URN etd-0407109-183708-572
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Statistics This thesis had been viewed 64 times. Download 38 times.
Department
Year 2006
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Development of a large measurement range ultra precision with topography machine
Date of Defense 0000-00-00
Page Count 87

Keyword
stylus profilometer
topography measurement
contact probe

Abstract
The purpose of this study is to develop a large measurement range ultra precision with topography with advantages of low cost and high precision. The measurement system is consisted of Piezo Ceramic Linear Moter (PCLM), X/Y axis microstep motor, and contact probe with sensor, and a PC with Borland C++ Builder is used to write control measurement software for system integration. The contact probe is designed with a cross-form frame bar, which has slender rod on all four ends. Commercial stylus is used and affixed at the end of lead cylinder, which is positioned at the center of the cross-form frame bar. The two sides of the lead cylinder are designed with a fixed structure and Vee grove structure. A roller and two univesal balls support the lead cylinder at interval of 120° by surrounding the center of the lead cylinder. The probe is limited to move toward Z-axis.

The sensor of the contact probe is made with an optical displacement sensor modified from a pick-up head inside DVD player available on the market. The measurement principle of this study is that when the stylus tip of the contact probe is touches the object surface, the contact force would be passed to the suspension structure via the lead cylinder, and the cross-form frame bar inside the suspension structure generates vertical displacement. Then the optical displacement sensor would generate a focus error signal, and move the contact probe driven by program judgment, so that the contact probe always moves along the surface profile. At the same time, the coordinates of PCLM are recorded by a linear scale, and are used to obtain the profile data of objects.
Advisory Committee Chih-Liang Chu - advisor

Files etd-0407109-183708-572-001.pdf

indicate access worldwide
Date of Submission 2007-08-23