



The Japan Society for Precision Engineering

Introduction of JSPE Technology Awards 2020

This award is presented to researchers and engineers of companies who have had creative achievements in the field of precision engineering in recognition of their dedication and effort, as well as in the anticipation of their future development.

● **Integrated automatic design technology for robot production line that can be adapted immediately for changes in production environment**

Daiki KAJITA, Nobuaki NAKASU, Atsuko ENOMOTO, Daisuke KATSUMATA (Hitachi, Ltd.) and Koya OYAMA (Hitachi Automotive Systems, Ltd.)

Manufacturing companies often face difficulties in securing adequate production capability due to a variety of regional risks, such as natural disasters and epidemic outbreaks. To address this difficulty, we developed an integrated automatic-design technology for a flexible production line using robotic technology that involves three processes: (i) high-throughput assembly sequence generation, (ii) minimum-cost production line configuration generation, and (iii) short-man-hour robot motion program generation. This technology can facilitate non-skilled workers in effortlessly designing an optimized production line and reconfiguring the line for immediate adaptations to changes in the production environment.

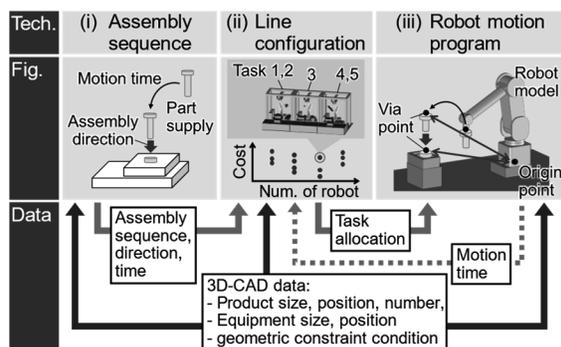
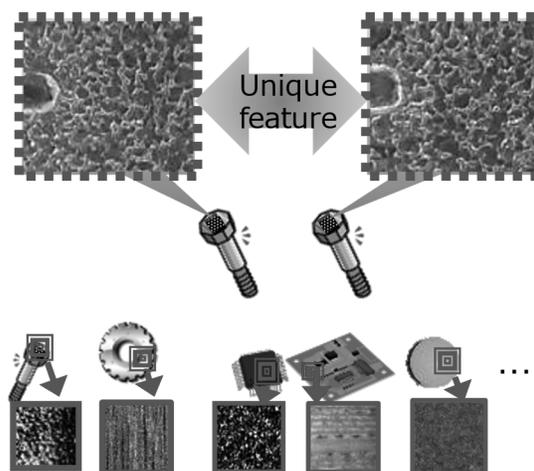


Fig. 1. Integrated automatic design technology

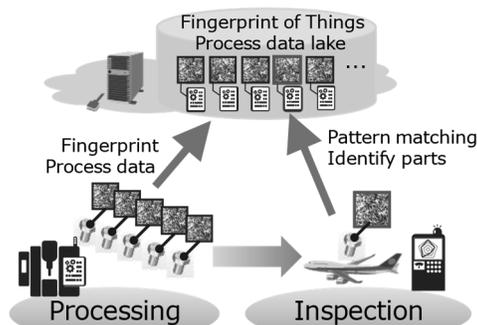
● **Development of sensing and matching methods for “fingerprint of things” towards individual identification of various products**

Toru TAKAHASHI (GAZIRU, Inc.), Kengo MAKINO and Rui ISHIYAMA (NEC Corporation)

We developed Fingerprint of Things recognition technology that enables the identification of individual parts being processed in a production line without marking or tagging. This technology enables the tracing of every part on a production line consisting of multiple manufacturing and quality checking processes. The technology consists of two key components: (i) a sensing method for capturing unique patterns from individual part surfaces and (ii) a fast image-matching algorithm for large-scale individual identification of parts. The technology was determined effective for various parts and is now being applied to real applications by many precision manufacturers, such as of automobiles, optics, electronics parts.



1. Sensing method for capturing “fingerprint” from various parts using single device



2. Fast pattern matching algorithm for mass-scale identification at real time in production process

Fig. 2. Overview of Fingerprint of Things recognition technology for part traceability

● **Development and Realization of TDS-DMA system for passing down skills and techniques on motion and muscle analysis by craftsmen for their die finishing skill**

Chiharu SAEKI, Yuki KUBO, Minoru SUGA, Takushi OTANI and Hideyuki EGUSA (Mazda Motor Co., Ltd.)

Most of companies share common challenge for passing down of craftsmanship in a short term while the labor population has been shrinking because of falling birthrate and aging population. We have developed “Takumi Development System on Digital Motion Analysis (TDS-DMA)” to shorten the period of handing down of craftsmanship. By measuring the motions of craftsmen, which had been cultivated over the years, with a motion capture system and analyzing them along with their eye movements and musculoskeletal motions, we worked on visualization and analyzation of the know-how of craftsmen, and

quantification of their skills. As a result of improving trainee’s skill by this system, the training term for craftsman has been shortened from 20 years to 10 years. We have realized passing down of craftsmanship in a short term.

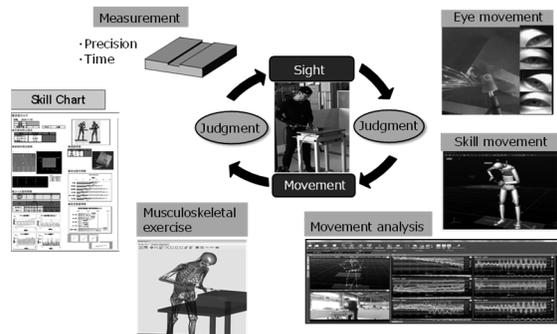


Fig. 3. TDS-DMA system

Report of the 2nd JSPE Affiliate Workshop

The 2nd JSPE Affiliate Workshop was held on December 1st, 2020. Due to the COVID-19 pandemic, the workshop was online this time. The JSPE Affiliate Workshop is an event that aims to encourage international perspectives for young researchers. The workshop is organized by JSPE Affiliate, an organization of young leading researchers and engineers in Japan.

In the 2nd JSPE Affiliate Workshop, Prof. Hitomi Yamaguchi Greenslet, an associate professor from the University of Florida, gave a lecture on “Academic Career Development in the US”, based on her rich experience. The outline of her lecture is as follows:

- Funding Opportunities in the US
- Life in US Academia
- Finding Academic Positions in the US
- Messages for Young Researchers

Thirty-two young students, researchers, and engineers participated in this online workshop. They plied the lecturer with questions, making the 2nd JSPE Affiliate Workshop very successful.



Prof. Hitomi Yamaguchi Greenslet



Participants of the 2nd JSPE Affiliate Workshop