NX CAM Robotics Programming

Plan, validate, optimize robot driven machining processes

- Comprehensive offline programming solution for machining-like tool path operations for robots
- Single intuitive look and feel for NX CAD, NX CAM and NX CAM Robotics Programming
- Generate collision free and robust robot programs

The use of robots is expanding rapidly in a variety of manufacturing industries. Two trends drive this change:

- Recent improvements in accuracy, repeatability and payload capacity make robots adequate for increasing number of machining tasks.
- It is harder to find qualified workers that are willing to perform repetitive actions, in tough environmental and physical conditions for long time.

Beyond the familiar tasks of lifting, positioning and welding, today’s robots are being fitted with milling, grinding and other heads, so they can be used to deburr, grind, cut, trim, polish, finish, glue and more. These tasks require the robots to perform continuous precision motions including area coverage patterns and removal of in-process material. This can be challenging to program using manual teaching or some of the existing software tools to program robots.

Siemens PLM Software has integrated its proven Tecnomatix® portfolio’s advanced robotic technology with NX™ software’s CAM component to provide the NX CAM Robotics Programming solution. This makes it easy to program a robot to perform machining-type tasks using familiar NX CAM computer numerical control (CNC) programming methods.

NX CAM Robotics Programming software lets users design, simulate, validate, optimize and offline program industrial robots for machining-type tasks. This solution greatly increases the efficiency and quality of these high precision, multi-axis robotic operations. Featuring the intuitive and widely-accepted NX 3D environment, the software combines the simplicity of CNC programming with the power to accurately create, control and simulate complex robotic machining processes.
Associative updates, a key benefit of NX, make it easy to accommodate change orders, since all of the robotic programming can be refreshed when design changes occur.

**Robot definition**
The NX CAM Machine Tool Builder now enables users to define robotic kinematic chains, making it easy to incorporate robots as the CNC machine selection in NX CAM. This is the basis for simulating the robot’s motion as well as providing the correct output for the robot’s controller.

**Tool path to robotic path**
The concept behind NX CAM Robotics Programming is to use the robust tool path creation methods of NX CAM to generate the end effector motion. This motion makes sure the cutter or grinder moves along the workpiece correctly in whatever pattern is required. Added to this basic path are the robotic rules that account for the extra degrees of freedom (axes of motion) and possible singularities. The user specifies preferences with straightforward rules for aligning the head relative to the working path, such as Fixed Vector, tangent to path and tangent zig zag. The robot’s configuration provides additional rules that help to guide robot motion and maintain predictable orientations along the motion and the starting and ending poses.

**Advanced robot setups**
One of the great benefits of using robots for machining is the large work envelopes they can cover and the flexibility they can apply to reach inaccessible areas. In order to support machining of complex shapes with difficult reaches, a part positioner is often used. NX CAM Robotics Programming supports these use cases by synchronizing the robot with a positioner and supporting robot on rail setup.

**Robotic path validation**
The complete, proven suite of NX CAM validation tools is available for robotics path validation. Collision detection and gouge checking are available to identify any interference issues between the robot, its tool, the fixture and the part. Reachability issues such as inaccessible locations along the path and robot joints that exceed their hard or soft limits are reported and can be analyzed. Special robotic issues, such as kinematic singularities, can also be automatically identified and reported.
Robot tool traces can be displayed during simulation to provide another important view of the motion. These advanced validation tools ensure high-quality programs that can be reliably executed by robots, reducing prove-out times and minimizing production issues.

**Offline programming**

With NX CAM Robotics Programming, the user can add offline programming (OLP) commands based on motion type in order to accurately follow company standards and ensure that the commands are properly considered even during part and process changes. OLP commands can be applied at various stages, including: start of the motion, end of the motion, the end of any approach move, the start of any departure move, the start of a traverse move, between machining regions, within regions and at the initial and final approach and depart moves. The system supports user interface (UI) customization so companies can create their own dialogs to easily input OLP commands and motion parameters without learning complex robot language syntax.

**Postprocessing**

Production-ready output that does not require any manual modifications is the key to shorten planning cycle time and to increase productivity. The standard postprocessing mechanism of NX CAM generates the robotic program. Available posting modules for Kuka (KRL), ABB (Rapid), Fanuc (RJ TPE) and Siemens Sinumerik 840D sl can be used for standard program generation on these common controllers.

**Fully managed environment with NX**

The NX CAM Robotics Programming solution can be fully managed with the Teamcenter® software data and process management system as part of the NX CAM family. With the integrated robotics programming in NX, you get the same full benefits for assemblies and associativity as with other NX applications, such as computer-aided manufacturing (CAM). Programming the motion of the trimming, cutting or grinding tool can be accomplished using the same user-friendly techniques that CAM programmers enjoy. And the toolpaths will update associatively to accommodate any design changes.

This background information and a press picture are available at [www.siemens.com/presse/emo2015](http://www.siemens.com/presse/emo2015)

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