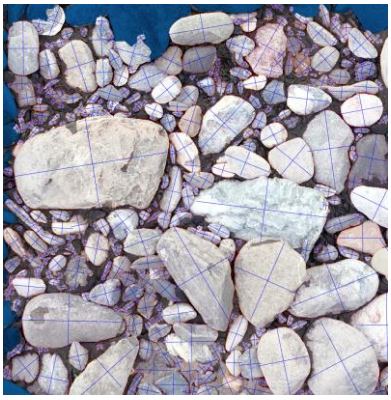
Chair of Hydraulic Engineering
TUM School of Engineering and Design
Technical University of Munich

Study Project / Master Thesis

Background / Hintergrund

Knowledge of the grain size distribution of riverine sediments is of high importance for understanding the morphological processes within a river, defining input data for hydraulic and hydromorphological simulations as well as for designing suitable mitigation measures. The estimation of grain size distributions is however often connected with time-consuming sampling methods and laboratory analysis. Several automatic estimation methods have been developed such as Basegrain, SediNet, and PebbleCount, which use photos taken from the sediments to analyze the grain size distributions. However, intensive post-processing of these automatic results is reported and their accuracy highly depend on the quality of the photos and the post-processing steps. It is therefore necessary to compare different software solutions and to identify and define important user steps starting from the conditions at which the pictures need to be taken to the different post-processing steps and validation methods.

Research Question / Forschungsfragen

- Which automatic methods for estimating the grain size distributions exist and what are the difference between them?
- Which aspects need to be taken into account when collecting photos of sediments as input data for the different software options?
- How can the accuracy of the different software solutions be assessed?
- Which are the main steps needed to successfully used the different software solutions?
- Which software solution performs best?

Structure / Aufbau

1) Identification of different software solutions for automatic grain sizes distribution estimations
2) Determination of steps required to successfully take photos of riverine sediments
3) Data collection according to the results of 2)
4) Determination of steps required to successfully apply the different software
5) Data analysis according to the results of 4) and comparison of the results regarding accuracy and complexity

Supervisor / Betreuung

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Prerequisites / Vorkenntnisse

Basic knowledge of hydraulic engineering and sediment transport processes in rivers

Literature / Literatur

- Detert and Weitbrecht (2012): Automatic object detection to analyze the geometry of gravel grains – a freestand-alone tool, *River Flow 2012*
- Chardon et al (2021):Comparison of software accuracy to estimate the bed grain size distribution from digital images: A test performed along the Rhine River
- Purinton and Bookhagen (2019): Introducing PebbleCounts: a grain-sizing tool for photo surveys of
- dynamic gravel-bed rivers, Earth Surf. Dynam., 7, 859–877. https://doi.org/10.5194/esurf-7-859-2019
- Buscombe (2019). SediNet: a configurable deep learning model for mixed qualitative and quantitative optical granulometry. Earth Surface Processes and Landforms 45 (3), 638-651. https://onlineli-brary.wiley.com/doi/abs/10.1002/esp.4760