

Autonomous UAS for environmental monitoring

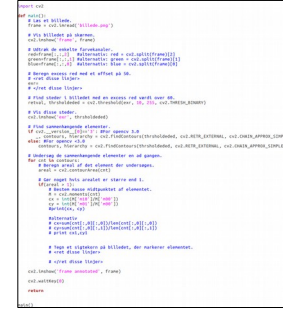
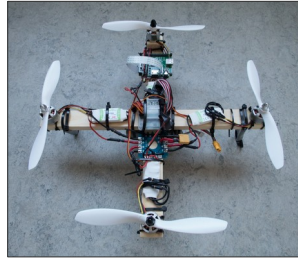


Project description, Summer School 2021, SDU UAS Center

Project objective

The summer course project objective is to design and develop a Proof of Concept of an autonomous UAS for environmental monitoring

- The UAS will have an onboard camera payload which can autonomously fly a planned route while recording still images
- The recorded images will be post-processed using computer vision supported by data from the drone to detect and locate objects of interest



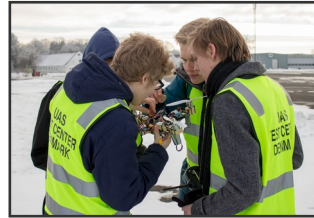
**UAS
autonomous
platform**



**Camera
module
payload**



**Computer vision
algorithms**



**Flight tests
HCA Airport**



**Image post
processing**

Requirements

- The UAV must be a quad rotor construction
- The UAV camera must be controllable and time-synced by the UAS. Maximum required capture rate is 1 Hz
- The UAS must be able to successfully perform a programmed monitor flight of an area sized 100 x 100 m
- The UAV must fly at 15 m Above Ground Level (AGL)
- The UAV must fly 10-15 m/s
- The UAV must be able to take-off and land autonomously.
- The UAV Maximum Take-off Weight (MTOW) must be maximum 3 kg
- Operational procedures must be available and followed at all times: flight-planning, preflight, flight, contingency, emergency post-flight
- All project documents, source etc. must be available at a git repository shared with the teaches or public. The repository must contain a license statement (BSD 3-clause is recommended).

Design goals

- The UAS design and construction should consider tech ethics and value sensitive design principles.
- The UAS design, construction, production, operation, scrapping should aim to be sustainable in the sense of low resource consumption
- Privacy concerns for a camera drone should be addressed.
- The UAS should to the extent possible conduct the operation fully autonomously. For safety purposes a remote pilot must monitor and be able to intercept the flight following defined operational procedures.
- The UAS post-processing of images must be able to perform robust color based segmentation of images: Classification of object shapes based on feature descriptors, Putting camera observations on a map using information about camera, UAV Position and orientation obtained from flight log.

Project flow week 1

Project objectives (Monday)

Introduction to tech ethics and value sensitive design (Monday)

Design plan

Operating procedures

Construction of a basic UAS, flight tests (Wednesday)

Construction of a basic camera payload (Thursday)

Post-processing using computer vision (Tuesday)

Design review (Friday)

Project flow week 2

Design and construction of UAS based on design plan (Monday-Thursday)

Drone EU legislation (Monday)

Company visits (during week)

Final demonstration (Thursday)

Take-apart and return of equipment (Friday)

Exam (Friday)

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