Hard Material Small-Batch Industrial Machining Robot

Fact Sheet

Project Information

**Hephestos**

Grant agreement ID: 314739

**Project website**

**Status**
Closed project

Start date 1 September 2012  
End date 31 October 2015

**Funded under**
FP7-ICT

**Overall budget**
€ 3 356 761

**EU contribution**
€ 2 402 488

**Coordinated by**
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.  
Germany

Project description

Smart Factories: Energy-aware, agile manufacturing and customisation Hard materials machining has recently attracted great attentions from the European automotive, the aerospace and the biomedical industries. However, the existing technology failed to cope efficiently with small-batch production of large and complex-shaped products. The project Hephestos shall give rise to a cost-efficient solution in hard materials machining for this small-batch production of highly customized products through the application of industrial robots. Hephestos will develop a paradigm to provide standard industrial robots with break-through techniques in production planning, programming and real-time control system.
Human experience and expertise will also be involved in the entire planning process to develop a plug-and-play flexible robotic metal removal system.

Hard materials machining has recently attracted great attentions from the advanced industries, in particular, the European automotive, the aerospace and the biomedical industries. However, the existing technology failed to provide these industries with a cost efficient solution to cope with small-batch production of large and complex-shaped products. The project Hephestos, with its focus on developing sophisticated methods in robotic manufacturing, shall give rise to a cost-efficient solution in hard materials machining for this small-batch production of highly customized products through the application of industrial robots.

Hephestos will develop a paradigm that shall provide standard industrial robots with break-through techniques in production planning, programming and real-time control system. Based on established computer-aided-manufacturing frameworks, Hephestos will optimize production planning through the automatic generation of robotic program, taking into account specific robot signature i.e. robot system kinematic and dynamic characteristics, as well as models of processes (milling, grinding, polishing etc.), that are essential for the robotic application in hard material machining. To cope with small batch production time scales, real system data obtained by means of advanced sensor techniques will be integrated in the planning to improve efficiency. Human experience and expertise will also be involved in the entire planning process. Real-time strategies based on impedance and force control for the interactions between robot and the cutting of material, will take into account uncertainties and critical chattering effects in hard metal machining. Force-feed control should ensure high quality and precision in grinding and polishing operations and thus, extends the accuracy limits of the robot. Subsequent re-planning and re-programming will enhance the iterative machining process through existing sensor technology. Through this methodology, Hephestos will combine robotic advantages with the flexibility of human-like strategies of dexterous artisans and workmen to develop a plug-and-play flexible robotic metal removal system. In addition, Hephestos would utilize and further develop flexible and truly open robot control and planning platforms. The key innovations of the Hephestos will ensure substantial improvements of industrial robots technology in hard material machining and establish cost-efficient robotic applications in industry that are of considerable commercial benefits for the European machining sectors, pertinent and affordable to both small-and-medium enterprises and large scale producers.

Field of science

/social sciences/economics and business/economics/production economics

Programme(s)
Call for proposal

FP7-2012-NMP-ICT-FoF

Funding Scheme

CP - Collaborative project (generic)

Coordinator

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