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Design of MEMS vision tracking system based on a micro fiducial marker

Yong-Sik Kim [a], Seung Ho Yang [b,*], Kwang Woong Yang [c], Nicholas G. Dagalakis [a]

[a] Intelligent System Division, Engineering Laboratory, National Institute of Standards and Technology, 100 Bureau Dr. Gaithersburg, MD 20,899, USA
[b] HDI Tech. Staging, Shakopee Drive Center, Seagate Technology, Mailstop SHK221, 1280 Disc Drive, Shakopee, MN 55379, USA
[c] Korea Institute of Industrial Technology, Cheonan, South Korea

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ABSTRACT

Many microelectromechanical systems (MEMS) devices require considerable design effort to embed their own sensors to monitor themselves.

In this study, a MEMS-based vision tracking system is developed based on micro fiducial markers. The vision tracking system recognizes the predetermined patterns of the micro-scale fiducial markers and calculates the position and rotation of the MEMS elements. Due to its good accessibility, the presented system can be applied to MEMS devices without significant effort or modification. This tracking system and three micro vision markers are applied to a MEMS nanopositioner as a linear displacement sensor. With three fiducial markers printed on a nanopositioner, the presented system can monitor the linear displacement of the nanopositioner with the error less than 1% of an intended motion and the jitter error less than 1 μm. The presented MEMS vision tracking system also demonstrated its capabilities to track multiple MEMS elements simultaneously in MEMS-based micro-manipulation.

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