Lehrstuhl Steuerung,
Regelung und Systemdynamik

Master thesis

Programming

Kernel-based Visual Servoing for Unmanned Aerial Vehicle: Implementation on a real drone system

Conditions

Duration:	6 Months
Requirements:	Experience of control theory and Matlab programming
Language:	German or English
Target groups:	Master students

Content

Visual servo algorithms have been extensively developed in the robotics field over the last ten years. Visual servo systems may be divided into two main classes: pose-based visual servo (PBVS) control and image-based visual servo (IBVS) control. Position-based visual servo control involves reconstruction of the target pose with respect to the robot and results in a Cartesian motion planning problem. This approach requires an accurate 3D model of the target, is sensitive to camera calibration errors, and displays a tendency for image features to leave the camera field of view during the task evolution. Image-based visual servo control (IBVS) treats the problem as one of controlling features in the image plane, such that moving features to a goal configuration implicitly results in the task being accomplished.
Traditionally, visual servoing is separated into tracking and control subsystems. This separation, though convenient, is not necessarily well justified. When tracking and control strategies are designed independently, it is not clear how to optimize them to achieve a certain task. In this work, a framework will be used in which spatial sampling kernels are used to design feedback controllers for visual servoing of a drone system.

The steps of this project are as follows:

- Understanding and analyzing the existing approaches
- Capturing images from the drone camera system, analyzing, and feature extraction
- Design and implementation of a Lyapunov-based controller to follow the target based on kernel measurement and drone model
- Complete and detailed documentation/presentation of the research results

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