Analyse Best Practice Parameter Setting to Effectively Programme Robots To Meet Manufacturing Specifications

29th-30th November, Birmingham, UK
Topics to be addressed

- From EU funded research to Industrial Application
- Robotic Co-worker Technologies development for industrial applications
- Workflow-based robot process design and execution
- Onboard process planning and configuration tools
- **Symbiotic** human-robot collaboration for multimodal Human Robot Interaction
PROFACTOR Profil

- Austria’s no. 1 in applied production research
- Multidisciplinary team with 74 employees
- Business locations in Steyr and Vienna
- 6 Mio. EUR turn-over (2015)
- Since 1995 over 1,700 (inter-)national projects in industry (1,360) and research (350)
Increasing the competitiveness!

Aim: to support human beings in a volatile, richly varied and highly flexible production
- Decision-making competence, knowledge and experience of workers
- Precision, endurance, speed or the power of the machine

Intelligent Automatization for Mass Customization.
**Ergonomic Collaboration Human & Machine (LOCOBOT)**

**Initial situation**
- Reduction of “red” work places

**Research approach**
- Solutions for practical division of work between human and machine, which is realizable with adequate use of resources

**Results**
- Improvement of ergonomics through development of assistant systems
- Modular design of intelligent hard- and software components (e.g. compliant robot arm)
- Software environment for user-friendly development of solutions and coordination of component interaction
Locobot’s application development

- Modeling application logic
  - user-friendly workflow modeling environment (WME)

- Supervisory control is generated
  - 'workflow execution control' (WEC)

using skills of service components = using skills like puzzle pieces for the application logic
Results – EuroNews Report
Robot Assistance - Idea

„A robot for every work shop“

- Fast Setup
- Versatile
- Small lotsizes
- Easy to use
- Fast programming
- Ad-hoc usage
Challenges for flexible robotic systems

- Reduction of Invest
- Cover a wide area of use
- Shortest ramp up periods for on-demand applications
- Lower training, operating- and maintenance costs
A robot for each working place (each garage) - features

- Movable, modulare Systems
- Short Ramp up (few hours)
- Modification in a few minutens
- Process execution also by Non Experts using only one Interface (HMI)
- Communication / Data Input using an intuitive HMI System with automatic functions
- Adaptive process execution
Solution – Software/Hardware construction kit

- Sensors & Tools
- Robots (UR, KUKA, nn)
- Control system (IPC, PC) + Software
XRob – Features

- **Workflow – based**, intuitive and integrated **process mapping** and execution in **only one user Interface**

- **Consolidation of existing input tools of the sub components** (Robot, Vision, Tool, usw…)

- **Intelligent, semi automatic tools** for process planning

- **Use of standardized IT Interfaces** (TCP/IP, DIO, Profinet,…) – fast integration to the Environment
XRob – Software Tool Kit

Workflow Manager

Robotcontrol

Tooling control

Safety control

Interfaces

2D/3D-position detection

Processssimulation

Automatic path planning

3D-Workspace scanning

HMI-System

Cognitive Function

Online - Tacking

WWW.PROFACTOR.AT

LEADING INNOVATIONS
XRob – Technologies

Tool kit for quick setup and safe operation

- 3D scanning of the workspace
- Semi automatic creating of a collision model
- Inline - 2D/3D position detection
- Collision avoidance through automatic path planning
XRob – Technologies

Tool kit for quick setup and safe operation

- Configuration all involved components via a user interface
- Workflow-based process
- Process status and progress mapping
The Software system X Rob allows the creation of complex robot application within a few minutes
Screwing Assistant

Screwing of covers and mounting parts on mobile workpiece holder in the assembly line
Screwing Assistant

➤ Screwing of accessories / Covers
Inspection Assistant – Flexible Quality Gate

3D-Inspection of the locking conditions of plugs and oil cover plates (since autumn 2013)
XRob – Applications

Inspection Assistant

- 3D Inspection of Plugs and Oil cap on the engine
- Acustic Testing System for vehicle body parts

© Profactor GmbH

Pilotproject Flexible Quality Gate BMW Steyr 2013

Flexible Acoustic Inspection Systems 2015
Assembly Assistent

3rd Hand Support

R&D-Project 3rd Hand Support 2016

© Profactor GmbH
XRob – Application

Handling Assistant

Pin Picking (since 2009)

New: Selective Handling (AR-based)
XRob – Application

Paint Assistant

Painting of 3D-Objects

Printing on 3D Surfaces
Research projects

- Cognitive interaction- robot knows user requirements
Symbiotic human-robot collaboration for safe and dynamic multimodal manufacturing systems
(SYMBIOTIC)

Early results and outlook for human robot symbiosis
The project’s final goal is to test and quantify the aforementioned four objectives in terms of:

- Safety
- Feasibility
- Intuitiveness
- Adaptability
- Scalability

Three demonstrators:
- Food-processing (Robomotion)
- Aeronautics (Aciturri)
- Automotive (Volvo Cars)
Project Objectives

Active collision avoidance for safe human robot collaboration in real time.

Adaptive task plan generation for robots and human workers allowing collaboration.

Dynamic adaptation to changes in the shop-floor environment with zero programming for the robot users.

Instructions generation for supporting human workers on what and how to do.
Thank You!

Contact

Dipl. Ing. Christian Wögerer, MSc
International Networks
PROFACTOR GmbH
Graumanngasse 7 | Top C3-1 | 1150 Wien |
Mobil +43 (0)664 6207675
christian.woegerer@profactor.at
www.profactor.at

Visit X - Rob on HMI In Hannover
Hall 2, Booth A44 - 24.-28. April, Hannover