

Tool Wear Automatic Monitoring System Based on The Multiple Parameters of The Cutting Force And Machine Vision Technique

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Abstract

In the paper a tool wear monitoring system based on multiple parameters analysis of cutting force and machine vision technique is introduced. A drilling model relating cutting parameters (cutting force, coating layer, spindle speed and feed rate) and tool condition (focus on tool flank wear measurement and analysis) was developed. To quickly gain an optimal combination of cutting parameters, the experimental design methods discussed in the paper can optimize cutting parameters in an efficient and reliable fashion. The drilling model based on cutting force was built with regression algorithms. With this method, the wear status was evaluated based on the actual force obtained from a dynamometer. Then, the relationship between the cutting force and tool wear was formulated. The derived relation is useful for in-process wear monitoring. Due to its complexity, the dynamics of tool wear is not yet fully understood. Therefore, vision-based tool wear monitoring techniques are helpful to comprehending wear progress. The drilling model based on the machine vision technique has established a direct relation between cutting parameters and tool wear. The object of the experiments was to measure the flank wear of the dry cutting of various coatings tools. The experimental results show the monitoring system can establish a correct relationship between cutting force and multiple cutting parameters.

Keyword : Multiple parameters, Automatic monitoring system, Cutting force, Machine vision technique, Dry cutting