

# Accepted Manuscript

Virtual pivot alignment method and its influence to profile error in bonnet polishing

Junkang Guo, Anthony Beaucamp, Soichi Ibaraki



PII: S0890-6955(16)30582-X

DOI: [10.1016/j.ijmachtools.2017.06.001](https://doi.org/10.1016/j.ijmachtools.2017.06.001)

Reference: MTM 3265

To appear in: *International Journal of Machine Tools and Manufacture*

Received Date: 29 November 2016

Revised Date: 4 May 2017

Accepted Date: 4 June 2017

Please cite this article as: J. Guo, A. Beaucamp, S. Ibaraki, Virtual pivot alignment method and its influence to profile error in bonnet polishing, *International Journal of Machine Tools and Manufacture* (2017), doi: 10.1016/j.ijmachtools.2017.06.001.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Virtual Pivot Alignment Method and its Influence to Profile Error in Bonnet Polishing

Junkang Guo<sup>1\*</sup>, Anthony Beaucamp<sup>2</sup>, Soichi Ibaraki<sup>3</sup>

<sup>1</sup> Collaborative Innovation Center of High-End Manufacturing Equipment,  
School of Mechanical Engineering  
Xi'an Jiaotong University  
Xi'an, P.R. China  
guojunkang@stu.xjtu.edu.cn

<sup>2</sup> Department of Micro Engineering  
Kyoto University  
Kyoto, Japan  
beaucamp@me.kyoto-u.ac.jp

<sup>3</sup> Department of Mechanical Systems Engineering  
Hiroshima University  
Higashi-Hiroshima, Japan  
ibaraki@hiroshima-u.ac.jp

---

## Abstract:

This paper proposes a measurement and adjustment procedure for virtual pivot errors using the R-test and investigates the influence of virtual pivot errors to the surface profile in bonnet polishing. Initially, kinematic modeling is carried out for describing the location errors of rotary axes and defining overall errors of the virtual pivot arm. Then, the R-test is introduced to measure the three-dimensional displacement of a sphere located at the virtual pivot point and identify location errors. The adjustment procedure for virtual pivot errors is developed by means of mathematical analysis. The measurement and adjustment approach is applied to an ultra-precision polishing machine, on which an adjustment experiment was conducted to validate the proposed method. Based on this, a contrastive polishing experiment on a concave lens is carried out under good and poor virtual pivot errors. The experiment result shows that the maximum form deviation of the polished surface profile is reduced from 241.0 nm to 89.6 nm when good alignment of virtual error is achieved. Analytical simulation based on a material removal model of the bonnet polishing tool

---

\* Corresponding author

Download English Version:

<https://daneshyari.com/en/article/5015693>

Download Persian Version:

<https://daneshyari.com/article/5015693>

[Daneshyari.com](https://daneshyari.com)