Note: Research Thesis

This is a thesis topic that is designed as an opportunity for excellent students who are interested in getting a first dive into research.

For this topic, there is a very high risk of failure!!!

Please note that this only make sense if

a) you understand the topic presented in the slides,
b) you are willing to work yourself into the topic and to read some background material,
c) you have excellent theoretical skills, and
d) you are willing and capable to work independently on a challenging topic.

As a **reward**, there is a **high likelihood** that a **scientific publication** is the outcome.

Photogrammetry on Dissimilar Images

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Context: Photogrammetry

- with methods like Structure from Motion (SfM) or Bundle Adjustment (BA)
- takes a sequence of images, e.g., a video stream,
- and computes 3D models from this

Problem:

- runtime can be very long if there are many images

Idea:

- skip images in the video stream that are very “similar” to the previous one
- i.e., need to find a suited (i.e., very fast to compute) metric for image “similarity”, e.g., cross-correlation

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Implementation

- investigate options for image similarity (e.g., cross-correlation)
- discard images from sequences if they are too similar to the previous one
- install and use open source photogrammetry software to generate 3D models (e.g., Colmap https://demuc.de/colmap/)
- thoroughly evaluate parameter setting of similarity (especially, #images in relation to computation speed vs model quality)

Data (videos from a quadcopter) from project Valentin-3D can be found at http://robotics.jacobs-university.de/TMP/BScTheses/data/UAV-Valentin3D/

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Topics for the Literature Survey (State of the Art) Part

- Photogrammetry (Structure from Motion, Bundle Adjustment, …)
- Image Similarity