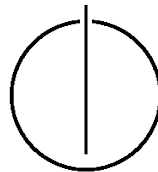# FAKULTÄT FÜR INFORMATIK

DER TECHNISCHEN UNIVERSITÄT MÜNCHEN

Mater's Thesis in Biomedical Computing

The Big Work - Deformable object detection in underwater imaging

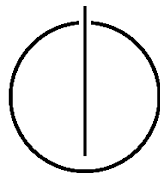Andrés Sánchez

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The Big Work - Deformable object detection in underwater imaging

Deformierbare Objekterkennung in Unterwasser-Bilder

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Advisor:	M.Sc. David J. Tan
Date:	November 27, 2013

I hereby declare that this thesis is enterely the result of my own work except where otherwise indicated. I have only used the resources given in the list of references.

München, den 12. März 2014   Andrés Sánchez

Acknowledgments

If someone contributed to the thesis... might be good to thank them here.

Abstract

An abstracts abstracts the thesis!

The monitoring of fish for stock assessment in aquaculture, commercial fisheries and in the assessment of the effectiveness of biodiversity management strategies such as marine protected Areas and closed area management has been thriving since the 1980s. as does area constinuously grows, it becomes important to develop a remote monitoring systeme to estimate the biomass of the large number of fishes bred in cages, since around 80% of all sales of farmed fish ara arranged pre-harves, that mean, the profit on the sale directly depends on correct estimations of weight, size distribution and total biomass. Therefore automated and relatively affordable tools for biomass estimation have to be developed.

Here, we will rely on complex stereo camera system, compose of time of flight range camera and CCD grayscale camera, that film fishes in the cage for sertain period of time. in order to estimate the biomass, the volume of the fish has to be estimated. this can be achieved by first detecting and segmenting the fish in every grayscale image of the incoming video stream and then translate this found fish contour to the range image obtaining a estimation of the volume. to find the algorithm that is in line with our problem, we need to understand the challenge in detecting fishes. they include the motion of the fish which makes the object of interest deformable, the location of the fish respect to the camera and occlussion caused by having multiple fishes in every available frame.

In this project, we concentrate on the first step that is detection of the fish that undego deformation in grayscales images. Inspired by recent works in we develop a similar approach for fish detection. we use a define algorithm

We evaluate the proposes method by computing difference between tha label dataset with the predicted result, in addition, we cluster the results from different camera locations and found that when the sagittal plane is parallel to the image plane, the tracking algorithm provide the best result. Finally, we show that .

Therefore, this thesis accomplished the following:

define recent work

show improvement

define accomplish, if there are somethings

Contents

Contents

Outline of the Thesis

Part I: Overview

CHAPTER 1: INTRODUCTION

This chapter presents an overview of the thesis and it purpose. Furthermore, it will discuss the sense of life in a very general approach.

CHAPTER 2: RELATED WORKS

No thesis without theory.

Part II: Methods

CHAPTER 3: THEORICAL BACKGROUND

This chapter presents the requirements for the process.

CHAPTER 4: IMPLEMENTATION

This chapter presents the requirements for the process.

Part III: Results and Conclusion

CHAPTER 5: RESULTS AND DISCUSSION

This chapter presents the requirements for the process.

CHAPTER 6: CONCLUSION

This chapter presents the requirements for the process.

Part I.

Overview

1. Introduction

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

1.1. Motivation

There is no need for a latex introduction since there is plenty of literature out there.

1.2. Problem Statement

There is no need for a latex introduction since there is plenty of literature out there.

1.3. Next Section

There is no need for a latex introduction since there is plenty of literature out there.

2. Related Work

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

2.1. Related Work

There is no need for a latex introduction since there is plenty of literature out there.

Part II.

Methods and Implemantation

3. Methods

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

3.1. Theorical Background

There is no need for a latex introduction since there is plenty of literature out there.

3.2. Notation and Symbols

There is no need for a latex introduction since there is plenty of literature out there.

3.3. Camera Geometry

There is no need for a latex introduction since there is plenty of literature out there.

4. Implementation

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

4.1. Fish Model

There is no need for a latex introduction since there is plenty of literature out there.

4.2. Linemod

There is no need for a latex introduction since there is plenty of literature out there.

Part III.

Results and Conclusion

5. Results and Discussion

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

5.1. Results and Discussion

There is no need for a latex introduction since there is plenty of literature out there.

6. Conclusion

Here starts the thesis with an introduction. Please use nice latex and bibtex entries [1]. Do not spend time on formating your thesis, but on its content.

6.1. Discussion

There is no need for a latex introduction since there is plenty of literature out there.

6.2. Conclusion

There is no need for a latex introduction since there is plenty of literature out there.

Appendix

A. Detailed Descriptions

Here come the details that are not supposed to be in the regular text.

Bibliography

[1] Leslie Lamport. *LaTeX : A Documentation Preparation System User's Guide and Reference Manual*. Addison-Wesley Professional, 1994.