Abstract
Demand for good surveillance of indoor environments is on the rise due to the increasing significance of climate protection. The reason for this being to keep indoor spaces comfortable while consuming the least amount of energy possible. Conventional sensors measure the temperature in one or in few punctual places. The combined use of thermal and depth imagery seems to represent an improvement as this uncovers more causes of discomfort. The change of usage of rooms throughout the day and the week has caused an interest to monitor the temperature for a period of time. Work on merging depth and thermal images has been carried out already, but with huge parts of this process requiring manual data acquisition and merging. The presented procedure compares, evaluates, and implements computer vision and image processing technology for these tasks.
Approaches for each of the necessary steps, keypoint detection, keypoint matching, matrix extraction, and image warping are outlined. Different target setups and software approaches are tested and compared. The best approach is evaluated through a series of tests in five different rooms. Keypoint accuracy is analysed, image overlay accuracy is evaluated, and the extracted matrices are compared and interpreted.
For accurate keypoint detection sufficiently big keypoints at a large distance between each other must be present in the FoV of both cameras. This is due to the low resolution of the thermal sensor. An error in keypoint detection propagates to keypoint matching, matrix extraction and image warping. The evaluation of image overlay showed that the accuracy achieved is sufficient for the reconstruction of indoor spaces.