Object Distance Estimation Using Kinect Sensor

This project wants to be a “proof of concept” for more complex implementations of distance estimation using the Microsoft Kinect sensor.

The pipeline starts with the acquisition of rgb images and depth maps from the Kinect sensor and some measurements useful to the calibration of the system.

To process the extrinsic calibration the system needs two depth maps images and the distances of the calibration marks from the sensor, while to do the intrinsic calibration only one rgb image and relative depth map are needed.

To detect reference points it has been used a black circle that contrasts well with the background, of course thi is a proof of concept so the reference shape can be changed in future applications.

The intrinsic calibration consists of resizing the images to align the border of di objects; to do so, the radius of the reference circle is calculated in both rgb and depth images and the resulting division is the scale factor.

The extrinsic calibration meanwhile is done by establishing a linear correlation between two different depth maps, finding the gray scale value of every pixel that corresponds to a distance from the sensor.

In the end we are able to predict the distances of future reference points in images just using the calibration data and the depth map of the image.

The future development of this technology could be implemented to detect distances in the environment in robotic and industrial applications and to get fast measurements in design and building contexts.

For further explanations of the python code, an instruction file is present in the github project.