



**BLACKBIRD**

R O B O T E R S Y S T E M E

**Blackbird Robotersysteme GmbH**

**ECHORD Opening Event**

Munich, September 4, 2009

Dr.-Ing. Wolfgang Vogl

Blackbird Robotersysteme 2009

Datei Zellenlayout Prozessmodule Hilfe

Virtuelle Maschine

Aktive Kinematikkette

Name: KR60\_L45\_HA\_RoboScan\_1

Bezug: Roboterkoordinaten

TCP: X [086.4] Y [105.2] Z [1233.0]  
 A [148.1] B [31.8] C [54.4]

Referenz-Frame erzeugen  
 Aufgaben-Frame erzeugen

Bewegen der Achsen

Bewegen des TCP

Bezug: TCP-Frame

X Y Z  
 RX RY RZ

Inkr.: 10,00 mm

Konfig: -1,+1,+1

Kinematikposen verwalten  
 Programme / Pfade / Frames

Zellenlayout

Projektstruktur

- DemoRoboScan.mmc
  - Zellenlayout
    - Aufgaben

Objektanzeige

Name: F\_V347\_3KY-FIX-19J020-000

Bezug: Weltkoordinaten

X [2404.2] Y [5232.6] Z [400.0]  
 A [45.0] B [0.0] C [60.0]

Relative Positionierung

Bezug: Weltkoordinaten

X Y Z  
 RX RY RZ

Inkr.: 50,00 mm

Reset

Absolute Positionierung  
 Best-Fit-Positionierung

RLS-MODUL

Variante 1

Filter:  Aus  Aufgaben  Operat.  Punkte

**Aufgaben:**  
 Verwaltung  
 Editor

**Bahnplanung:**  
 Automatisch  
 Manuell  
 Simulation

**Offlineprog.:**  
 Codeerzeugung

**Automatische Bahnplanung**

Initialisierung

Nichtinitialisierte Nahtpunkte: 0

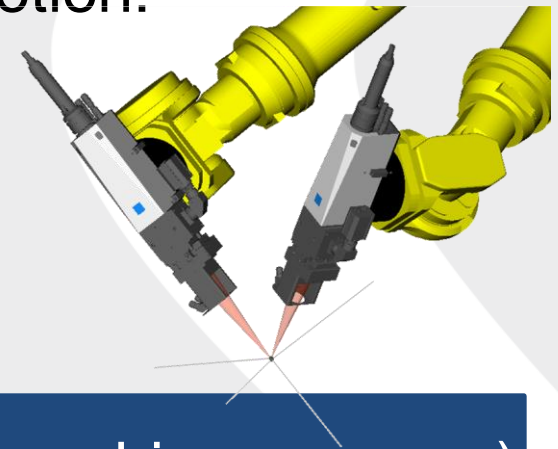
Nur undef. Nahtpunkte initialisieren  
 Alle Nahtpunkte initialisieren

Element	Verb.	Vel	TX	TY	TZ	TA
Variante1						
P60_N039						
P60_N039_P02	PTP	100.00	-795.67	-2119.78	1659.81	-45.22
P60_N039_P01	LIN	3.00	-802.13	-2113.27	1643.92	-45.22
P60_N040						
P60_N040_P02	PTP	100.00	-815.84	-2099.68	1610.49	-46.02
P60_N040_P01	LIN	3.00	-822.26	-2093.02	1594.47	-46.02
P60_N041						
P60_N041_P02	PTP	100.00	-831.06	-2084.35	1573.06	-46.08
P60_N041_P01	LIN	3.00	-837.40	-2077.77	1557.26	-46.08
P60_N042						

Reihenfolgeoptimierung  
 Werkzeugbahn optimieren  
 Roboterhandbewegung optimieren

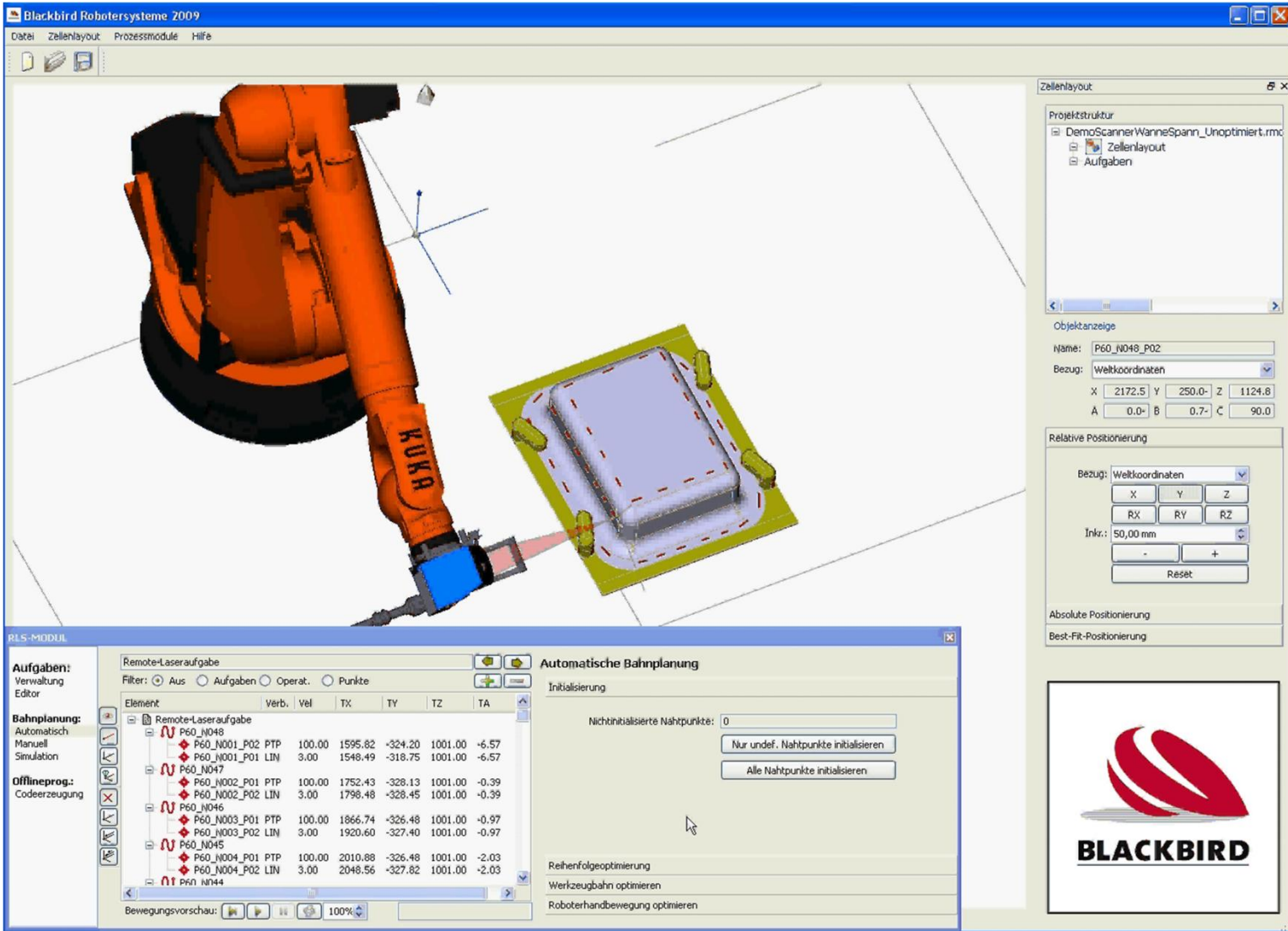
Bewegungsvorschau: 100%

- 3D-simulation system for planning and programming
- Task oriented: Users describe the task and solution space
- Automated path planners for the robot motion:
  - Collision avoidance
  - Sequence optimization
  - Trajectory smoothing
  - Velocity smoothing



- Exploit all available degrees of freedom (machine+process)
- Minimize manual efforts for programming
- Optimize motion quality (minimum cycle time)

# Remote Laser Welding (Robot + 3D-Scanner)



The screenshot displays the Blackbird Robotersysteme 2009 software interface. The main window shows a 3D simulation of an orange KUKA robot arm positioned over a white rectangular workpiece. A red laser beam is directed at the workpiece. The interface includes several panels:

- Zellenlayout** (Cell Layout): Shows the project structure and object settings for 'P60\_N048\_PO2'.
- Relative Positionierung** (Relative Positioning): Provides a coordinate system with X, Y, Z, RX, RY, RZ axes and an increment of 50.00 mm.
- RLS-MODUL** (RLS Module): Contains the 'Remote-Laseraufgabe' (Remote Laser Task) configuration.
- Automatische Bahnplanung** (Automatic Path Planning): Includes an initialization section with a 'Nichtinitialisierte Nahtpunkte' (Non-initialized Seam Points) field set to 0, and buttons for 'Nur undef. Nahtpunkte initialisieren' and 'Alle Nahtpunkte initialisieren'.

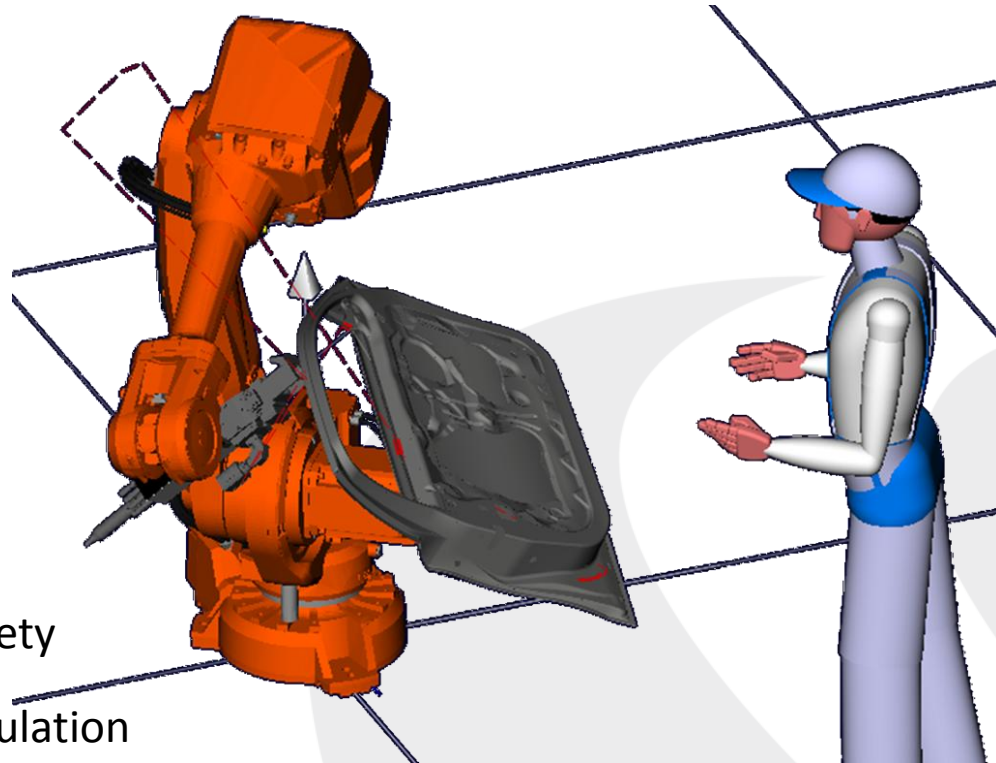
Element	Verb.	Vel	TX	TY	TZ	TA
Remote-Laseraufgabe						
P60_N048						
P60_N001_PO2	PTP	100.00	1595.82	-324.20	1001.00	-6.57
P60_N001_PO1	LIN	3.00	1548.49	-318.75	1001.00	-6.57
P60_N047						
P60_N002_PO1	PTP	100.00	1752.43	-328.13	1001.00	-0.39
P60_N002_PO2	LIN	3.00	1798.48	-328.45	1001.00	-0.39
P60_N046						
P60_N003_PO1	PTP	100.00	1866.74	-326.48	1001.00	-0.97
P60_N003_PO2	LIN	3.00	1920.60	-327.40	1001.00	-0.97
P60_N045						
P60_N004_PO1	PTP	100.00	2010.88	-326.48	1001.00	-2.03
P60_N004_PO2	LIN	3.00	2048.56	-327.82	1001.00	-2.03
P60_N044						

## Scenarios

- human-robot co-worker
- hyper-flexible cells
- cognitive factory

## Research foci

- human-robot interfacing and safety
- robot hands and complex manipulation
- mobile manipulators and cooperation
- networked robots



### Topics for collaboration:

- Automated configuration planning
- Automated (re-)programming
- Task-level user interfaces
- Interactive motion planning in changing environments



**BLACKBIRD**  
ROBOTERSYSTEME

**Thank you for your attention!**

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