

Automatic Co-registration of Images of Drill Cores for Mineralogical Analyses

Proposal for a Master thesis topic (DE/EN)

Among many other applications, the German Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe, BGR), which is located in Hannover, is interested in the analysis of drill cores with the goal of finding indicators for the availability of precious metals in the sites at which the drill cores were extracted. In order to do so, images of the drill cores are taken by multiple sensors having different properties with respect to sensor geometry, geometrical resolution, radiometry and sensing principles; figure 1 shows an example for five such images extracted using three different sensors (EDXRF, LIBS and three different hyperspectral sensors). These images are jointly evaluated to obtain the information relevant for the BGR. The first step of this process is the geometrical co-registration of the images produced by the individual sensors so that the sensor data can be evaluated in a common reference frame. It is the goal of this M.Sc. thesis to automate this step by feature-based matching techniques and to analyze the accuracy that can be achieved for co-registration.

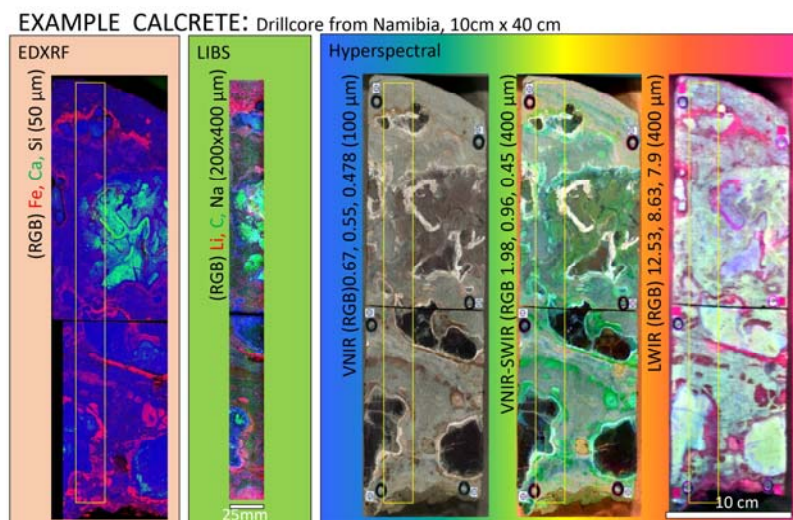


Figure 1: Five images of the same drill core, acquired using five different sensors.

In the course of this thesis, existing implementations of feature extractors and feature descriptors, e.g. SIFT or SURF, shall be applied along with descriptor matching and RANSAC techniques to determine the parameters of the transformations between pairs of images of the same drill core. These components should be combined to a workflow for co-registration. In this context, the selection of appropriate image bands for matching, the optimal combination of feature detector and descriptor as well as the optimal geometrical model to describe the transformation between pairs of images need to be investigated. The developed method has to be tested using reference data. This thesis is co-supervised by the BGR, who also provides the test data in the context of the Leibniz Research Centre GEO (FZ:GEO).

This thesis will be supervised by Dennis Wittich and Philipp Trusheim, supported by experts from BGR