



Video-based protection of automatic doors

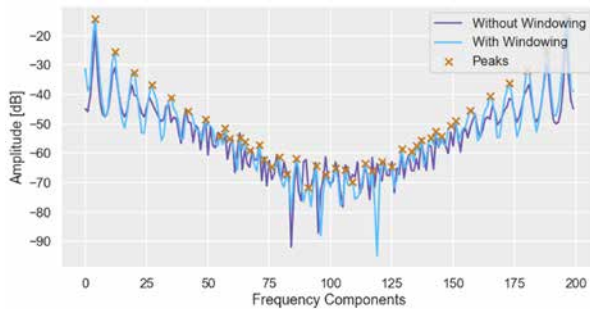


Abb. 1 Fouriertransformation of the checkerboard

Problem

Agtatec AG, a part of record, which is an international door manufacturer, would like to apply the stereo-vision technology for protection of automatic doors. So far, the protection zone was covered by active infrared sensors.

Concept

The work is split into three main tasks: The stereo camera calibration and rectification of both cameras, feature detection & matching and 3D position estimation.

Realisation

A checkerboard image set was used for calibrating the cameras and removing the lens distortion. Thereby, the Fast Fourier Transformation was used to drop blurred images. Afterwards, features were detected and matched with SIFT. Finally, the 3D position was estimated by using the stereo information and through a rigid transformation, the 3D points were described in a predefined coordinate system.

The project was realized in Python with OpenCV, an open-source library for image processing and computer vision.

Results

Apart from a deviation in the Z-axis, 3D points were plotted from the input of two cameras. The single camera calibration has a small reprojection error and can undistort raw images properly. The stereo camera calibration has a bigger reprojection error. The change detection delivers a solid result, but is vulnerable to changes in illumination. Thanks to the rectification constraints, the feature detection and matching has a high accuracy.

Outcome

The timing aspect was not considered in this project and has to be researched in a further work. In the current state, the algorithm isn't usable for real-time applications. The error in the 3D position has to be investigated properly and the matching process should be optimized.

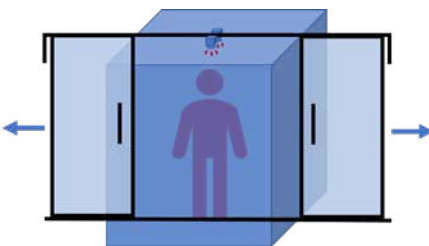


Abb. 2 Protection of an automatic door

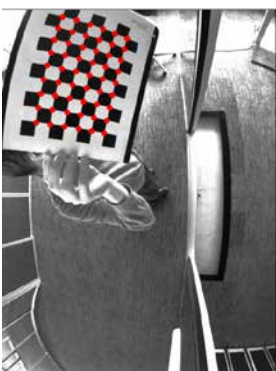


Abb. 3 Checkerboard detection

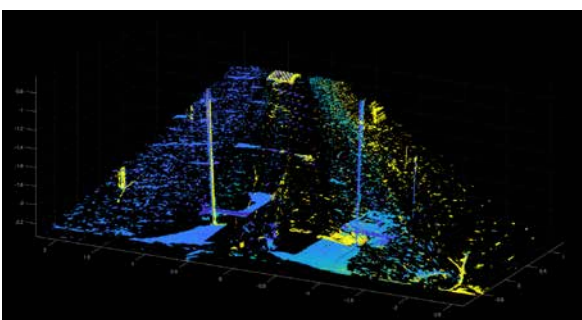


Abb. 4 3D point cloud