CAD/CAM of Sculptured Surfaces on Multi-Axis *NC* Machine

The DG/K-Based Approach

***CAD/CAM* of Sculptured Surfaces on Multi-Axis *NC* Machine: The *DG/K*-Based Approach**
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ABSTRACT

Many products are designed with aesthetic sculptured surfaces to enhance their appearance, an important factor in customer satisfaction, especially for automotive and consumer electronics products. In other cases, products have sculptured surfaces to meet functional requirements. Functional surfaces interact with the environment or with other surfaces. Because of this, functional surfaces can also be called dynamic surfaces. Functional surfaces do not possess the property to slide over itself, which causes significant complexity in machining of sculptured surfaces. The application of multiaxis numerically controlled (NC) machines is the only way for an efficient machining of sculptured surfaces. Reduction of machining time is a critical issue when machining sculptured surfaces on multiaxis NC machines. To reduce the machining cost of a sculptured surface, the machining time must be as short as possible.

KEYWORDS

sculptured surface, generating surface of a cutting tool, surface generation, NC machine, kinematics of surface generation, DG/K-based method, indicatrix of conformity

Dedication

Dedicated to friends of mine.

Preface

Many products are designed with aesthetic sculptured surfaces to enhance their appearance, an important factor in customer satisfaction, especially for automotive and consumer electronics products. In other cases, products have sculptured surfaces to meet functional requirements. Examples of functional surfaces can be easily found in aero-, gas-, and hydrodynamic applications (turbine blades); optical (lamp reflector), and medical (parts of anatomical reproduction) applications; manufacturing surfaces (molding die, die face), etc. Functional surfaces interact with the environment or with other surfaces. Because of this, functional surfaces can also be called *dynamic surfaces*.

Functional surfaces do not possess the property to slide over itself. This causes significant complexity in machining of sculptured surfaces. The application of multiaxis numerically controlled (NC) machines is the only way for an efficient machining of sculptured surfaces.

Reduction of machining time is a critical issue when machining sculptured surfaces on multiaxis NC machines. To reduce the machining cost of a sculptured surface, the machining time must be as short as possible. Definitely, this is the case where the adage "Time is money!" applies. Generally speaking, the optimization of surface generation on multiaxis NC machine results in time savings. It is the right point to recall the shrewd observation[1] that "gaining time is gaining everything!"

This book is the author's attempt to cover briefly the modern theory of surface generation with focus on optimal machining of sculptured surfaces on multiaxis NC machine.

[1]John Shebbeare, 1709–1788.

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