ABSTRACTS

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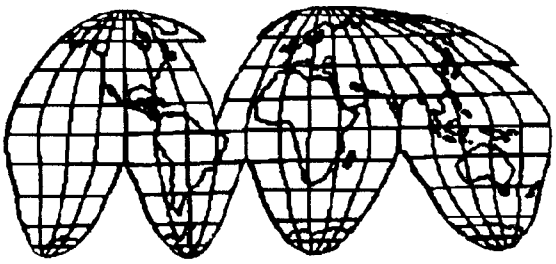

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Fix number Realization of Adaptive Control of Machine-Tool Vibration

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Abstract

In the turning operation the relative dynamic motion between cutting tool and workpiece, or vibration, is a frequent problem, which affects the result of the machining, and, in particular, the surface finish. Tool life is also influenced by vibration. Severe acoustic noise in the working environment frequently occurs as a result of dynamic motion between the cutting tool and the workpiece.

Dynamic motion between cutting tool and workpiece can be reduced substantially by active control of the machine-tool vibration based on the filtered-x LMS-algorithm. However, in the digital implementation of the filtered-x LMS-algorithm both the inputs and the internal algorithmic quantities are limited to a certain precision.

The process of machining a workpiece is also likely to introduce large variations in the level of both input and output signals of the digital controller.

The tool shank vibrations can generally be described as a superposition of narrow-band random processes at each modal frequency.

Both the variation in signal level and the narrow-band character of the vibration are likely to be unfavorable a fix number realization of the filtered-x LMS-algorithm. The potential large dynamic range in the input signal may introduce coefficient bias and stalling of the convergence of the adaptive FIR filter. Furthermore, both the narrow-band character of the vibration and a large dynamic range in the input signal may result in overflow and thereby seriously degrade the performance of the control system.

However, by the use of the leaky filtered-x LMS algorithm problems due to the limited numerical precision such as overflow will be reduced to a large extent.