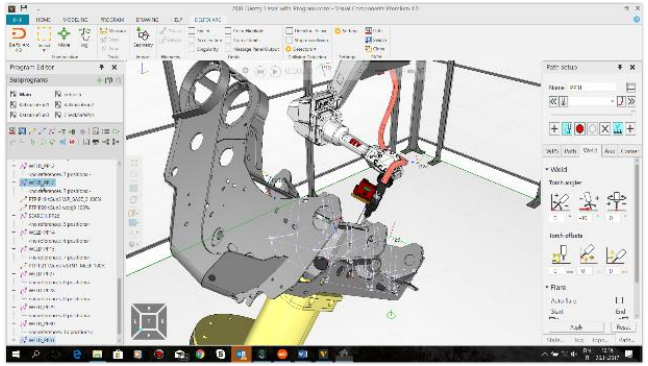
DELFOI ROBOTICS

Delfoi

Founded 1990 – spinoff from Technical Research Centre (VTT)

Two software segments:

- Delfoi Robotics – Offline Programming software suite
- Delfoi Planner - Advanced Planning & Scheduling + MES



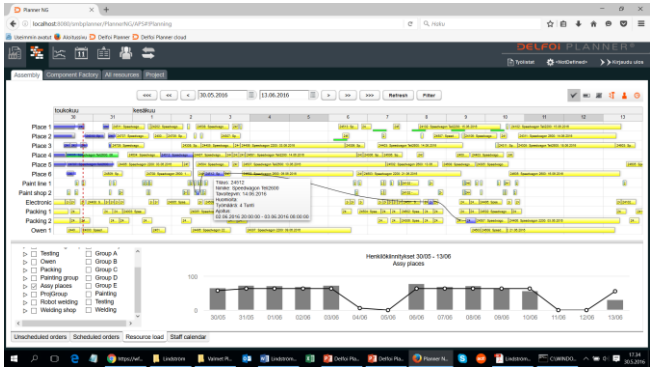
Global business & technology partners:

VISUAL COMPONENTS

In offline programming (technology)

ORACLE NETSUITE

In Advanced Planning & Scheduling (channel)



Distributors in Europe, USA, South America, Asia, India

DELFOI

PARTNERS IN GERMANY

Value Adding Resellers (VAR) in DACH

severt

systemworkx
IT-Lösungen & 3D Produktivität erleben

DUALIS®

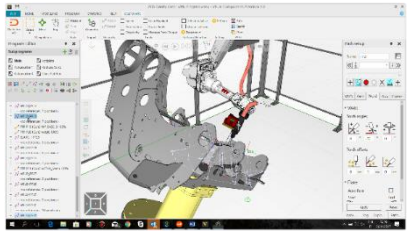
Femitec GmbH

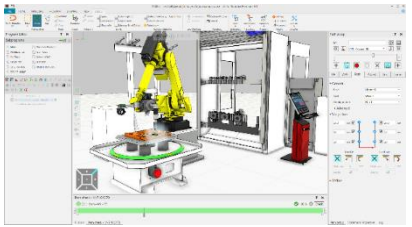
FOCUS IN DELFOI ROBOTICS SOFTWARE

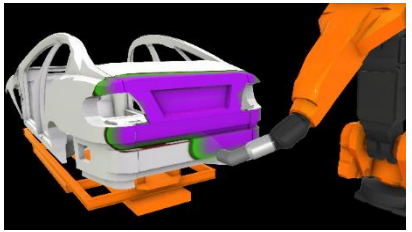
DELFOI ROBOTICS

- **Robot off-line programming (OLP) software experience since 1990**
- **Main products**
  - Defoi ARC: arc welding, laser welding
  - Delfoi CUT: cutting (beam and mechanical), finishing
  - Delfoi PAINT: coating, painting (NEW in 2020)
- **Supported robot brands with robust postprosessors**

YASKAWA MOTOMAN ROBOTICS, FANUC Robotics, KUKA, ABB, OTC, Kawasaki Robotics, REIS ROBOTICS, CLOOS, Panasonic Robotics, igm, NACHI NACHI ROBOTIC SYSTEMS INC., STÄUBLI, HYUNDAI

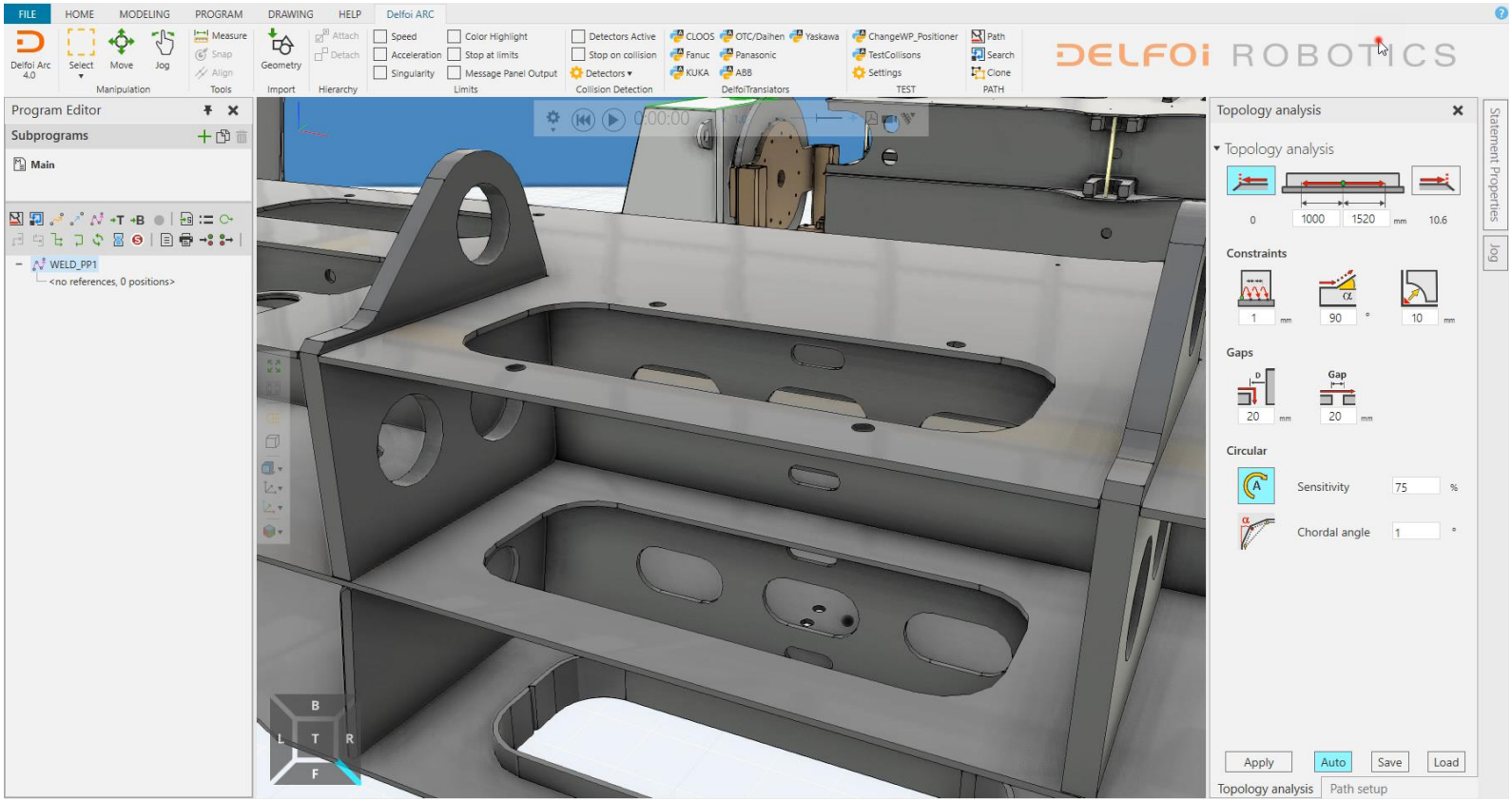




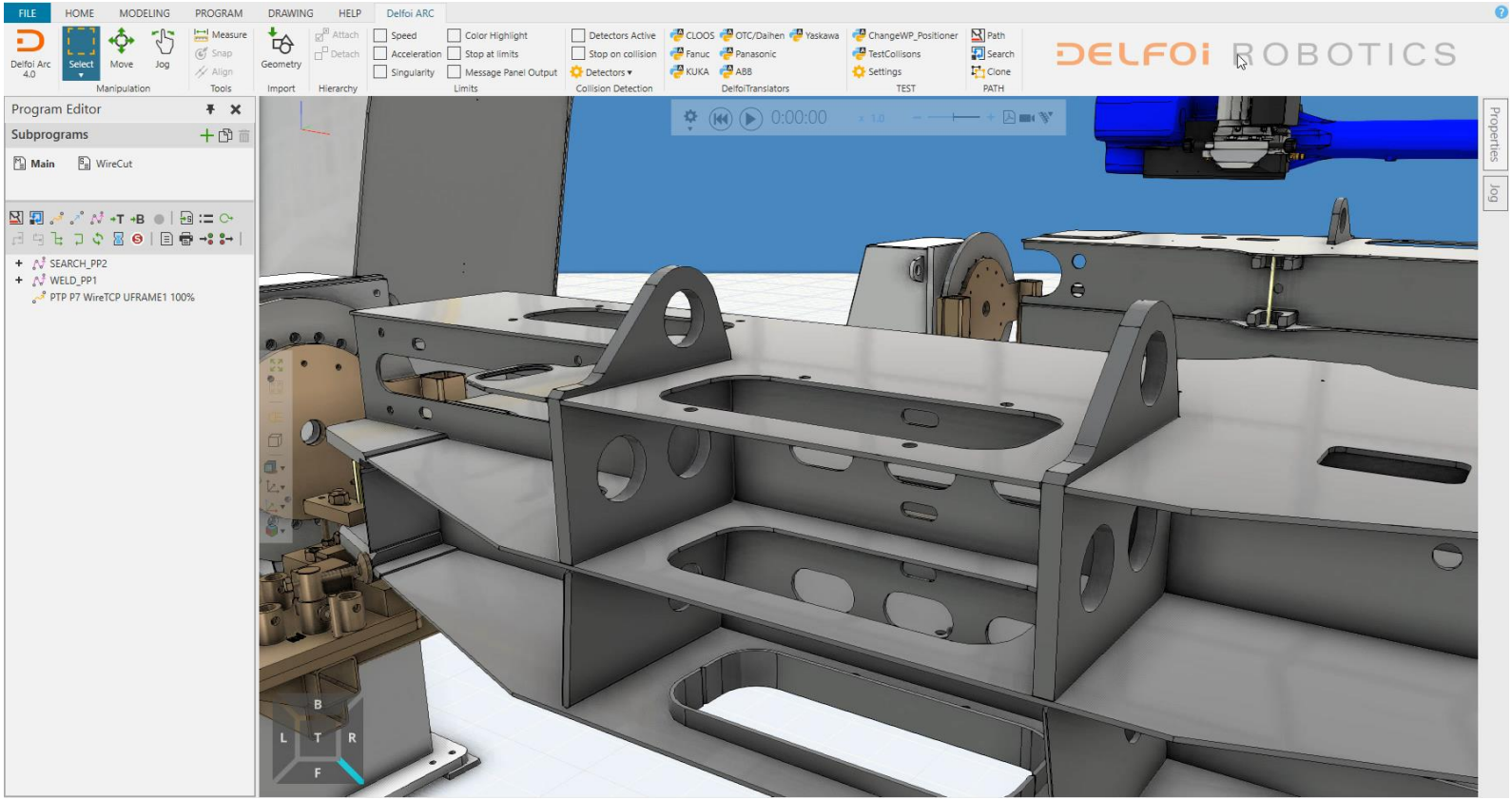


In 2020

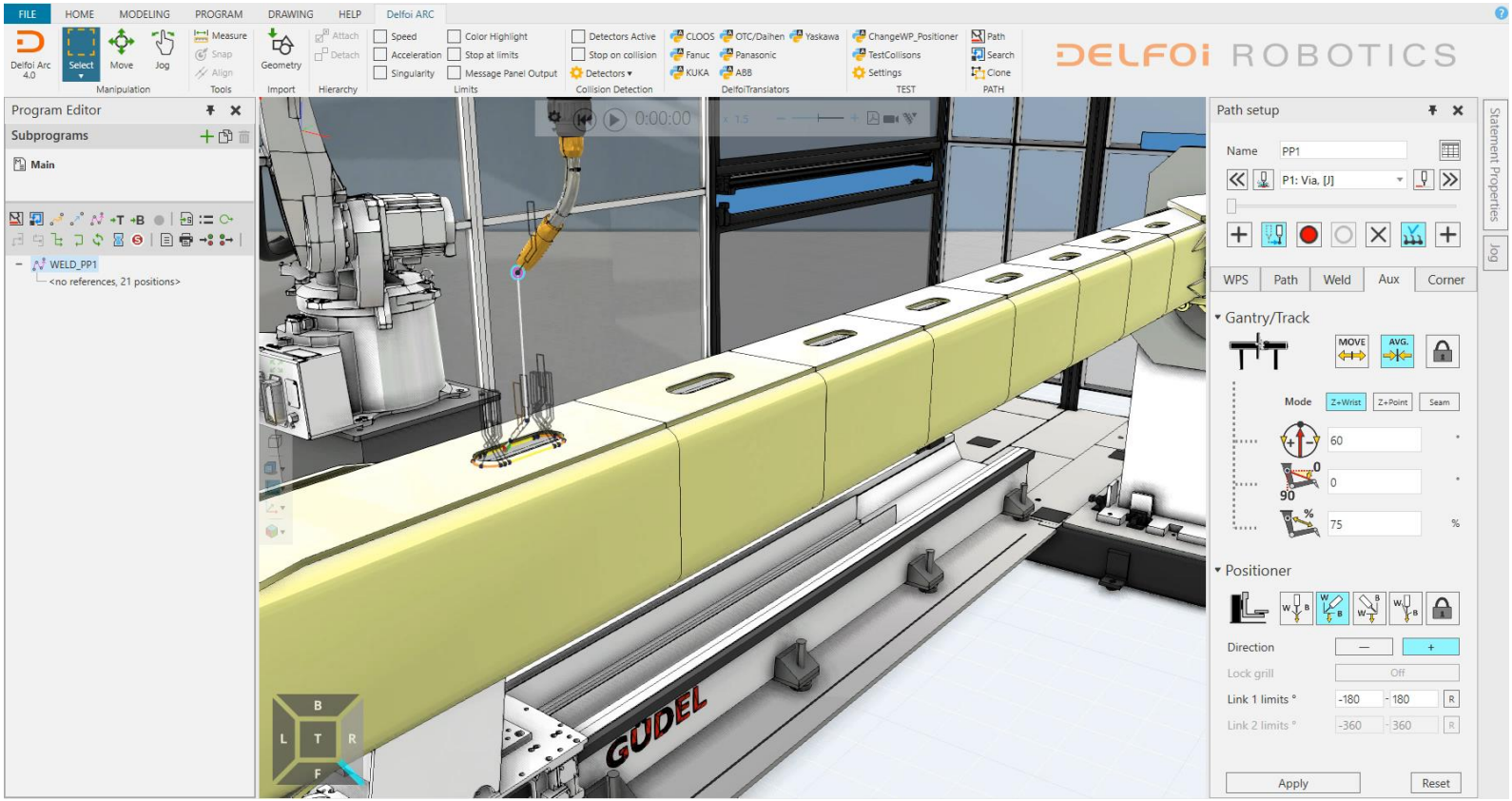
From Digital design to Digital Robot Welding: 16 points in 3 sec.



Realistic Simulation and automatic path planning



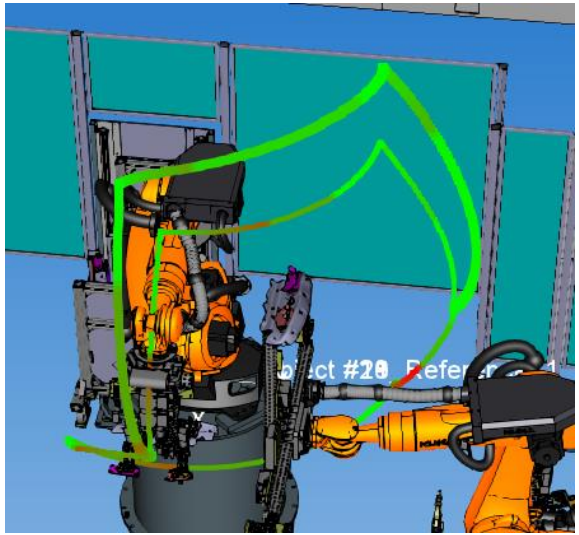
Similar features – copying and cloning of paths: 168 teach points



RESEARCH AND INNOVATION ACTIVITIES

Delfoi path optimization – Daimler setup

- Energy saving optimization for robot tools paths
- Daimler has more than 5000 robots in Sindelfingen ...



Full speed

Path	Timestep, [s]	Resolved	Energy, [J]	Time, [s]
path1	0.01	Yes	11258.52	3.055
path2	0.01	Yes	16152.45	3.509
path3	0.01	Yes	10026.57	3.296

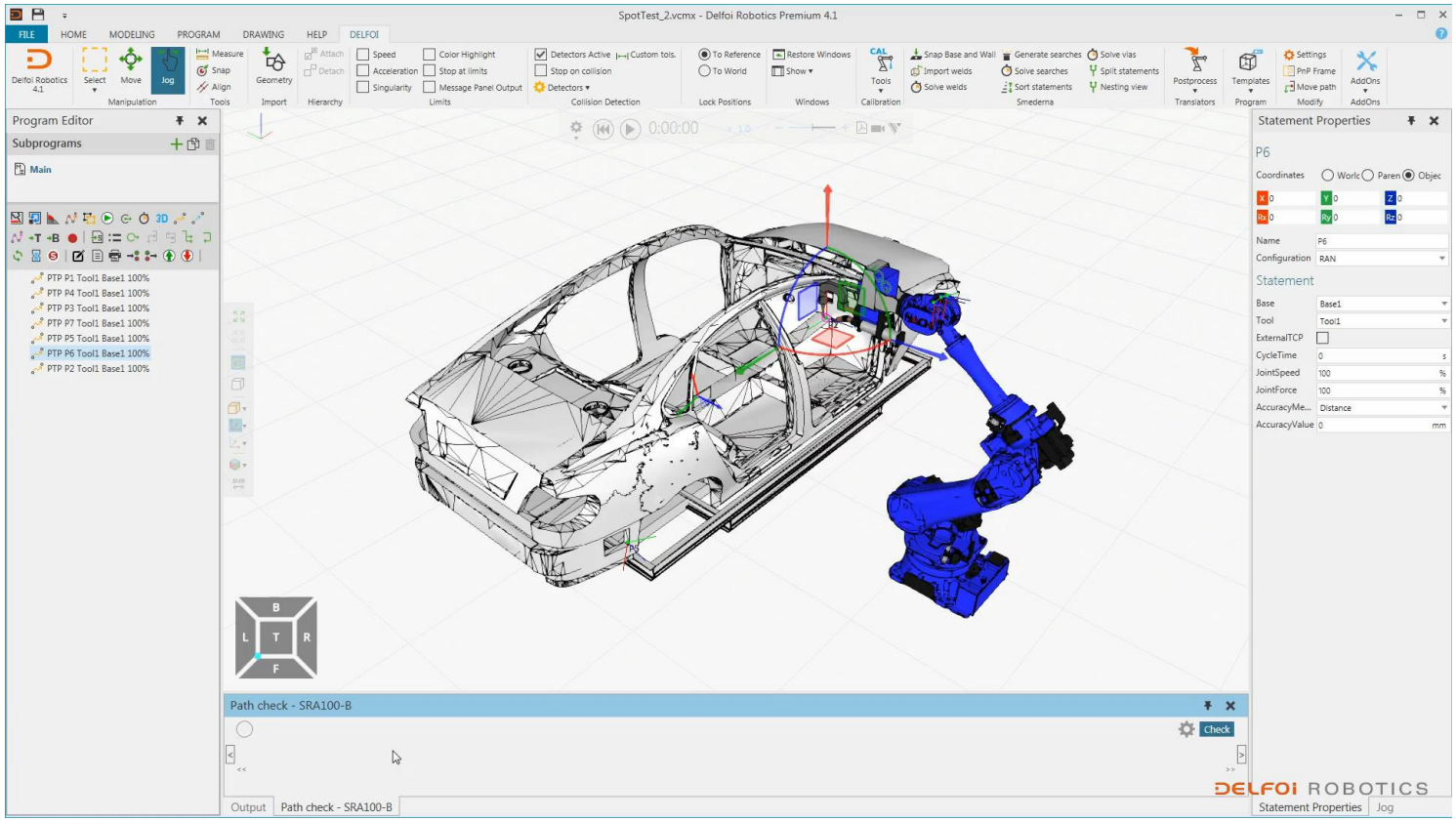
Optimized speed

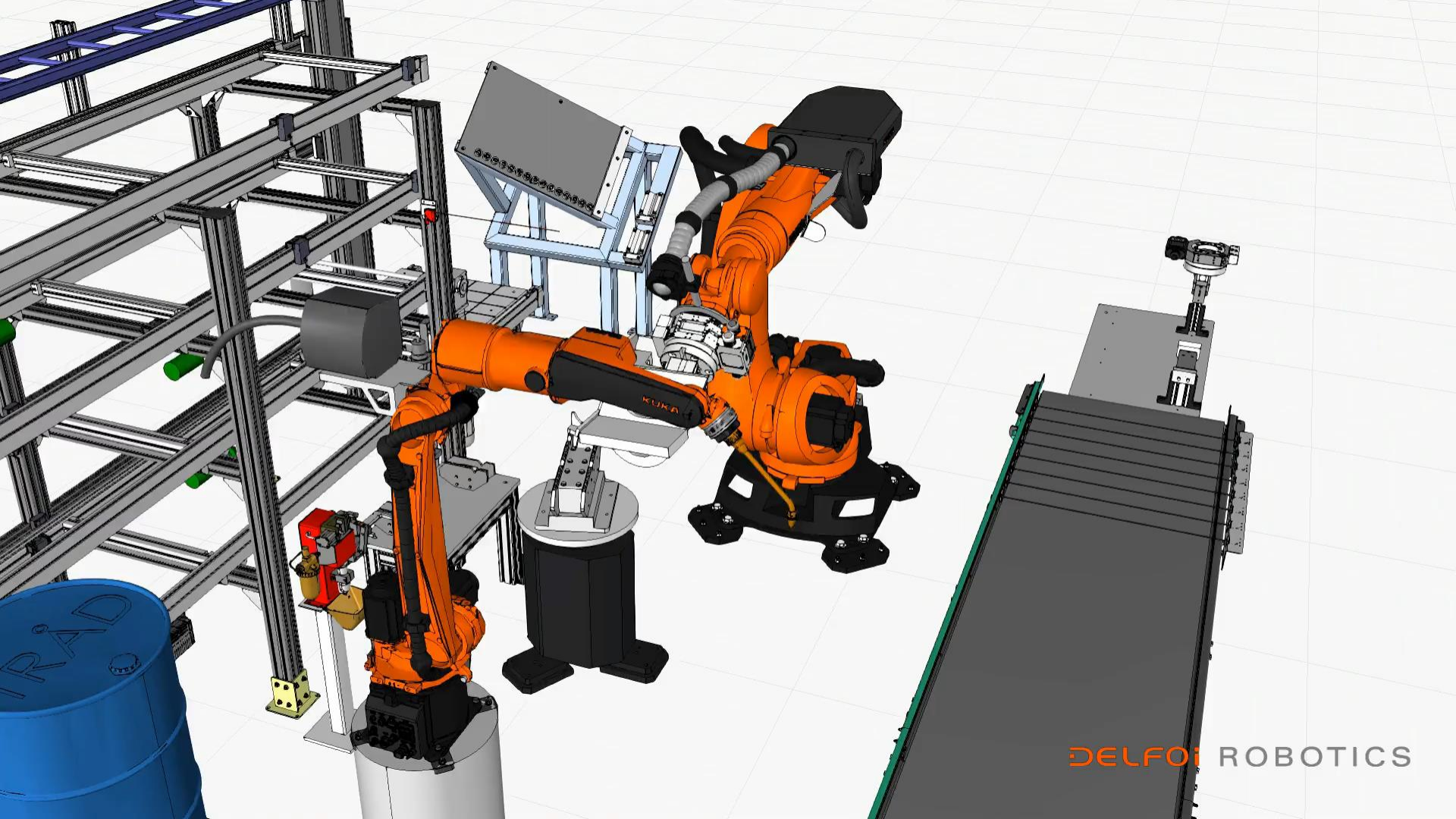
Path	Timestep, [s]	Resolved	Energy, [J]	Time, [s]
path1	0.01	Yes	9236.42	3.374
path2	0.01	Yes	13831.37	4.121
path3	0.01	Yes	8881.39	3.718

Developments within Industry 4.0 and Smart Factories

- JigLess Welding using multiple robots (Volvo, John Deere)
  - Part positioner robot, assembly robot, welding robot
  - No jigs or fixtures
  - Grippers as fixtures
  - Reversed assembly sequence
- Robot-Robot Collaboration for Laser Welding (EU Application)
  - Coordinated, synchronous motions for a laser welding system
  - Trumpf, Fraunhofer-IPA, DelfoiRobots
- Automatic path planning (Fraunhofer-IPA/Delfoi)
  - Automatic solving of trouble free tool paths
    - No collisions, No joint violations, No speed or acceleration violances, No singularity issues
- Ability to utilize maximally the CAD meta data (Systemworkx)
  - Weld process information > weld size, material, …– welding parameter mapping

Automatic Path Planning




KUKA
DELFOI ROBOTICS

CUSTOMER CASES

KRONES

- KUKA Roboter & Delfoi
- Laser welding

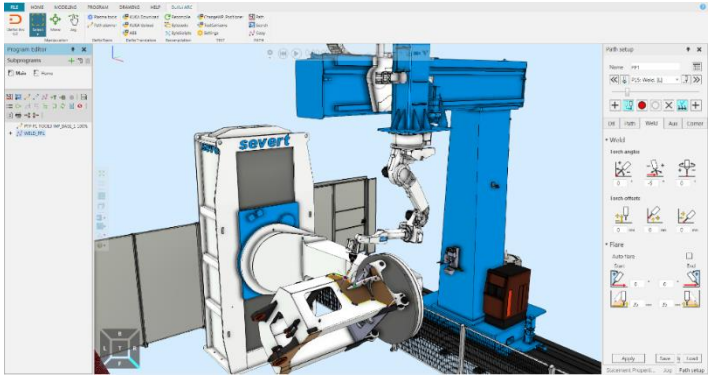
HORSCH

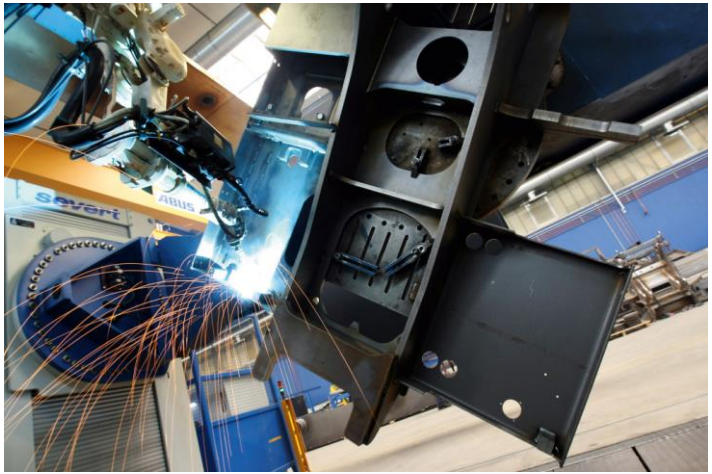
Hightech – Farming – Innovation

FAUN

KIRCHHOFF GROUP

severt





Background

- ✓ OTC and ABB robots
- ✓ Welding of heavy machine assemblies, defence
- ✓ System integrator: selling robot welding systems

Partner

- ✓ Delfoi's reseller partner in DACH – also globally

JOHN DEERE

Background

✓ Long programming time by teaching: appr. 100h-120h per new machine frame

✓ Poor utilization rate of the robots

✓ 14 robot stations: 10 Yaskawa, 2 CLOOS, 2 ABB

Solution

✓ Offline programming of all robot brands

Results

✓ Appr. 20-30 working days saved in every new product launch

✓ Utilization of robots more than 93% > ability to manufacture more forest machines > increased sales potential

✓ Flexibility: new robot programs can be moved between robot stations

JUNGHEINRICH

Background

- ✓ Yaskawa and IGM robots, more than 10 stations
- ✓ Welding of various forklift components
- ✓ Big robots as part positioners while smaller robots are welding
- ✓ Online programming is time consuming

Solution

- ✓ Offline programming for both robot brands

Results

- ✓ Programming stoppages minimized in the robot cells which are programmed offline (four at the moment)

– Heavy welding

Background

- ✓ Welding of various mining machine parts
- ✓ Long ramp-up times due to programming
- ✓ Welds with up to 30-40 passes

Solution

- ✓ offline programming software supporting all robot brands

Results – no measured results yet

- ✓ Pilot case: a big Yaskawa portal robot station
- ✓ welding track booms with plate thickness up to 50 mm.

Thank you.

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