APSC496

Project Report

**Praxim Surgical Robot**

**Authors:**

Nicolas Adams

Davy Chiu

Ibrahim Gadala

David Mountford

Erica Wodzak

**Date Submitted:**

April 19, 2010

**Word Count:**

####

# Abstract (NICHOLAS)

Table of Contents

[Abstract (NICHOLAS) i](#_Toc257059270)

[1.0 Introduction (NICHOLAS) 1](#_Toc257059271)

[2.0 Project Background (NICHOLAS) 2](#_Toc257059272)

[3.0 Project Scope (NICHOLAS) 3](#_Toc257059273)

[4.0 Work Completed 4](#_Toc257059274)

[4.1 Mechanism Analysis and Selection (?) 4](#_Toc257059275)

[4.2 Hard surface implementation (NICHOLAS?) 4](#_Toc257059276)

[4.3 General size and weight optimization (IBRAHIM) 4](#_Toc257059277)

[4.4 Gravity Compensation (NICHOLAS) 4](#_Toc257059278)

[4.5 Joint Design (DAVE) 4](#_Toc257059279)

[4.6 Error Minimization (IBRAHIM & DAVY) 4](#_Toc257059280)

[5.0 Conclusions 5](#_Toc257059281)

[5.1 Testing (ERICA) 5](#_Toc257059282)

[5.2 Results (TEAM) 5](#_Toc257059283)

[6.0 Recommendations (?) 5](#_Toc257059284)

# Introduction (NICHOLAS)

* General overview of project and how it came to be – include Nikolai and MECH 457 2008
* List different parties involved – Chris (praxim), Tony (UBC), Team
* Arthroplasty surgery background and value product brings to patients and surgeons

# Project Background (NICHOLAS)

* Introduction to haptic surface emulation and potential use
* Brief review of existing technologies (not as long as benchmarking)
* More complete review of PREVIOUS MECH 457 Prototype
* Highlight failures of existing devices, specifically MECH 457

# Project Scope (NICHOLAS)

* Relate failures of other devices to the objectives/scope of current project – general final state to where the project will get to (Device suitable for Cadaver testing of parameters related to performance and to user interface).
* Design objectives: List of specific evaluation criteria and requirements (cleanable, total error, user feel….)

# Work Completed

* Overview of structure of focus and areas that will be presented in document

## 4.1 Mechanism Analysis and Selection (?)

* Diagrams of mechanisms reviewed
* stand out features of each design
* brief description of methods used to evaluate each design
* single table summarizing results

## 4.2 Hard surface implementation (NICHOLAS?)

* Overview of passive hard surface implementation methods (not entirely sure where to put this as seems suited to objectives section – perhaps do not include at all?)

## 4.3 General size and weight optimization (IBRAHIM)

* Include analysis completed for TAR comparing operating envelop size and predicted weight of the device.

## 4.4 Gravity Compensation (NICHOLAS)

* Include analysis completed for TAR that focuses on the need for gravity compensation and discusses the selection design technique

## 4.5 Joint Design (DAVE)

* Overview of joint design
* Specifics of Bearing and encoder selection/design WRT to overall size of device.
* Specifics relating to looseness
* Specifics relating to manufacturing

## 4.6 Error Minimization (IBRAHIM & DAVY)

* Mechanical hardware selection
* Electrical hardware selection
* Software design

# Conclusions

## GENERAL STATEMENT:

## Device Performance: Does the device do what it should be able to do?

## User Interface: Is the device user-friendly? How well does the device interact with the user?

## 5.1 Device Performance Tests (Nicholas)

* Brief description of testing procedure and objectives
  + Hard constraint precision and accuracy
  + Instability
* Relate to design objectives and requirements
  + Hard constraint error should be less than +/- 0.5 mm
  + Workable volume is within typical bone implant sizes: 7cm x 5cm x 3cm\*
  + Total device weight is less than 10 lb
* Results

## 5.2 User Interface (Nicholas)

* Brief description of testing procedure and objectives
  + User assessment rating (1 – 10) for different facets
* **Specifications:**
  + Virtual Weight (resistance to user movement): scale between 1-10 based on various users
  + Tool position instability should cause a radius of displacement less than 1 mm
  + Accessibility (interference): scale between 1-10 based on various users

# Recommendations (?)

Not sure what will be said yet

**6.0 References and Appendices**

**6.1 References**

1. Mech451/2 Praxim Project Final Report, 2008

2. Haptic Emulation of Hard Surfaces with Applications to Orthopaedic Surgery, Nikolai Hungr, 2008

**6.2 Appendix A - Gantt Chart**

