Lower-Limb Motion Estimation

Modelling the Kinematics of the Human Lower-Limbs using Cameras and an IMU

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Terms of Reference

Title

Lower-Limb Motion Estimation - Modelling the Kinematics of the Human Lower-Limbs using Cameras and an IMU.

Description

Recent breakthroughs in the field of artificial intelligence has invigorated the pursuit of humanoid robots. Unfortunately, modern bipedal robots lack the elegance of motion and fluidity observed in nature. Perhaps then a modern take on the lower limb kinematics of humans could provide insight to the field of bio-inspired robotics. By using modern cameras with miniature footprints and accurate sensors data capture systems can be transferred onto the subjects in question. This methodology allows for a much larger spectrum of motion capture and can greatly improve our understanding of motion in the unconstrained real world.

Deliverables

The following items have been identified as critical deliverables for the project:

- functional harness to hold electronics
- data capture equipment
- estimation algorithm
- kinematic model of the human lower-limbs
- computer vision algorithm (!?)

Skills and Requirements

Mechanical Design, Electrical Design, Programming and Modelling.

Area

Computer Vision, Sensors, Biomechanics and Bio-inspired Robotics.

Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the IEEE convention for citation and referencing. Each contribution to, and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
3. This report is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as their own work or part thereof.

Signature:.....
Hendrik Joosten

August 25, 2017

Acknowledgements

I would like to thank some people...

Abstract

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Chapter 1

Introduction

1.1 Background to the study

review of the area being researched -
data capture with subject-borne sensor equipment,
bio inspired robotics,
human gait
This research project
The field of bio-inspired robotics aims to understand various natural phenomena and incorporate these techniques into the design of modern robotics.
current information surrounding the issue
previous studies on the issue
and relevant history on the issue

1.2 Objectives of this study

This research project aims to show that subject-borne sensors, primarily cameras and IMUs, can provide researchers in the field of biomechanics and bio-inspired robotics with extensive datasets to understand and model the seemingly magical natural world.

1.3 Scope and Limitations

The research presented herein does not seek to push the boundaries of modern sensor technology, nor does it wish to re-imagine understood and accepted models of natural phenomena. Instead, a humble methodology is proposed that brings together systems from exciting disciplines of research
It should therefore be understood that the following work

1.4 Plan of development

plan of development

1.5 Report Outline

report outline goes here

Chapter 2

lit review

2.1 Subject Bourne Data Capture

In large this researched project was inspired by work done by the Mechatronics lab at the University of Cape Town. In [1] the viability of on board data collection was shown.
RAM group
eagle cam stuff [2]

2.2 Introduction

This research prject brings together various disciplines of research with the intention of showing that these modern techniques could be

2.3 Bio-Inspired Robotics

2.4 Human Gait

2.5 Humanoid robotics

2.6 Computer Vision

2.7 Motion Sensors

2.8 Mathematical Modelling

2.9

Chapter 3

Methodology

Bibliography

[1] A. Patel, B. Stocks, C. Fisher, F. Nicolls, and E. Boje, "Tracking the cheetah tail using animal-borne cameras, gps, and an imu," *IEEE Sensors Letters*, vol. 1, no. 4, pp. 1–4, 2017.

[2] S. A. Kane and M. Zamani, "Falcons pursue prey using visual motion cues: new perspectives from animal-borne cameras," *Journal of Experimental Biology*, vol. 217, no. 2, pp. 225–234, 2014.