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Computer Vision and 3D Graphics Assignment

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1 Assignment

Plane segmentation using RGBD data. Implement a segmentation strategy from RGBD signals that clusters pixels according to their normals.

2 Introduction

The report is structured as follow:

- Algorithm description
- Results
- Conclusions

3 Algorithm description

- Undistortion procedure
- Geometric transformation to compute the point cloud X,Y,Z coordinates from the depth map
- Geometric transformations to project the point cloud the RGB camera image plane
- Computation of the integral images for the tangential vectors
- Computation of the local surface normal vectors in Cartesian coordinates
- Computation of the surface normal vectors in spherical coordinates
- Quantization of the surface normal vectors
- Initial segmentation in the normal space
- Clustering with K-means
 - The normals in cartesian coordinates
 - The normals in spherical coordinates

- The normals and the color information
- The normals, the color information and the depth
- Clustering evaluation

3.1 Parameters

Window size for normal computation

Quantization parameters

K-means

4 Results

Images

4.1 Conclusions

K-means is good and slower, similar results can be obtained with simple quantization of the normals.

When adding the RGB information the results improve w.r.t. using only the depth information or the normals.

Increasing the window size of the normals allows us to get a good estimate of the floor and the algorithm is real time oriented.

Recent improvements have shown that the use of deep learning techniques brings a big improvement.