
Advances in Robotic Sanding and Polishing Systems

Dr. **Tomislav Staroveški**, Associated Professor, Chair of Machine Tools, Department of Technology,
Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb

Short description:

Robotic sanding and polishing systems have evolved considerably in recent years, enabling more consistent surface quality and greater efficiency in finishing operations. Achieving the desired surface characteristics, however, requires precise control of tool engagement and the relevant process parameters. To meet these requirements, current research has increasingly focused on trajectory generation methods, real-time force control, and process monitoring aimed at improving the performance and reliability of robotic sanding and polishing processes. The first part of the presentation will provide an overview of state-of-the-art technologies in robotic sanding and polishing, covering different types of force-control subsystems, process-monitoring approaches, and trajectory-generation methods. Within this broader overview, particular attention will be given to force control, as the contact force between the tool and the workpiece surface is one of the most important process parameters affecting surface quality. The presentation will also introduce the ARCOPS robotic cell, a dedicated robotic sanding and polishing system equipped with a novel servo-electric force-control unit and incorporating both direct and indirect process-monitoring subsystems. The main capabilities of the system will be illustrated through experimental results and practical applications. Selected case studies conducted using the ARCOPS cell will demonstrate the application of force control, present a newly developed method for correcting predefined tool paths to account for deviations in the actual position and geometry of the workpiece, and describe the development of direct and indirect process-monitoring approaches. The audience will gain an overview of recent technological developments and their practical implementation in robotic surface finishing.

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More about Tomislav Staroveški:

Tomislav Staroveški is an associate professor at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (FSB), where he has been working since 2007. He graduated from FSB in May 2007, specializing in Automation and Robotics, with a thesis titled *Machine Vision in Industrial Robot Guidance*. In November 2007, he enrolled in postgraduate studies in Mechanical Engineering at FSB, specializing in Robotics and Automation. He received his PhD at FSB in May 2013 with a dissertation titled *Wear Modelling of a Medical Drill*. During his career, he progressed from junior research assistant to senior research assistant and assistant professor, and has been an associate professor since December 2021. He actively participates in teaching multiple courses at the Faculty, focusing on the mechanical and control system design of machine tools, as well as machining process monitoring. His early interest in engineering and innovation was recognized through awards at student competitions and exhibitions, including a gold medal at the 30th Croatian Innovation Exhibition INOVA 2005. His research focuses on production and medical engineering. To date, he has authored or co-authored 41 scientific and professional papers, including 16 original scientific articles published in journals indexed in the Current Contents database, as well as one EU/US patent. He has also participated in over 14 technological and scientific projects funded by the EU and the Government of the Republic of Croatia, and since 2020 has been a member of the editorial board of the journal *Transactions of FAMENA*.