

A Unified Algorithm to Determine Machining Configuration for Free-Surface Parts

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Abstract

To cope with industrial demand for geometric variety and high precision, development of a CAD/CAM system for multi-axis machining is required. Previous work in developing such a system has been mainly concerned with tool-path generation for the given machining configuration: machine tool type and workpart setup orientation. However, as the part geometry gets complicated, determination of machining configuration is hard as it requires dealing with integrated motion of part and machine tool.

In this paper, we develop a unified algorithm to determine the machining configuration for free-surface parts using a digitized spherical map (DSM). DSM is constructed based on the visibility at every surface point and is used to determine : a) the minimum number of machine tool axes, b) the axes configuration, and c) the workpart setup orientation. Since the developed algorithm can provide all the process planning information in a unified fashion, it can be used as an automated process planning module for the integrated CAD/CAM system for multi-axis machining. To show the powerfulness and effectiveness of developed algorithm, numerical examples are presented.