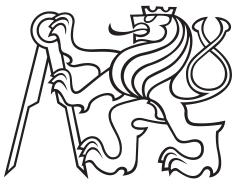
Master Thesis



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F3

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Part localization for robotic manipulation

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May 2019

Acknowledgements

I would like to express my sincere gratitude to my supervisor, Dr Gaël Pierre Écorchard for his patient guidance and good predisposition to help me with my thesis...

Declaration

I hereby declare that the presented work was developed independently and that I have listed all sources of information used within it in accordance with methodical instructions for observing the ethical principles in the preparation of university theses.

Prague, . May 2019

Abstract

The new generation of so-called collaborative robots allow the use of small robotic arms without them being isolated from human workers. Such an example of the collaborative robot is the YuMi robot, dual 7-axis arms robot designed for precise manipulation of small parts and available in the lab of Intelligent and Mobile Robotics, CIIRC.

For further acceptance of such robots in the industry, some methods and sensors systems have to be developed to allow them to pick parts without the position of the part being known in advance, just as humans do. The thesis is focussed on the implementation of an algorithm for localization of the known parts. In addition to the localization, part of the work consists of calibrating the camera relatively to the robot and developing methods to obtain the ground truth position of parts. ...

Keywords:

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Abstrakt

Nová generace takzvaných spolupracujících robotů umožňuje použití malých robotických zbraní bez toho, aby byli izolováni od lidských pracovníků. Takovým příkladem spolupracujícího robota je robot YuMi, dvojitý 7-osý robot robotů určený pro přesnou manipulaci s malými částmi a dostupný v laboratoři Inteligentní a mobilní robotika CIIRC. Pro další přijetí takových robotů v průmyslu je třeba vyvinout některé metody a systémy snímačů, které by jim umožnily vybírat části bez předchozího znát umístění části, stejně jako lidé. Práce je zaměřena na implementaci algoritmu pro lokalizaci známých částí. Vedle lokalizace se část práce skládá z kalibrace kamery relativeley k robotovým a devolopingovým metodám pro získání pozemské pravdivé pozici dílů. ...

Klíčová slova:

Contents

1 Introduction **1**
1.1 Motivation 1
1.2 Goal 1
1.3 Thesis structure 2

Bibliography **3**

Figures

1.1 An example of the social event on a webpage 2

Tables

Chapter 1

Introduction

Within this chapter, the reader receives an outline of the general context which surrounds this thesis. Starting with the motivation section and the ultimate goal to be accomplished, and a summary of the thesis' structure follow.

1.1 Motivation

For years, The industrial robot has undergoes through enormous development. Robot nowadays not only receives command from the computer. But also has the ability to make decision itself. Such abilities are well known in the world of the computer vision as recognizing and determining 6D pose of a rigid body (3D translation and 3D rotation). However, finding the object of interest or determining its pose in either 2D or 3D scenes is still a challenging task for computer vision. There are many researchers working on it with method that goes from state-of-the-art to deep learning means where the object is usually represented with a CAD model or object's 3D reconstruction and typical task is detection of this particular object in the scene captured with RBGD or depth camera. Detection consider determining the location of the object in the input image. This is typical in robotics and machine vision applications where the robot usually does task like pick and place objects. However, localization and pose estimation is much more challenging task due to the high dimensionality of the search in the workspace. And addition, the object of interest is often sought in cluttered scenes under occlusion with requirement of real-time performance.

1.2 Goal

We attempt to provide an algorithm for the localization of the known parts(6D object pose estimation using RGBD data) [3]. In addition, a robot-camera calibration needs to be done, and a 3D object model is created.

1.3 Thesis structure

The next chapter gives a brief overview of the field of computer vision and related work. We have a look at the classical way the community tackle the problem of pose estimation of rigid body. This is followed by a description of the ROS which stand for Robot operating system, and a background information in order to keep up with the method we will implement.

Figure 1.1: An example of the social event on a webpage

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Lorep ipsum [1]

Bibliography

[1] J. Doe. *Book on foobar.* Publisher X, 2300.

[2] `https://github.com/ros-industrial/industrial_calibration`

[3] `https://hci.iwr.uni-heidelberg.de/vislearn/research/scene-understanding/pose-estimation/#ICCV15`