

Peg-in-hole using transient information of force response

Hikaru Unten¹, Sho Sakaino² and Toshiaki Tsuji¹

In precision assembly, a peg is guided into a hole with a tolerance smaller than the position accuracy. Although force/torque sensing can estimate the relative position between the peg and hole accurately, its performance is impaired because of the degradation of estimation accuracy caused by transient error at the time of the collision. We found in this study that if contact state transitions can be generated reproducibly, accurate relative positions can be derived from the transient responses, which were previously regarded as errors. We propose a method that focuses on this characteristic. The transition in the contact state is determined by force/torque responses. Then, the estimation accuracy of the direction of the hole improves by using only the force/torque responses of a specific contact state. Additionally, the time between the contact and estimation of the relative position is reduced by using the transient force information.

Manuscript number of the TMECH paper: TMECH-04-2022-13549

¹Hikaru Unten and Toshiaki Tsuji are with the Graduate School of Science and Engineering, Saitama University, 255 Shimo-okubo, Saitama, 338-8570

²Sho Sakaino is with the Graduate School of Systems and Information Engineering, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8577, Japan