3-Axis Magnetometer Calibration

2015 CONTROLA Day three

Lab. For Navigation, Control, and Applications

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Contents

I. Introduction
II. Magnetometer Calibration
III. Calibration Result
IV. Forward

Introduction

Magnetometer

- 지구자기의 세기와 방향을 측정하는 기기
- 물체가 가진 자화의 세기 측정

Calibration

- 어떤 기기나 측정 계기를 정확도가 확인된 표준 기기나 계기와 비교하여 정확도의 차이를 찾아내고, 상호 비교하고, 기록하고, 차이를 제거하는 행위

Magnetometer Calibration

$$v\text{max\_}x = \text{max\_}x - ((\text{min\_}x + \text{max\_}x)/2)$$
$$v\text{max\_}y = \text{max\_}y - ((\text{min\_}y + \text{max\_}y)/2)$$
$$v\text{max\_}z = \text{max\_}z - ((\text{min\_}z + \text{max\_}z)/2)$$

$$v\text{min\_}x = \text{min\_}x - ((\text{min\_}x + \text{max\_}x)/2)$$
$$v\text{min\_}y = \text{min\_}y - ((\text{min\_}y + \text{max\_}y)/2)$$
$$v\text{min\_}z = \text{min\_}z - ((\text{min\_}z + \text{max\_}z)/2)$$

$$avgs = \begin{bmatrix} avg\_x \\ avg\_y \\ avg\_z \end{bmatrix} = \left(\begin{bmatrix} v\text{max\_}x \\ v\text{max\_}y \\ v\text{max\_}z \end{bmatrix} + (\begin{bmatrix} v\text{min\_}x \\ v\text{min\_}y \\ v\text{min\_}z \end{bmatrix} \cdot \underline{(-1)} \right) \Big/ 2$$

$$avg\_rad = (avg\_x + avg\_y + avg\_z)/3$$

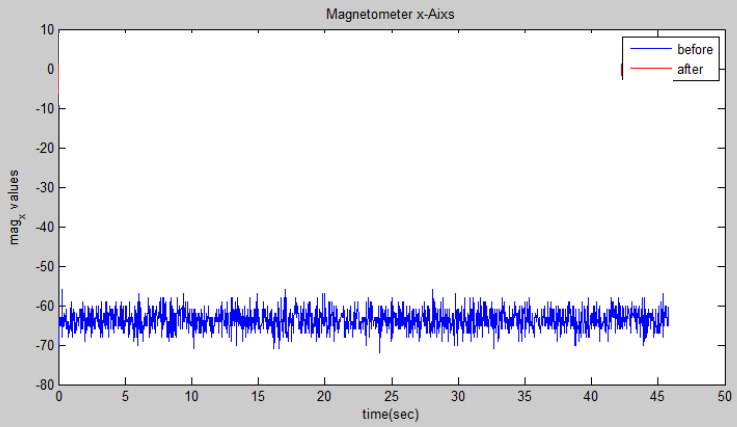
$$x\_scale = avg\_rad/avgs\_x$$
$$y\_scale = avg\_rad/avgs\_y$$
$$z\_scale = avg\_rad/avgs\_z$$

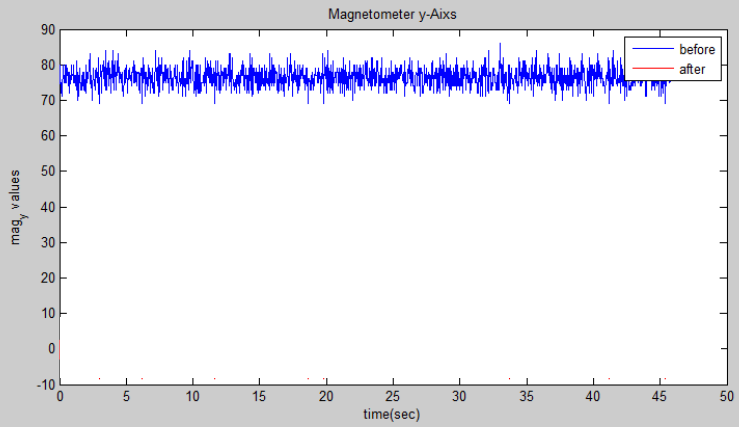
$$mag\_x = mag\_x - ((\min\_x + \max\_x)/2)$$
$$mag\_y = mag\_y - ((\min\_y + \max\_y)/2)$$
$$mag\_z = mag\_z - ((\min\_z + \max\_z)/2)$$

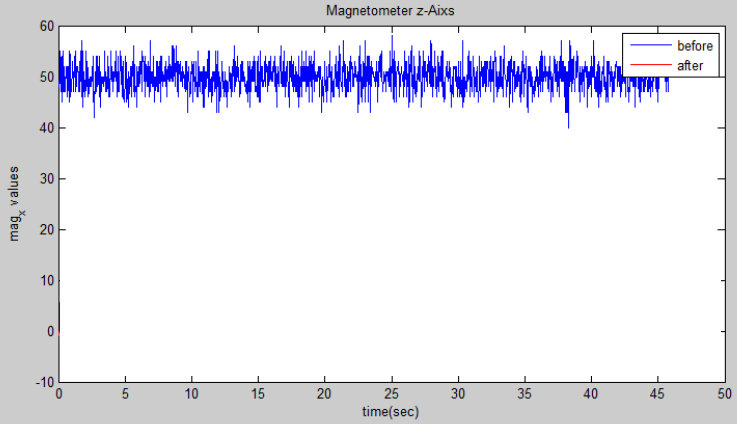
$$mag\_x = mag\_x \cdot x\_scale$$
$$mag\_y = mag\_y \cdot y\_scale$$
$$mag\_z = mag\_z \cdot z\_scale$$

Calibration Result

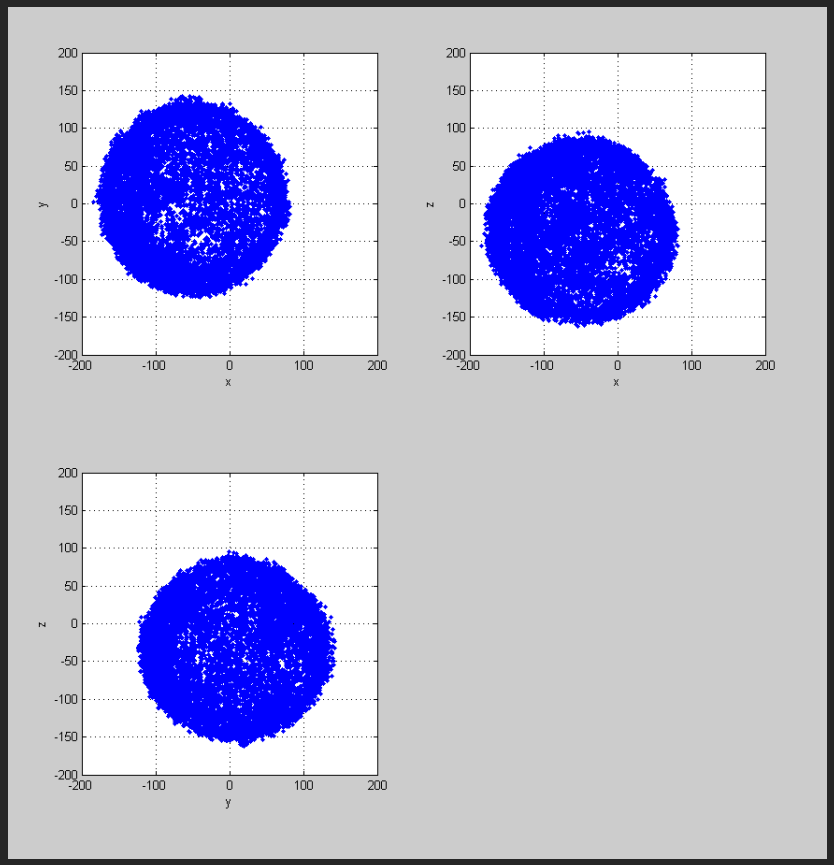
Calibration Result(1/3)



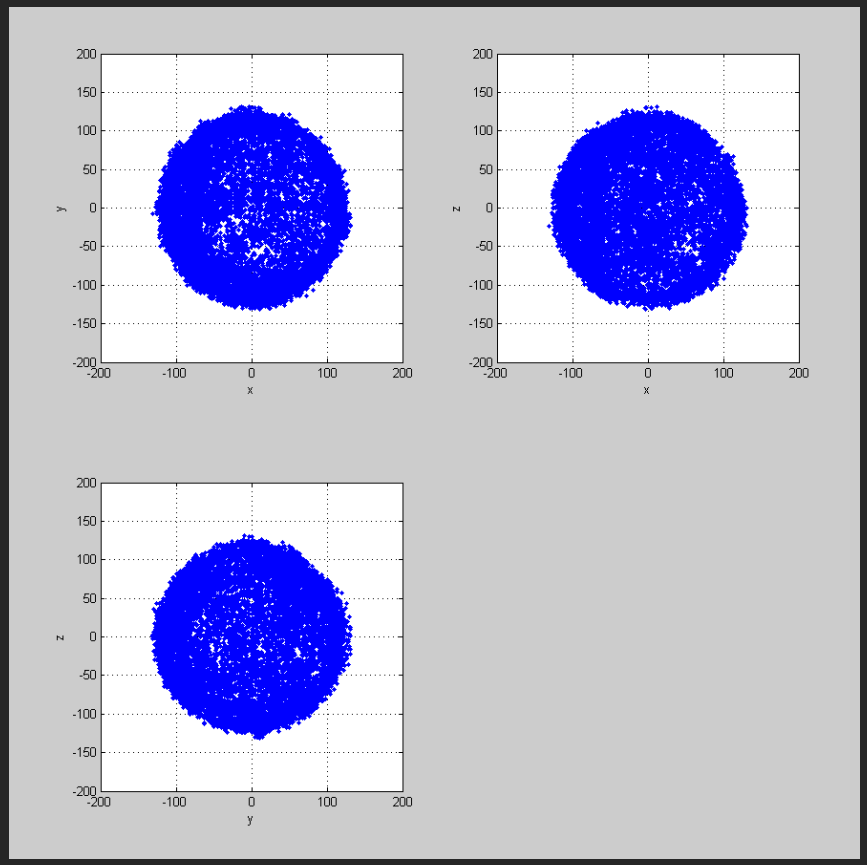




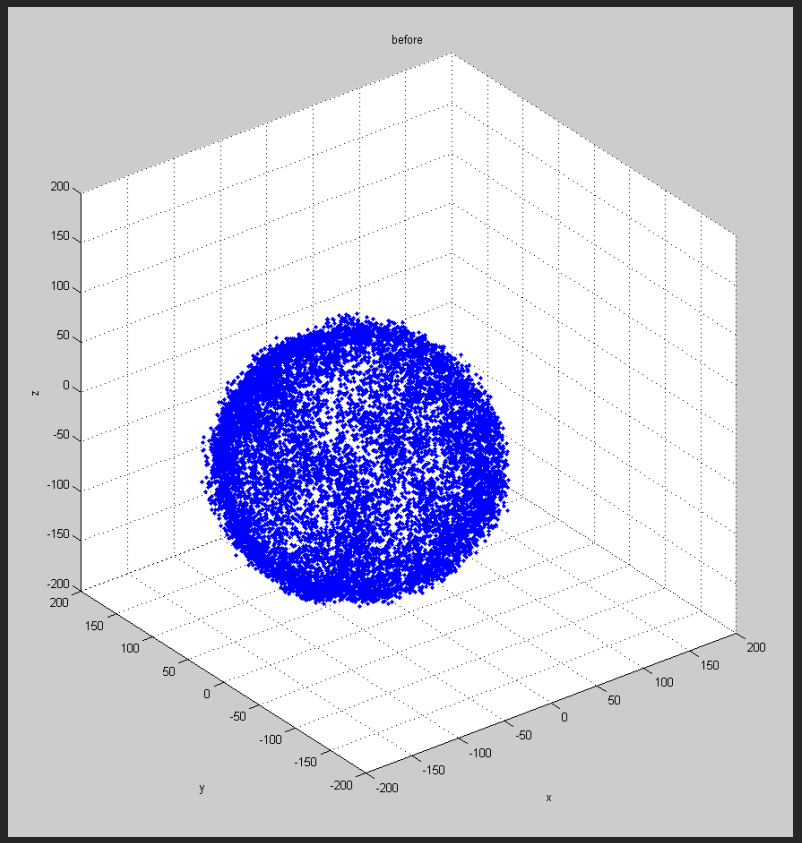
Calibration Result(2/3)



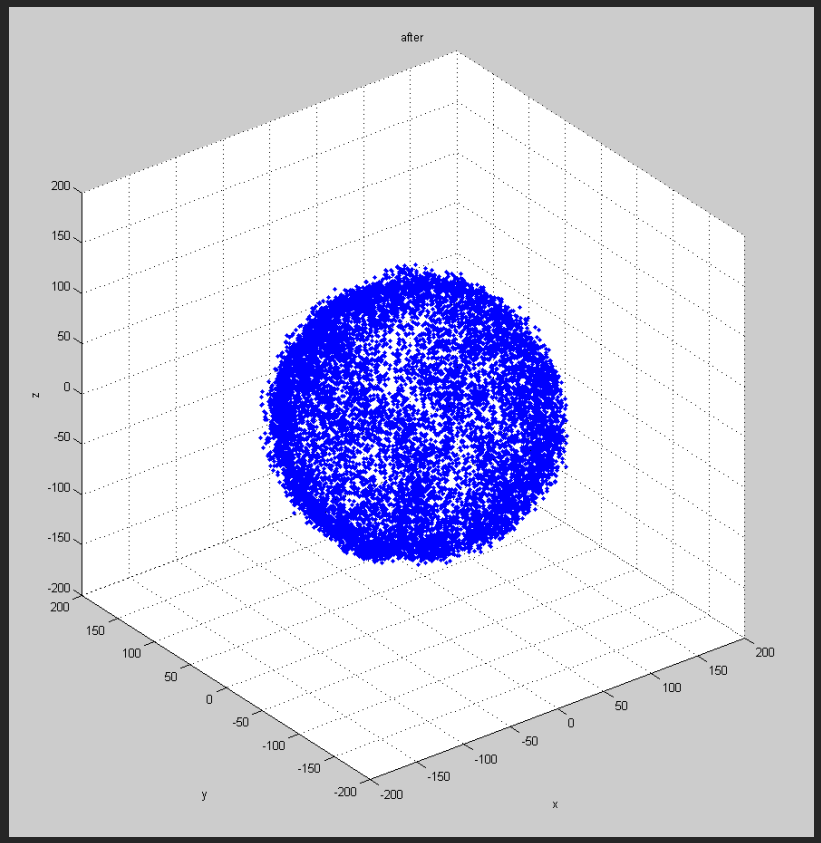
- Calibration before -



- Calibration after -



- Calibration before -



- Calibration after -

Forward

- “Calibration of Strap down Magnetometers in the Magnetic Field Domain” Using Calibration
- Sensor values Filtering Using Kalman Filter

THANKS.