Development of the Numerical Control Program for a Five-axis Machine Tool with Nonorthogonal Rotary Axis

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ABSTRACT

The postprocessor is the important interface that converts cutter location data to machine control data, and is much more complicated in five-axis machine tool due to the simultaneous motion of linear and rotary axes. Since most researches of five-axis postprocessor method only deals with the orthogonal machine tool ’s configuration, this paper has developed a postprocessor methodology for three types of five-axis machine tools with a nutating head and table whose rotational axes are in an inclined plane. The advantage of this kind of configuration is to switch from vertical to horizontal machining in one machine. The machine tool ’s form-shaping funcation matrix is derived based on the homogeneous coordinate transformation and the forward kinematics . The analytical equation of NC data is obtained by the inverse kinematics and the form-shaping funcation matrix. The linearization algorithm for postprocessor is developed to ensure the machining accuracy. A window-based five-axis postprocessor with nutating axes programmed by Borland C++ Builder and OpenGL has been developed and can generate the NC code of the above three types ’ configuration according to the presented algorithm. Through the commercial solid cutting software VERICUT? and trial cut experiment, it demonstrated the feasibility of the proposed postprocessor methodology.

Keywords : Postprocessor ; Five-axis Machining ; Form-shaping Function ; Nutating axis

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