Correlation of Spindle Torque with Tool Wear in 5 Axis Milling
Bachelor / Semester Thesis

Motivation
Due to its unbeaten precision to speed ratio, high-speed 5-axis milling remains the preferred manufacturing technique for an uncountable number of parts in aerospace and automotive engineering. However, although extensive research has been conducted, the main limiting factor - chatter vibrations are still not fully understood. One of the significant contributors to the stability of the process is the wear of the tool.

Since in a real process the tool wear cannot be easily measured, a new approach is to derive the condition of the tool from signals that can be monitored within the machine. In the scope of this project, the relation between the tool wear and the spindle torque shall be investigated. A state of the art 3D-microscope as well as 5-axis CNC machine can be used in this thesis.

The work is part of an industry project that involves leading machine tools and controller manufacturers. The exact tasks can be defined according to the student’s interests.

Possible work packages
- Development of a quantifiable criteria for the wear state of the tool
- 3D microscope analysis of cutting edges
- Performing experiments to compare the torque of a worn out and a new tool, comparison against theoretical predictions
- Investigation of the correlation between the wear state and the spindle torque

Division of work: 20% Modeling, 30% Experiments, 40% Analysis, 10% Documentation
Start of work: August 2016 or upon agreement
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