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## Bachelor thesis

Theoretical/literature review

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### Vision-based UAV flight control, object tracking, and obstacle avoidance

#### Conditions

Duration:	4 Months
Requirements:	Experience of control theory
Language:	German or English
Target groups:	Bachelor students

#### Content

Unmanned aerial vehicles (UAV) constitutes the ideal platform for many robotic tasks e.g. exploration, mapping, and surveillance. The flight of UAVs may operate under remote control or autonomously by onboard computers. It is appealing when UAVs are able to navigate based on perceptions from their on-board sensors. So far, many methods have been driven for state estimation, sensor fusion, and vision-based position control of UAVs. Vision-based control is an approach that uses information extracted from the vision sensor(s) to control a plant, robot, manipulator, etc.



It is worth mentioning that most reported studies do not address internal constraints, such as actuator saturation and velocity limitation. To consider all of these constraints into the control design, model predictive control (MPC) can be taken into account.

The purpose of this work is collecting and reviewing the existing vision-based control methods implemented on the UAVs. Furthermore, vision-based model predictive control considering its advantageous and disadvantageous in the control of UAVs has to be more elaborated.

The steps of this project are as follows: Literature review of

- Vision-based model predictive control of UAVs
  - Sensor fusion using Kalman Filter
  - Vision-based target tracking and obstacle avoidance
  - Vision-based navigation, localization, and path planning
  - Altitude and position control of UAVs using model predictive control
  - Using of vision sensors in the structure of model predictive control
  - Optimization using image information
- Application fields of vision-based UAVs
- Complete and detailed documentation/presentation of the research results

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