Announcement for Master Thesis/Research project

Predicting Contact Situations with an Eye-In-Hand Visual Servoing System for Robotics Applications

Motivation

Eye-in-Hand Visual Servoing [1] is a promising technology that enables robots to perform precise motions by using visual feedback from a camera mounted at the end effector of the robot arm. One potential application of this technology is the prediction of contact situations between the end effector and the object to be manipulated using the camera's 3D image. This can be particularly useful in tasks that require delicate and precise manipulation, such as assembly or inspection. However, accurate prediction of contact situations is a complex problem that necessitates the development of sophisticated algorithms and the use of advanced computer vision techniques.

Task description

The aim of this thesis is to develop an Eye-in-Hand Visual Servoing system that can accurately predict contact situations. Before developing the algorithms for predicting contact points and contact moments using computer vision techniques, an extrinsic camera calibration will be necessary to properly align the camera's coordinate system with that of the robot. For this task the ViSP C++ library [2] shall be used. Subsequently, the developed algorithms will be implemented and experimental studies will be conducted on a platform that involves a Franka Emika robot arm and a 3D camera to validate the performance of the Eye-in-Hand Visual Servoing system.

Requirements

Basic understanding of robot control (e.g. from the lectures Robotics 1 and 2), as well as programming experience with C, C++ or Python.

References

[1] Chaumette, F. and Hutchinson, S. (2006). Visual Servo Control Part I: Basic Approaches. Robotics and Automation Magazine, 13(4), 82-90

[2] Marchand, É., Spindler, F. and Chaumette, F. (2005). ViSP for Visual Servoing: A Generic Software Platform with a Wide Class of Robot Control Skills. Robotics and Automation Magazine, 12(4), 40-52

Contact

Tim Goller, M.Sc.
Lehrstuhl für Regelungstechnik
tim.goller@fau.de