

Research topics for graduate students for 2025

Professor Hayato Yoshioka

Department of Mechanical Engineering

Acceptable course(s)

- Master's Degree
- Doctoral Degree

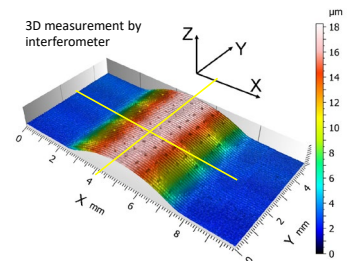


Research Topics

Our main research field is the realization of advanced manufacturing systems that can provide high precision, high efficiency, flexibility, and lower cost. The manufacturing system consists of machine tools, measuring systems, monitoring functions, robot manipulators and so on. Following are a few research topics.

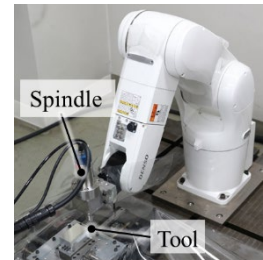
1. Fabrication of functional curved surface with fast tool servo technology

We have developed a fast tool servo mechanism for the milling process [1] for fabricating curved surfaces with micro textures. The textured surface is expected to provide various surface functions. We are evaluating the system performance and the function of the generated surface.



2. Robotic milling system for flexible cutting process

Industrial robots have the flexibility to machine a complex curved surface. However, the stiffness of the robot structure is lower than that of conventional machine tools. Therefore, we have evaluated the relationship between the posture of the robot and machining characteristics and investigated the determination method of optimal posture for precise machining[2].



3. Reconfigurable manufacturing system with autonomous mobile robots

Future industrial factories will be required to have reconfigurability to produce various products with short product cycles. Autonomous mobile robots (AMR), which move omnidirectionally, can do tasks instead of human operators. We have studied the applications of AMR in flexible manufacturing systems[3].

Articles Related to Research Topics

- [1] Yoshioka, H., Kojima, K., Toyota, D., Micro patterning on curved surface with a fast tool servo system for micro milling process, CIRP Annals, Vol.69, No.1, (2020), pp.325-328. (DOI:10.1016/j.cirp.2020.04.046)
- [2] Leandro Batista da Silva, Yoshioka, H., Shinno, H., Zhu, J., Tool orientation angle optimization for a multi-axis robotic milling system, Int. J. of Automation Technology, 13-5, (2019), pp.574-582. (DOI: 10.20965/ijat.2019.p0574)
- [3] Inoue, S., Urata, A., Kodama, T., Tobias, H., Maruyama, Y., Fujita, S., Shinno, H., Yoshioka, H., High precision mobile robotic manipulator for reconfigurable manufacturing systems, Int. J. of Automation Technology, 15-5, (2021), pp.651-660. (DOI: 10.20965/ijat.2021.p0651)

Lab. Web page: <https://yoshioka-lab.iis.u-tokyo.ac.jp/>