UNIKASSEL VERSITÄT

mrt

Departement of Measurement and Control
Univ.-Prof. Dr.-Ing. Andreas Kroll

Internship

Development of a Program λ^{MULTI}Calib for Geometric Camera Calibration in Different Spectral Ranges

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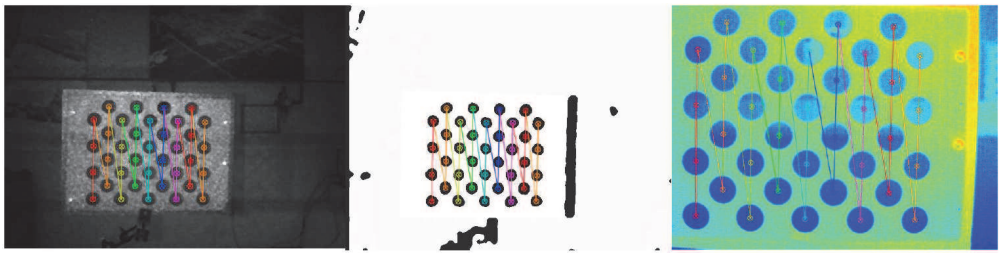

Figure 1: Calibration target in the near infrared range (l.), depth image (m.) and infrared (r.).

For the reconstruction of spatial data from cameras, the parameters of the perspective projection are required. These are determined by means of an intrinsic **geometric calibration**. In order to integrate cameras of different spectral ranges into an overall system, for example when creating **3D thermograms from depth sensors and thermal imaging cameras** (see Figure 1), the transformations between the individual camera coordinate systems must also be determined using extrinsic calibration. Images of a target with defined geometrical dimensions are captured from different poses. The camera parameters are computed by minimizing the deviation of the detected target's feature points from the target dimensions.

The research subjects of the *Department of Measurement and Control* (MRT) include sensor data fusion and calibration of imaging sensors in different spectral ranges. Programs based on the **OpenCV** image processing framework and the **Python** programming language have already been written for this purpose. In this work, the existing calibration routines should be combined into a program, extended by user-guiding functions and operated via a graphical user interface. The advantages of the program compared to already available software could be, for example, the use of **different targets and camera systems**, **guidance of inexperienced users** and a **real-time feedback of the calibration process**.

The following tasks have to be addressed:

- Familiarization with the subject of geometric camera calibration
- Comparison of existing calibration programs with respect to target and camera flexibility as well as user guidance
- Design and Programming of the user interface, the evaluation and the graphical real-time visualization (Python, OpenCV, Qt, ROS, Git)
- Merging of existing MRT program parts with the developed extensions
- Functionality test and case study
- Documentation of the results in form of an user manuel (including a tutorial) and a program code description

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