Tool Wear Monitoring Using Machine Vision and Taguchi Method

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Abstract

This study proposes a tool wear monitoring system based on machine vision technique. The tool wears of different coating drills employing various drilling parameters such as coating layer, feed rate, spindle speed, and number of holes drilled in drilling 28 mm × 140 mm × 160 mm steel plates was experimentally investigated in this study. The entire experiments were designed by using Taguchi method to obtain robust results. In order to realize the level of importance of the machining parameters, the L9(34) orthogonal array, analysis of variance (ANOVA), and signal-to-noise (S/N) ratio were determined. The tool wear images are captured by using a machine vision system incorporating with an effective vertex detection algorithm. Finally, Statistical Process Control (SPC) technique is applied to detect vertices. The experimental results showed that by using TiAlN-coated drill and setting the spindle speed at 764 rpm and the feed rate at 0.12 mm/rev, the drill wears were minimized and thus the tool life were maximized. The confirmation tests demonstrated that it is a feasible and effective method for evaluating tool wear in drilling processing.

Keyword：