PI s stem

PI s stem algorithm development that use modulating laser

* [1], # [2], [3], i [3], [4]

*S. J. Kim[1], #Y. J. Kang (yjkang@chonbuk.ac.kr)[2] , N.K. Park[3] , S.H.Lee[3], W.J. Ryu[4]

。

Key words : Modulating Laser, ESPI, LabVIEW, GPIB, Wavelength Modulation

1.

, /

. , MEMS, LCD, Build-Up PCB

。 ,

.

(ESPI) PZT

.

2.

2.1 avelength Modulation

(injection current) (wave length)

.

$\Delta i = \alpha \cdot$, (wavelength)

, .

$$\Delta\lambda = \beta \cdot \Delta i = \beta \cdot \alpha \cdot \quad (1)$$

α β .

.

(Laser cavity condition)

$$\lambda = \frac{2}{m} \cdot \quad (2)$$

: Refractive index

: Cavity length

m : Integer

Δi ,

ΔT .

$$\Delta T = \cdot \Delta i \quad (3)$$

: Thermal resistance

, $\Delta\lambda$ (2)

.

$$\Delta\lambda = \frac{2}{m}\left(\frac{\partial}{\partial T} + \frac{\partial}{\partial T} \right) \cdot \Delta T \quad (4)$$

(cavity length) (refractive index)

$\Delta\lambda$ (3) (4) .

$$\Delta\lambda = \frac{\lambda}{\partial T} \cdot \Delta i \quad (5)$$

, β Wavelength(656.5nm),ref-

-ractive index(=3.5), refractive-index differential(10^{-3}/),

thermal resistance(R 25)

。 .[6]

$$\beta = \frac{\lambda}{\partial T} \quad 6 \times 10^{-3}(\text{nm/mA}) \quad (6)$$

2.2. PI I

PZT RS-232 i

Ω Ω

. PZT

, .

IP

GPIB(General Purpose Instrument Bus)

. = GPIB

LabVIEW 8.2

NI PCI-GPIB

.

3.

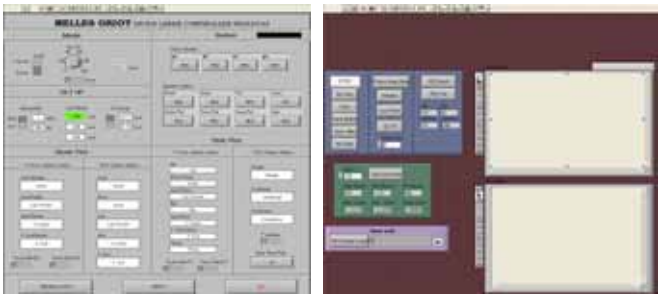

Fig. 1 Modulating GPIB program

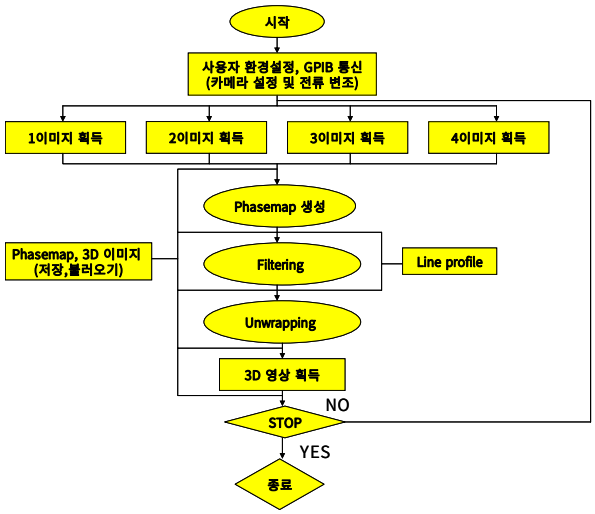

Fig. 2 Modulating Laser method algorithm

4. n

300 X 160 mm, 2mm

.

ESPI

Beam Splitter

.

ESPI . GPIB

USB .

. n

Table. 1

5 μ m, 5.5 μ m, 6 μ m .

80mA Pig3~8

+0.2mA +0.4mA Pasemap

unwrapping, 3D . λ

3D .

3D 1Pix 2 μ m

.

+0.2mA +0.4mA

. +0.1mA +0.3mA

Pasemap .

Table.1. Error rats by Experiments Data

		μ	. μ	μ
.2m		4.31	4.72	5.11
		13.8%	13.6%	14.8%
.4m		4.73	5.21	5.67
		5.4%	5.2%	5.5%

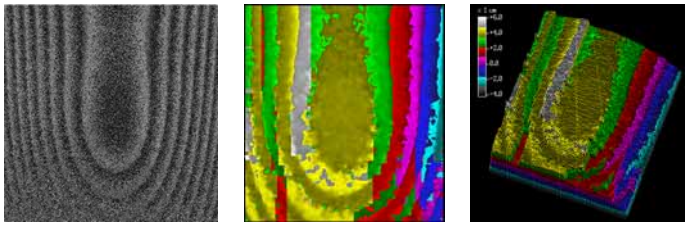

Fig. 3 Phasemap, Unwrapping, 3DPolt (+0.2mA, 5 μ m)

Fig. 4 Phasemap, Unwrapping, 3DPolt (+0.4mA, 5 μ m)

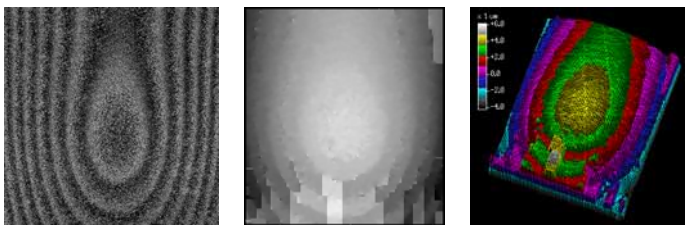

Fig. 5 Phasemap, Unwrapping, 3DPolt (+0.2mA, 5.5 μ m)

Fig. 6 Phasemap, Unwrapping, 3DPolt (+0.4mA, 5.5 μ m)

Fig. 7 Phasemap, Unwrapping, 3DPolt (+0.2mA, 6 μ m)

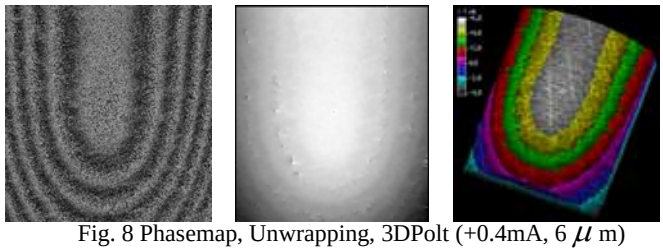

Fig. 8 Phasemap, Unwrapping, 3DPolt (+0.4mA, 6 μ m)

.

controller LabVIEW 8.2

GPIB ESPI System

ESPI .

unwrapping 3D ,

+0.4mA

λ detail

.

ESPIS System PZT

. ,

. = LabVIEW 8.2

, .

λ

.

1. , , PZT i

, Journal of the Korean Ceramic Society, Vol. 31, No. 10, pp. 1133-1140, 1994.

2. Osami Sasaki, Yoshihiro Ikeada, Takamasa Suzuki, "Superluminescent diode interferometer using sinusoidal phase modulation for step-profile measurement", Applied Optics, Vol. 37, No. 22, 1998

3. , , ,

,

, pp. 23-27, 1990

4. Takamasa Suzuki, Hiromi Suda, Osami Sasaki, "Double sinusoidal phase-modulating distributed-Bragg-reflector laser-diode interferometer for distance measurement", Applied Optics, Vol. 42, No.1, 2003.