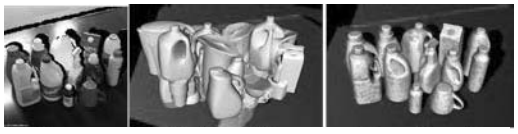
Introduction of JSPE Young Engineer Awards 2017

1. Shuichi AKIZUKI (Keio University)
Physical Reasoning for 3D Object Recognition using Global Hypothesis Verification

This work proposes a hypothesis verification algorithm that can simultaneously interpret the postures of multiple objects in 3D object recognition by using distant images. Our algorithm was more accurate and stable than algorithms proposed in existing studies; this was achieved by proactively incorporating verification steps without solely relying on forward processing. Further, the generation and recognition of scene hypotheses are efficiently realized through combinatorial optimization that considers the physical disposition possibilities. The proposed technique is academically superior and has a high industrial application value. Therefore, it is worthy of being awarded the Technical Encouragement Award of the Society.



(a)Input scene (b)All object candidates (c)Recognition result

Fig. 1 Recognition result of the proposed method

2. Daisuke KONO (Kyoto University)
Direction and position dependencies of machine tool compliance

This work proposes a technique to evaluate the compliance of machine tools from a bird's eye view. By creating a 3D compliance map from the data measured at the time of excitation, we have quantitatively evaluated the variations in compliance due to the direction dependency of compliance and the tilt angle of the rotary axis. Furthermore, by using the proposed technique in actual applications, we have realized quantitative evaluation in a 5-axis machine tool. Because the proposed technique is useful in machine design and setting of machining conditions, its industrial contribution is significant. Therefore, it is worthy of being awarded the Technical Encouragement Award of the Society.

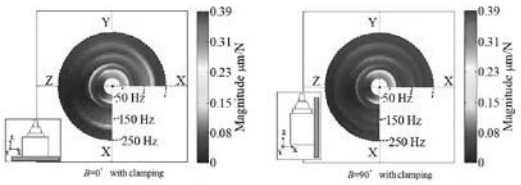


Fig. 2 Compliance maps at different tilt angles of B-axis

Introduction of JSPE Takagi Awards 2017

1. Precision Improvement in the Continuous Path Control of Direct Drive Rotary Table Systems for Machine Tools by Identifying the Vibration Modes with Higher Resonance Frequencies than the Control Cycle's Defined Nyquist Frequency

Yasusuke IWASHITA, Kazunori IIJIMA, Naoto SONODA
(FANUC CORPORATION)
J. JSPE, Vol.83, No.11, pp.1033-1040

Direct drive (DD) motors realize precise position control but are easily affected by torque ripple vibrations. Higher gain leads to suppression of the vibrations but it brings excitations of other mechanical resonances at higher frequencies than the Nyquist frequency. We propose a new measurement method of exact frequency response to the Nyquist and beyond to identify such mechanical resonances. The performance has been evaluated in an actual machine tool with a DD motor. The precision of continuous path control is improved with higher gain assisted by the proposed method.

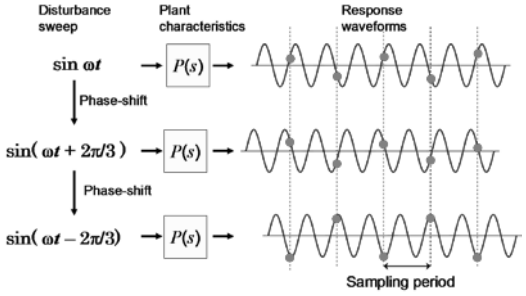


Fig. 3 Schematic illustration of the proposed method to measure frequency response

2. Mechanisms of material removal and subsurface damage in fixed-abrasive diamond wire slicing of single-crystalline silicon

Takaaki SUZUKI, Yuki NISHINO, Jiwang YAN
(READ Co., Ltd.)

Precision Engineering, Vol.50, pp.32-43

Single-crystal silicon was sliced using a newly developed high-speed fixed-abrasive dicing wire saw. The effects of diamond grit size, wire speed, and number of slicing cycle on the surface roughness and subsurface damage of the workpiece were investigated by surface profiling, Raman spectroscopy and cross-sectional transmission electron microscopy. It was found that by using finer diamond grits and increasing the sawing cycles, the depth of micro dents and saw marks was reduced significantly, and in turn, the surface roughness was improved. A transition from brittle mode to ductile mode machining was confirmed from chip morphology observation when reducing the grit size. The subsurface damaged layers were composed of amorphous layers, dislocated layers with grain boundaries, as well as micro cracks. The smooth surface regions were dominated by amorphous silicon; while within the saw marks, a mixture of amorphous and metastable silicon phases was detected. Inside the micro dents, however, single-crystal silicon was predominant. Furthermore, the significance of silicon amorphization and poly-crystallization was strongly dependent on the wire speed. The higher the wire speed, the less the amorphous and polycrystalline layer. The present study provides comprehensive insights into the surface formation mechanism which is important for process optimization of high-speed and low-damage slicing of single-crystal silicon.

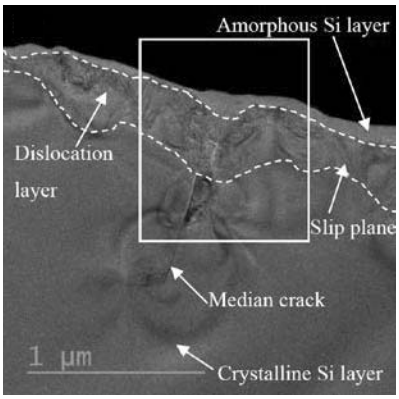
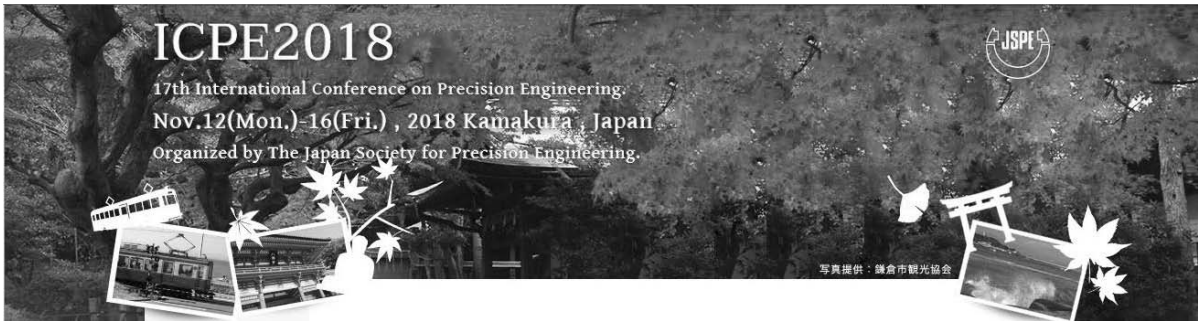
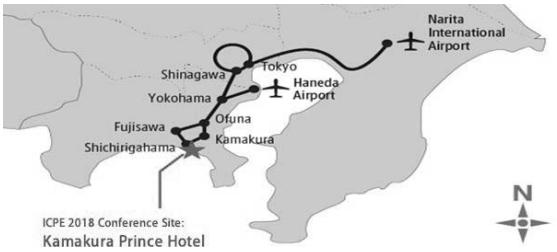


Fig. 4 TEM image for diamond size of 8-16μm



It is great honor and pleasure to invite you to the 17th International Conference on Precision Engineering (**ICPE2018**) will be organized by the Japan Society for Precision Engineering (JSPE) on **12-16 November 2018 in Kamakura, Japan**.

The conference will be held at Kamakura Prince Hotel located right off the shore of Shichirigahama beach, which is a part of famous Shonan area of Sagami Bay. Kamakura is known for an ancient capital of Japan. There are a number of shrines and temples including Kotokuin with a Buddha statue.



Registration

Early registration deadline Sep. 15, 2018

For more details,
Please visit our website: *http://icpe2018.jspe.or.jp/*

Contact Information

Please do not hesitate to contact ICPE2018 staff for any further assistance.
Email: info@icpe2018.jspe.or.jp