SEVENTH FRAMEWORK PROGRAMME

Plug-and-produce **CO**mponents and **MET**hods for adaptive control of industrial robots enabling cost effective, high precision manufacturing in factories of the future

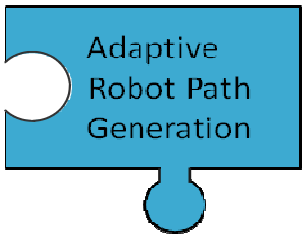
The COMET news

The COMET EU Project Newsletter
Issue 2— April 2011

COMET technologies: the Robot Path Generation

The PSIR (Programming and Simulation environment for Industrial Robots) system is one of the four innovations developed in the COMET project with the ultimate aim to be able to perform high-accuracy machining using industrial robots. Industrial robots are flexible and relatively cheap compared to CNC machines and have a much larger working envelope. With the PSIR system a software platform is developed, tested and demonstrated allowing the output of 100% correct robot programs to form one of the four cornerstones of the COMET solution. The PSIR system is a full CAD/CAM solution to generate machining tool paths for industrial robots, including simulation, optimisation and post processing.

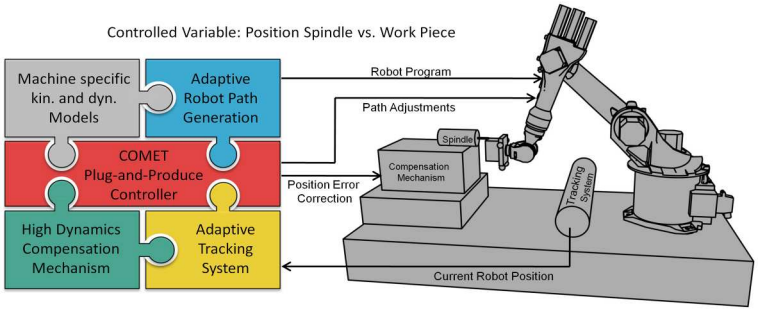
The majority of the work in the first six months of the project has been improving the interface, setting up of various robot cells across Europe, training of the COMET partners and the requirement setting for new developments for the PSIR during the project. The partners received a dedicated PowerMILL 4 Robots training in January 2011 at Delcam's headquarters in Birmingham and are now starting to use the software in their first machining experiments. They will regularly provide feedback to the developers to further improve the PSIR.



1. One of the 4 cornerstones of the COMET platform: adaptive path generation PSIR

The PSIR module contains a number of general functionalities and also is the platform for the four main sub-modules. Each of these will provide tools to either manipulate the robot tool path to calculate robot poses, to avoid singular points, to analyse robot behaviour using the kinematic and dynamic models from the KDMIR module, to optimise and adapt the tool path for specific robots using the unique signature developed in the KDMIR module or to perform 3D collision simulations of the robot movements in a 3D simulation of the complete robot cell.

Delcam's commercial product name for the PSIR is the PowerMILL Robot Interface.



2. The complete COMET platform for high accuracy machining with robots

In this issue:

COMET news & events

Week training on PSIR

@ Birmingham, 10-13 January

14 members from 10 partner companies have participated in the PowerMILL Robot Interface week training at Delcam. They all have gotten their copy and licence and are now ready to play with the system in their companies.

COMET robot cell @SIR and @Delcam

Two more COMET robot cells have been installed in the consortium to start experimental tests. A ABB 6640 robot 185 kg payload at SIR and an ABB IRB 6400-24-120 M98 at Delcam. A modular configuration of the cell has been designed considering the chance to implement only some of the COMET technologies or the complete platform.

3rd GA meeting

@ Innsbruck, 17-18 March

All partners have met in the small village of Igls near Innsbruck to share first 6 months results and review next 6 months period action plan. Project Officer Jan Ramboer and Project Technical Advisor Vincenzo Nicolò joined the meeting giving their first advices and encouragement to the consortium for this challenging project.

First metal cuts at TEKS monitored with Artis control unit

In January 2011 TEKS engineers were the first inside of the COMET project to mill alluminium with a standard industrial robot. COMET robot cell at TEKS is an ABB robot with a 42.000 rpm spindle.

1. TEKS COMET robot cell: ABB IRB 2400L/16

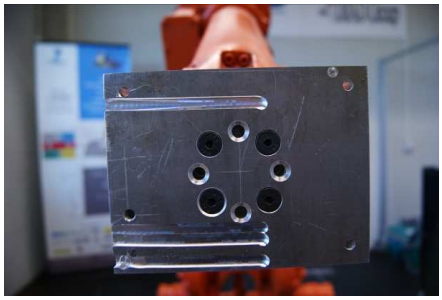
The robot has been equipped with Artis process control unit to measure acceleration on the robot during the metal cutting. Part of the research job foreseen in the COMET project, is to characterize the dynamic behaviour of the robot especially during milling process in order both to define the robot kinematic and dynamic model (WP1) and to optimize milling strategies of path generation software (WP2).

Specifically TEKS robot (picture 1) has been equipped with the Artis Genior Modular UM plus the acceleration sensor VA-2-S collecting acceleration data in the direction orthogonal to the tool path (Z direction).

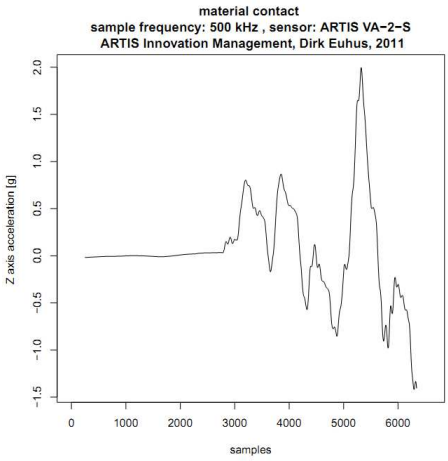
See in picture 3 an example of the acceleration signal registered by Artis sensor when starting a milling path on the part: before material contact there are no cutting forces to disturb the robot movement and consequently no acceleration in Z, while after material contact each cutting edge produces an acceleration peek in Z direction.

This process monitoring will be used in further project developments to better understand and improve milling process, knowing that best milling results would be expected where the acceleration signal amplitude in Z is as low as possible.

Find more about TEKS & Artis tests at:
http://www.comet-project.eu/results.asp



2. Metal cuts @ TEKS monitored with ARTIS



3. Z acc. before and after metal contact

COMET Publications

"On the integration of skilled robot motions for productivity in manufacturing"

Paper by Lund University, Sweden & K.U.Leuven, Belgium to be presented at International Symposium on Assembly and Manufacturing (ISAM 2011), 25-27 May, Tampere, Finland

The paper proposes techniques for the setup and programming of new generation flexible robot solutions, designated for advanced applications such as the dexterous assembly. These new techniques are built on existing knowledge by converting structured data into an RDF-based knowledge base.

New videos on COMET project YouTube channel

See new videos on project presentation and on first milling experiments @
http://www.youtube.com/COMETproject

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COMET partner profiles

Delcam plc is one of the world's leading innovators of CADCAM software for the 3D design and manufacture of complex shaped products. Delcam provides CAM solutions for high speed, 5-axis milling, turn/mill and Swiss-type machines.

Delcam recently introduced PowerMILL Robot Interface, a dedicated robot machining solution capable of programming robots with up to 8 axes. The COMET project provides an excellent opportunity for Delcam to apply its CAM expertise to robot machining, learn about new robot technologies, expand its network of partners and provide CAM software for high precision manufacturing using robots.

Delcam is the Coordinating Partner for the COMET project and is involved in almost all the technical work packages. In particular, Delcam is responsible for developing the robot path generation software, the Programming and Simulation Environment for Robots (PSIR) in WP2.

Find more about Delcam plc at:
http://www.comet-project.eu/delcam.asp

Artis GmbH is the leading international company in the field of tool, process and machine condition monitoring and adaptive control of processes.

Artis increase quality and reduce cost in production processes.

In COMET project Artis is mainly involved in the development of the kinematic and dynamic models of the robots, the KDMIR system of WP1, which represents the robots' unique signature, basis for the path programming.

The experience of Artis in monitoring is transferred to monitor the new COMET robot.

Artis is also a key partner for the demonstration phase of the project, when the COMET control platform will be tested on real parts in industrial environments.

Find more about Artis at:
http://www.comet-project.eu/artis.asp