

FPGA Development of the Self-sensing Magnetic Bearing System Using The FPGA

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BK21

Key words : (Self-sensing Algorithm), FPGA (Field Programmable Gate Array), TMP (Turbo Molecular Pump)

1.

가

$$(1) \quad (2)$$

가
가
가

$$g_0 - x = \frac{\mu_0 A_g N^2}{2V} \cdot \frac{di}{dt} \quad (3)$$

(Feedback Control) (3)

가

가

2.2

[2], [3]

가

[4], [7]

8-Pole

(Self-sensing)

가

()

Fig. 2 8-pole

(Position Estimator) FPGA

2.

2.1

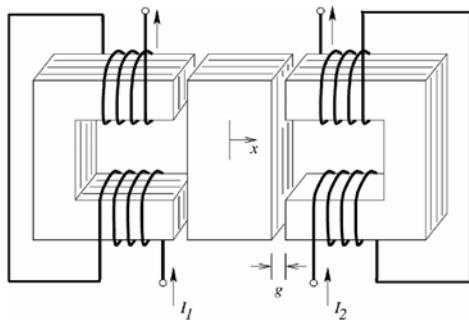


Fig. 1 Magnetic bearing scheme

Fig 1

가

Faraday

f g Non-linear Matrix Equation

2.3

[6]

PWM Switching

가

Fig.3

$$V = Ri + L \frac{di}{dt} \quad (1)$$

L

$$L = \frac{\mu_0 N^2 A_g}{2(g_0 - x)} \quad (2)$$

R

i

μ_0

가

N Pole

A_g Pole

g_0 , x

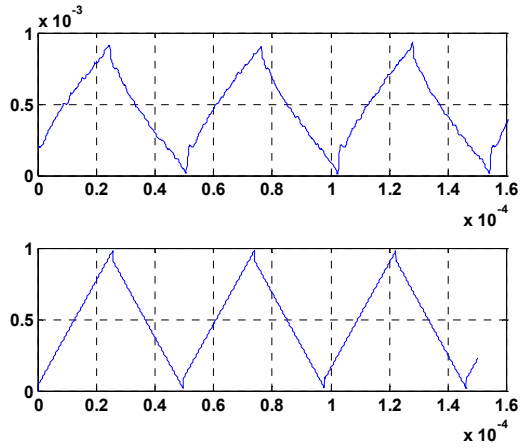


Fig. 3 Experiment current and simulation current

Thrust Bearing
 , FPGA
 (3) DS1104 Controller Current Amplifier
 , Xilinx
 Virtex-4 Extreme DSP Kit A/D
 D/A 가 2 4
 3 Inductive Sensor

5.

3. FPGA

3.1 FPGA

[1]

DSP 가 DSP 가 FPGA (Field Programmable Gate Array)

FPGA DSP Processor 가 DSP Processor FPGA Xilinx Virtex-4 Extreme DSP Kit 105 MSPS A/D 가 , 160 MSPS D/A

3.2 FPGA

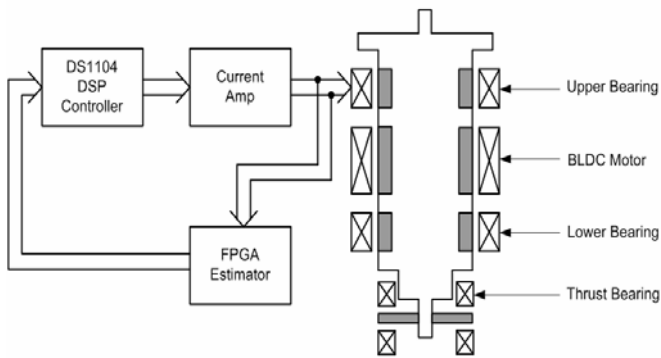


Fig. 4 System block diagram and Schematic diagram of a magnetically levitated turbo-molecular pump

Fig. 4

TMP (Turbo Molecular Pump)

FPGA APEX PA74 Power Amplifier , X Y BLDC Motor

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