



The Japan Society for Precision Engineering

Introduction of JSPE Young Engineer Awards 2018

1. Tomofumi OHASHI (THK CO., LTD.)

Nanometric contouring control accuracy for linear motion ball guides considering their nonlinear spring characteristics

This research realized a means of contouring control for linear motion ball guides utilizing a feed-drive system that is accurate to a nanometric scale by conducting a detailed analysis of the mechanism in which the quadrant glitch occurs as well as its reproducibility. This study also developed a compensation feature based on the results of that analysis. The proposed method has been tested and proven on an actual machine and is thus highly suited for industrial application. This achievement is worthy of the organization's technical incentive award.

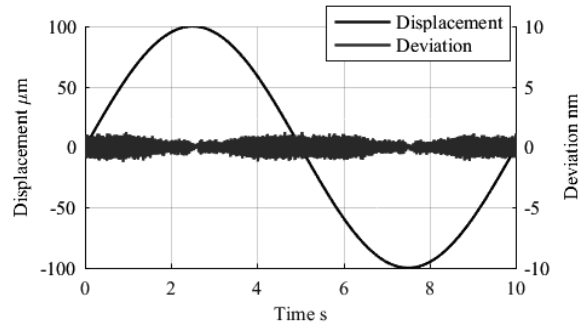


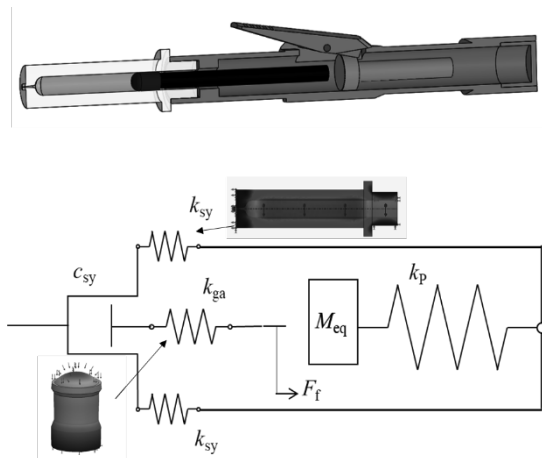
Fig. 1. Contouring controlled results of a feed drive system with linear ball guides. The error due to the non-linear spring behavior can be compensated less than ± 1 nm by the proposed method.

2. Mitsuru KUDO (National Institute of Technology, Nagaoka College)

Development of estimation method for maximum injection pressure in the needle-free injector

This research proposes a method of estimating the maximum injection pressure for needle-free injectors using motion analysis that employs simulation and experimental verification. This method enables the

design of needle-free injectors with an optimal injection pressure for various types of injectable solutions. It also optimizes the absorption of drug solutions in the intradermal. The method deserves recognition for its considerable contribution to improved quality of life and is thus worthy of the organization's technical incentive award.



- k_p : Stiffness of spring for driving piston
- M_{eq} : Equivalent mass
- k_{sy} : Stiffness of syringe
- k_{ga} : Stiffness of gasket
- F_f : Friction force between syringe and gasket
- c_{sy} : Damping coefficient of syringe

Fig. 2. Mechanical model of spring powered needle-free injector for motion analysis

3. Kenzo NOSE (NTN corporation)

Wrist joint actuator for robot

This research devised a new motion mechanism by analyzing a dynamic model and developing an actuator that employs a parallel link mechanism for realizing high-speed response with a more compact size. The double-armed robot equipped with wrist-joint actuators can effectively perform fine assembly operations and is thus highly suited for industrial application. This achievement is worthy of the organization's technical incentive award.

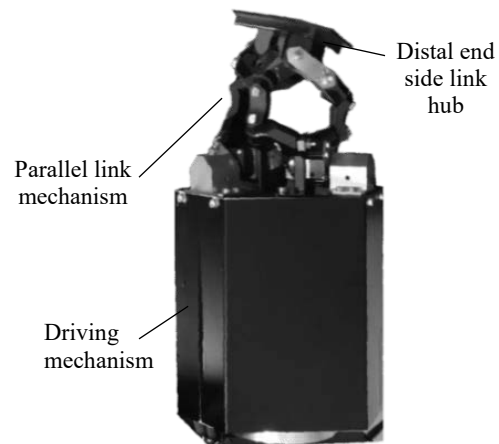


Fig. 3. Appearance of wrist joint actuator

4. Kenji NISHIKAWA (Hitachi, Ltd.)

A study on workpiece distortion integrated analysis of forging and machining processes for the high precision machining

This research considers a method of integrated analysis for residual stress and distortion generated during the forging and subsequent machining processes in the manufacture of elongated thin parts

such as turbine blades. The method realizes highly accurate analytical prediction by constructing algorithms that automatically inherit inter-process data and analytical models based on specific physical phenomena. The proposed method contributes considerably to the improved productivity and quality of turbine blades and is thus worthy of the organization's technical incentive award.

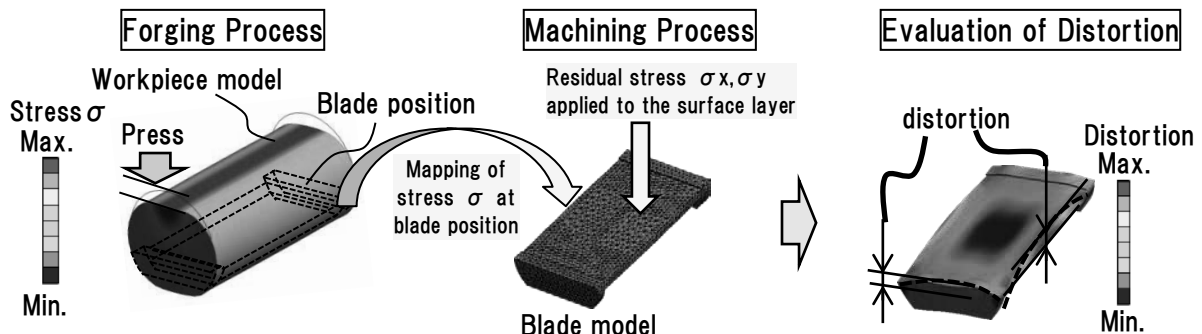


Fig. 4. Schematic of the distortion integrated analysis for simulated blade model

Introduction of The 39th Machine Tool Engineering Foundation Award

[Paper Awards 2017]

1. Influence of rotary axis on tool-workpiece loop compliance for five-axis machine tools

Daisuke KONO, Yuki MORIYA and Atsushi MATSUBARA

Precision Engineering, Vol.49, pp.278-286

2. Design of ECM tool electrode with controlled conductive area ratio for holes with complex internal features

Dahai MI and Wataru NATSU

Precision Engineering, Vol.47, pp.54-61

3. An optical lever by using a mode-locked laser for angle measurement

Yuki SHIMIZU, Yukitoshi KUDO, Yuan-Liu CHEN, So ITO and Wei GAO

Precision Engineering, Vol.47, pp. 72-80