電腦數值控制機械之最佳進給率

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ABSTRACT

In this study, the main purpose is to propose an optimal-feedrate controller for a computerized numerical controlled (CNC) machine. The first is to provide a speed-controlled interpolation method based on optimal-feedrate algorithm. The real-time interpolation method was taken full its advantages, the chord error and the difference between the orientation of tangent vector of the curve at current point and previous point were repeatedly checked through the whole interpolation process. If either chord error exceeded the prescribed tolerance or sharp corner was detected, the feedrate in the proposed interpolation method was automatically adjusted in order to confine the chord error within the prescribed tolerance. A parametric curve, determined by the non-uniform rational B-spline (NURBS), was employed to test the feasibility and precision of the proposed interpolation method. The second is to propose a look-ahead linear jerk filter (LALJF) for a CNC machine. Proposed algorithm was constructed in Structured Text program for a Fuji electric ’s open programmable logic controller (PLC). For the purpose of ensuring smooth and accurate motion of a tool with a linear jerk change during real-time machining process, the proposed filter was formed by combining a look-ahead algorithm and three modified moving average filters (3MMAF). The look-ahead algorithm performed one look-ahead step-changing speed of the speed curve. The speed command was recalculated and sent to controller of CNC machine based on step-changing speed profile, given maximal acceleration/deceleration, and given maximal jerk. The theoretical and computational aspects of such LALJF are presented together with experimental results from their implementation on a 3-axis CNC machine. A multiple-step-changing speed curve of a CNC machine and a speed curve of a high-speed measurement system were constructed in order to verify the feasibility and precision of the proposed method.

Keywords : Parametric curves、NURBS curves、Speed-controlled interpolation

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