

Contents

1	Modeling on the Coverage of Free-Form Surfaces	1
1.1	Questions for the Mapping of Free-Form Surfaces	1
1.2	Short Segments Generation	4
1.3	Modeling in Parallelogram Regions	6
1.4	Mapping Coverage of 3D Surfaces	9
1.4.1	Scanning the u -Strips	10
1.4.2	Partitioning	11
1.4.3	Simulations	12
1.5	Multiple Diagonal Segments	14
1.5.1	A Row of Parallelograms	15
1.5.2	Path with Multiple Diagonal Segments	17
1.5.3	Simulations	19
1.6	Process Validation	23
	References	25
2	Define and Synthesis on Orbit Diversity	27
2.1	Basic Model Along Orbit	27
2.2	Linear Orbit Features	31
2.2.1	Transformation Model of Gaussian Function	31
2.2.2	The Processing Steps with Multiplex Orbit	36
2.3	Curve Orbit Features	37
2.3.1	Effects of Curvatures	38
2.3.2	Effects of Corners with Different Angles	41
2.4	Combined Effect	44
2.4.1	Spiral Orbit	45
2.4.2	Raster Orbit	47
2.5	Process Validation	48
2.5.1	Spiral Orbit Finishing	48
2.5.2	Optimized Spiral Orbit	48

2.5.3	Raster Orbit Finishing	55
2.5.4	Optimized Raster Orbit	55
	References	62
3	Conquering the Dynamic Limitation of Velocity	65
3.1	Velocity Analysis.	65
3.1.1	Analysis of Velocity and Position	67
3.1.2	Velocity Checking and Smoothing.	69
3.2	Concept of Velocity-Variant Regime	71
3.2.1	Velocity-Variant Regime and Conflicts Between Convergence Rate and Efficiency	71
3.3	Models for Suppressing Velocity Limitation	74
3.3.1	Adding a Fictitious Removal Layer	74
3.3.2	Reducing the Removal Rate of TIFs	74
3.3.3	Traversing Nonuniform Orbits	75
3.4	The Controllable and Time-Variant TIFs Finishing Regime.	76
3.4.1	The Construction of CTVT Regime.	76
3.4.2	The Comparisons	79
3.5	Process Validation	80
3.5.1	Without CTVT Regime	80
3.5.2	With CTVT Regime	81
3.5.3	With CTVT and Larger Removal Rate.	82
	References	83
4	Prediction on Dwell Effects and Nonlinear Pressure Distribution	85
4.1	Analysis of Nonuniform Dwell	85
4.1.1	Material Removal Profile	87
4.1.2	Discrepancy in Removal Near the Edge	88
4.1.3	Simulation of Edge Rectification.	90
4.2	Weaken of Edge Dwell Effects	99
4.2.1	Situation of Different Tools	100
4.2.2	Orbits Extension	101
4.2.3	Surface Error Matrix Extension.	102
4.2.4	Extension Algorithms	102
4.3	Effects of Nonlinear Pressure Related Distribution	107
4.3.1	Tool Influence Functions (TIFs)	108
4.3.2	Modified Pressure Distribution Model	109
4.3.3	Modified Emulational TIFs Model.	111
4.3.4	Reverse-Calculation of Material Removal Rate	113
4.4	Process Validation	113
4.4.1	Validating the Edge Correction	113
4.4.2	Validating the Edge Extension	116

- 4.4.3 Validating the Removal Shape of e-TIFs 120
 - 4.4.4 Validating the Effectiveness of the Predicting Model 123
 - References 124
- 5 Correction on Data Matching and Remounting Errors. 127**
 - 5.1 Aspheric Calculation and Nonlinear Mapping Correction 127
 - 5.1.1 Description of an Off-Axis Aspheric Surface 128
 - 5.1.2 Non-negative Minimized Removal Criterion 129
 - 5.1.3 The Estimate of Radius of Curvature
and Conic Constant 131
 - 5.1.4 Design on the Interferometric Testing System 132
 - 5.1.5 Calculation on the Distorted Surface Error 134
 - 5.1.6 Multiregion Distribution Strategy 137
 - 5.1.7 Process Validation 140
 - 5.2 Remounting Errors Correction 144
 - 5.2.1 Effect of Dismatched Coordinate Systems 144
 - 5.2.2 Strategy for Reducing Remounting Errors. 146
 - 5.2.3 Process Validation 149
 - References 153

Pose-varied Multi-axis Optical Finishing Systems

Theory and Process Validation

Cheng, H.

2015, XI, 154 p. 128 illus., 51 illus. in color., Hardcover

ISBN: 978-3-662-44181-7