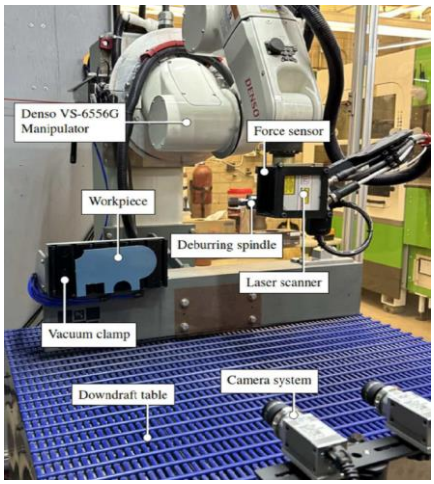
Precision Robotic Deburring

Background

Modern manufacturing requires flexible systems to allow for high customizability and production scalability. Deburring is still a critical machining operation in many modern processes and can comprise 9-35% of the total manufacturing costs. However, automation has had low adoption due to many factors including poor accuracy, difficulty localizing workpieces, slow cycle times due to high process complexity, as well as a lack of flexibility and scalability of the process.

Description of the Invention

Carleton researchers have developed a novel framework that addresses the critical challenges in precision robotic deburring. Through the introduction of simultaneous and real-time registration and machining, the system rapidly and accurately corrects and enhances stability – efficiently producing high quality results.



Prototype robotic deburring system

Publications: Lloyd, et al. J. RCIM, vol. 88, 2024, 102733 (https://doi.org/10.1016/j.rcim.2024.102733); Lloyd, et al. IEEE Trans. Control Syst. Technol., vol 32, no 4, 2024, pp. 1140-1155 (10.1109/TCST.2023.3348749)

Key Benefits

- Faster cycle times & reduced costs due to lower required workpiece registration requirements compared to other robotic systems
- Improved machining quality and feedrates: adaptive controller tuning improves surface finish, precision, consistency and feedrates
- Reduced tool wear: improved contact stability reduces variability in applied forces and notability reduces tool wear and associated costs
- Improved process awareness and tool wear tracking through real-time registration covariance and tool radius estimates
- Improve worker health and safety: reduce respiratory and vibration-induced health risks, repetitive motion injuries and cuts compared to manual deburring

Applications

- Automotive: engine components, transmission parts, body panels etc.
- Medical: devices, implants etc.
- Electronics: circuit boards, connectors, housings etc.
- Industry 4.0 processes: reduce bottlenecks in process flow

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Protection Status:

CA 3,239,469 (filed 05-24-24)
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Stage of Development:

Prototype
Validated at lab scale

Seeking:

Non-exclusive Licensees in fields of use outside of aerospace

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