

Auto-Tuning of CNC Parameters According to the Machining Mode Selection

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Abstract : CNC (computer numerical control) machining centers have been widely used for machining different metal components for various industries. For a specific CNC machine, its everyday job is assigned to cut different products with quite different attributes such as material type, workpiece weight, geometry, tooling, and cutting conditions. Theoretically, the dynamic characteristics of the CNC machine should be properly tuned match each machining job in order to get the optimal machining performance. However, most of the CNC machines are set with only a standard set of CNC parameters. In this study, we have developed an auto-tuning system which can automatically change the CNC parameters and in hence change the machine dynamic characteristics according to the selection of machining modes which are set by the mixed combination of three machine performance indexes: the HO (high surface quality) index, HP (high precision) index and HS (high speed) index. The acceleration, jerk, corner error tolerance, oscillation and dynamic bandwidth of machine's feed axes have been changed according to the selection of the machine performance indexes. The proposed auto-tuning system of the CNC parameters has been implemented on a PC-based CNC controller and a three-axis machining center. The measured experimental result have shown the promising of our proposed auto-tuning system.

Keywords : auto-tuning, CNC parameters, machining mode, high speed, high accuracy, high surface quality

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