

# Vertical-scanning profilometry having nanometric height resolution and high scanning speed using two short-coherent-light sources of different wavelengths

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# 2004 Fiscal Year Final Research Report Summary

## Vertical-scanning profilometry having nanometric height resolution and high scanning speed using two short-coherent-light sources of different wavelengths

Research Project

### Project/Area Number

14350129

### Research Category

Grant-in-Aid for Scientific Research (B)

### Allocation Type

Single-year Grants

### Section

一般

### Research Field

Intelligent mechanics/Mechanical systems

### Research Institution

KANAZAWA UNIVERSITY

### Principal Investigator

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### Project Period (FY)

2002 – 2004

### Keywords

two wavelengths / optical interferometer / interference phase / vertical scanning / phase shift / flash lamp / Extremely high power LED / Digital camera

### Research Abstract

We developed a high-speed vertical scanning profilometry which has nanometric height resolution. The developed profilometry is equipped with two short-coherent-light sources. These sources are made with two types of band-path filter and extremely high power light emitting diodes (LED). In 3-D profile measurements, this profilometry records many interferograms while vertically-scanning the Mirou-type objective with 0.4-micrometers step and alternately-flashing LED. Odd-numbered interferograms are captured with 503-nm LED and even-numbered interferograms are with 591-nm LED. Regarding the recorded interferograms, a computer extracts phase and modulation

amplitude using phase-shifting technique. As two step movements are put between the sequential captures with the same LED, phase step corresponds to approximately  $6n + n/2$  with 503 nm and approximately  $6n - n/2$  with 591 nm.  
After searching the interferogram having modulation peak, the computer extracts optical path difference at the capturing moment of the interferogram with nanometric resolution from phase information.  
From 0.4  $\mu\text{m}$  of the vertical step length and capturing rate more than 110 Hz, vertical scanning speed is given more than 46  $\mu\text{m/s}$ . This speed is four times higher than commercial high-speed vertical scanning profilometry

## Research Products (6 results)

All	2004	2003	2002
All	Journal Article		

[Journal Article] Vertical-scanning profilometry having nanometric height resolution and scanning speed more than 40 $\mu\text{m/s}$	2004	▼
[Journal Article] Vertical-scanning profilometry having nanometric height resolution and scanning speed more than 40 $\mu\text{m/s}$	2004	▼
[Journal Article] High-speed precision-surface profilometry using large phase shifting	2003	▼
[Journal Article] High-speed precision-surface profilometry using large phase shifting	2003	▼
[Journal Article] Vertical-scanning profilometry using double-exposure camera and two short-coherent-light sources of different wavelengths	2002	▼
[Journal Article] Vertical-scanning profilometry using double-exposure camera and two short-coherent-light sources of different wavelengths	2002	▼

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