Trusted AI Grinding Machine for Complex Materials

Automate production with AI-powered robotics

To help companies overcome their reservations about using artificial intelligence, Fraunhofer IEM uses hybrid modeling, a combination of conventional control technology and innovative AI methods. A control system keeps the process safely within the operating range, and a trustworthy AI continuously improves it.

Structure of the RoboGrinder

The trust placed in artificial intelligence by companies still remains relatively low up until now. In fact, when it comes to highly customized manufacturing, many companies avoid using AI in their production. As a result, many processes are still carried out manually.

Fraunhofer IEM is demonstrating how artificial intelligence and control engineering can be combined using the smart grinding machine RoboGrinder to create a dependable and efficient system. At the company Düspohl, a production step that had previously been carried out entirely by hand is being automated by the grinding machine: the manufacture of complex contoured profile wrapping rollers for the furniture industry. The process has very individual requirements and is prone to errors due to the elastic properties of the roller material.

This is how the process works

- Preparation: At the very beginning of the grinding process, the machine maps out the initial path for the roller to take to the grinding machine.
- Grinding process: A robot guides the roller along the travel path to the grinding machine with ultimate precision.
- Analysis: A built-in sensor identifies the remaining deviations in the contours of the roller from the target contour.
- AI optimization: By comparing the current contour to the target contour, the AI learns about the grinding removal rate and elastic behavior of the material and calculates a better path for it to travel. A defined robust control method reliably keeps the process in the desired operating range and prevents potential errors.

In cooperation with

düspohl
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Benefits

The robot-aided automation greatly improves the efficiency of the grinding process and leads to reproducible results. Furthermore, 15% fewer total grinding cycles per roller can be achieved by the RoboGrinder thanks to AI assistance. And in the case of regrinding, which is a very delicate process requiring precise work, this can be lowered by up to 40%. The machine independently measures the contour of the roller and automatically configures how to machine it. The new technology also optimizes the set-up time: It only takes a few minutes to plan out and complete the contour.

Applications

The RoboGrinder represents control engineering that's been reliably combined with artificial intelligence to ensure system efficiency over the long term. The control engineering components act as a sort of "guard rail" to put the AI's optimized solution into a technically feasible framework. Suitable areas of application for the RoboGrinder include all industrial processes which have materials with complex behaviors and require an individual approach.

Video

RoboGrinder – Trusted AI Grinding Machine for Complex Materials

To the Video

Further information

Project reference: Robotics and AI in surface technology
https://www.iem.fraunhofer.de/robotik-oberflaechentechnik

RoboticLabs: Explore and introduce automation technology
https://www.iem.fraunhofer.de/robotics-lab

Focus topic Robotics
https://www.iem.fraunhofer.de/robotik

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