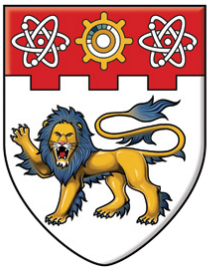

NANYANG TECHNOLOGICAL UNIVERSITY

REAL-TIME HIGH PERFORMANCE DISPLACEMENT SENSING IN HANDHELD INSTRUMENT FOR MICROSURGERY

YAN NAING AYE

SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

2016

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School of Mechanical and Aerospace Engineering

A thesis submitted to the Nanyang Technological University in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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Abstract

The main focus of this research is ...

Acknowledgments

I would like to express my first and foremost gratitude to my thesis adviser ...

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List of Symbols and Abbreviations

$\mathbf{A}_i = \begin{bmatrix} a_{ix} & a_{iy} & a_{iz} \end{bmatrix}^T$ ..... Vector representing acceleration at location {i}

BMFLC ..... Band-limited multiple Fourier linear combiner

Chapter 1

Introduction

1.1 Background

Physiological tremor is the most common involuntary motion affecting micromanipulation [1].

1.2 Organization

Chapter 1 defines the problem and objectives of this report.

Chapter 2

Literature Review

Chapter 3

Design of the Sensing System

3.1 System Overview

The *ITrem2* sensing system consists of two sub-systems, the inertial measurement system and the vision system.

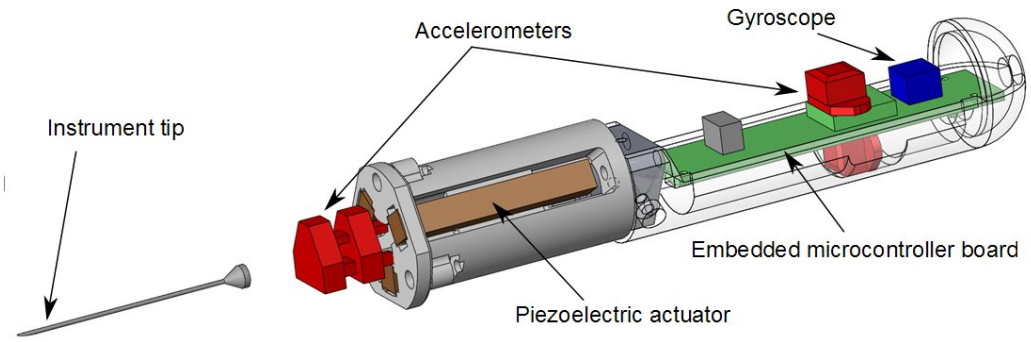

Figure 3.1: *ITrem2* schematic

Chapter 4

Conclusion

Appendix A

Error Calculation

A.1 Error Between Two Sinusoidal Signals

The motion equation of an assumed sinusoidal tremor with amplitude, X_1, and angular frequency, ω, is represented by

$$x_1(t) = X_1 \cos \omega t. \tag{A.1}$$

References

[1] Y. N. Aye, S. Zhao, C. Y. Shee, and W. T. Ang, "Vision aided active error canceling in hand-held microsurgical instrument," in *2012 International Symposium on Robotics and Intelligent Sensors (IRIS2012)*, (Kuching, Sarawak, Malaysia), Sept. 2012.