

DEVELOPMENT OF A 2-DOF DVD LASER PROBING PZT MICRO POSITIONING SYSTEM

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Abstract

The rapid growing of nano-technology in the industry has lead the micro-motion stages being widely used in various applications, such as semiconductor industry, bio-medical industry and micro/nano inspection. Normally, micro stages use PZTs as the actuators to move and it normally offers the displacement of tens of micrometer. For long displacement micro-motion, the resolution requirement of few centimeters displacement is about 10 nanometers.

The research on long displacement nano-technology is normally focused on one-degree-of-freedom displacement with two-step method that combines the coarse distance adjustment and the fine displacement. As for measuring the displacement, Laser Interferometer (LI) is regarded as the feedback sensor for probing the micro stage position. However, the cost of LI is nevertheless too high.

This project has established a two-degree-of-freedom DVD laser probing PZT micro positioning system which applied the optical pickup head of a commercialized DVD player which costs only less than NT\$2000. The two sets of home made DVD laser probe are able to substitute the costly LIs to measure the displacement of X-Y positioning stage and the accuracy can reach $\pm 100\text{nm}$ with only 0.05% of Laser Interferometer's cost. With the cost down, it has more advantage of applying laser probe on micro stage.

Keywords: DVD, Laser pickup head, PID control, Micro-stage

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