AN AUTONOMOUS METHOD FOR MEASURING 3D JOINT KINEMATICS FROM 2D XRAY IMAGES

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
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This is the dedication tex file, which should have been set in the main file using the command `\setDedicationFile{Drive:/file/location/dedicationFile}`. Keep in mind this should be written in first person; eg “I dedicate this to all those people that let me crawl into a cave and disappear while I learned way too much about way too specific of a subject in order to make a meaningful contribution to my field.”

ACKNOWLEDGEMENTS

This is the acknowledgments tex file, which should have been set in the main file using the command `\setAcknowledgementsFile{Drive:/file/location/acknowledgementsFile}`.

Keep in mind this should be written in first person, eg; “I thank my chair for his patience with my random tangents and endless questions and his subsequent (and often lengthy) explanations. I especially appreciate him refraining from voicing how dumb some of those questions were, despite me feeling like a moron nonetheless.”

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LIST OF ABBREVIATIONS

TKA	Total Knee Arthroplasty. This is the complete or partial resurfacing of the articulating surfaces in the knee.
TSA	Total Shoulder Arthroplasty. This is the complete resurfacing of the articulating surfaces in the shoulder.
rTSA	Reverse Total Shoulder Arthroplasty. This is a TSA procedure where the ”ball and socket” mechanism is reversed.
ML	Machine Learning. This is the process of feeding a computer inputs and outputs in order to determine an algorithm that goes from input $\longrightarrow$ output
CNN	Convolutional Neural Network. This is a type of neural network that uses convolution kernels as the operation between each of the layers
HRNet	High Resolution Convolutional Neural Network. This is a specific CNN created by (ADD CITATION) (https://github.com/HRNet)

Abstract of Dissertation Presented to the Graduate School
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Chair: Scott Banks
Major: Mechanical Engineering

`Abstract Placeholder`

This is a brief outline of the main points to make for the abstract

The function of joints The main function of our joints is to support dynamic loaded motion

Joint Pathologies Many joint pathologies express themselves during motion. i.e. most of the pain that someone might express would occur during motions like walking or running

Clinical Tools available Clinicians can't measure the motion of joints during these painful exercises.

Joint Cost These diseases cost, on average $XYZ dollars per year in direct and related costs. Despite this, there are no tools for clinicians to measure the fundamental motions of those joints

Existing Methods Existing methods are far too time-intensive, expensive, invasive, or unreliable for clinical use.

Autonomous Methods We know that clinicians would eagerly adopt these technologies!

The primary function of synovial joints is to support the dynamic, loaded motion of the human body. This motion is supported by bony and connective tissue working together with a

series of muscles and ligaments to move various parts of the human body. Most joint ailments arise during motion, and most treatments attempt to restore normative motion to the affected joint(s). The financial burden of musculoskeletal issues in the united states is approaching $XYZ dollars (CITE). Despite that staggering number, clinicians do not have the tools that they need to measure the motion of these joints, espically in a clinical setting. Historical methods of quantifying joint pathology are entirely static.

In the past, researchers have been able to create methods of determining the motion of joints. Despite their efforts, these methods still rely heavily on invasive techinques, inaccurate measurements, or time consuming computtations. Each of these make them impossible to introduce into a cliniical setting.

Utilizing computatiuonal speed-ups associated with increased computer power, various machine learning techinques have come into play for different computer vision problems. This paper explores the different cases of making an autonomous system that can quantify the 6 DOF kinematics of various joints using only 2D fluoroscopic imaging systems.

CHAPTER 1
INTRODUCTION

1.1 A subsection of the introduction

This sheet is part of the introduction test test

CHAPTER 2
LITERATURE REVIEW

This is the introduction to the literature review that I am going to write

$$\frac{hello}{goodbye} \tag{2-1}$$

CHAPTER 3
EXAMPLES OF EDITOR/AUTHOR TOOLS, TABLES, AND IMAGES

BIOGRAPHICAL SKETCH

`Biopgraphy placeholder`

This is adding some more stuff to the biography placeholder