Introduction to Computer Vision
Surface Segmentation from Range Images

Mayukh Sattiraju
msattir@clemson.edu

ECE 631
Lab 8 Report

December 7, 2017

1 Introduction

This lab deals with segmenting a range image based on surface normals. The resulting segmentation segments surfaces with similar orientation.

2 Method

A 2.5D range image - or x,y and depth, image is taken as the input. From this, a code snippet converts it into 3D coordinates. With these 3D coordinates, we generate surface normals for each pixel and segment out surfaces that have a similar surface orientation.

The Region Segmentation is shown in Fig 1. Each segmented surface is depicted by a specific grey scale.

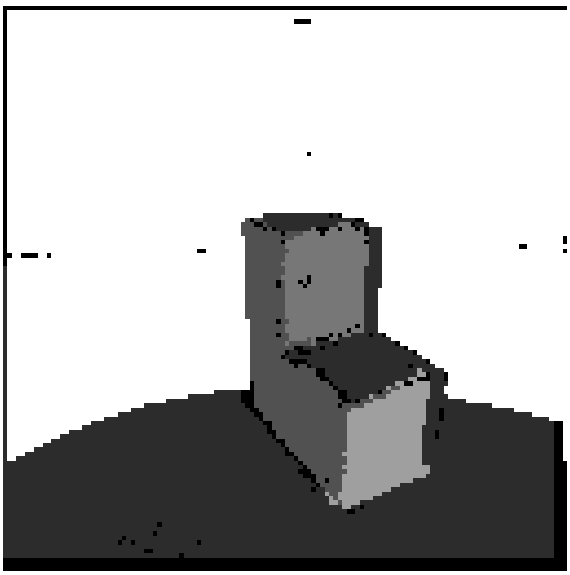

Figure 1: Surface Segments

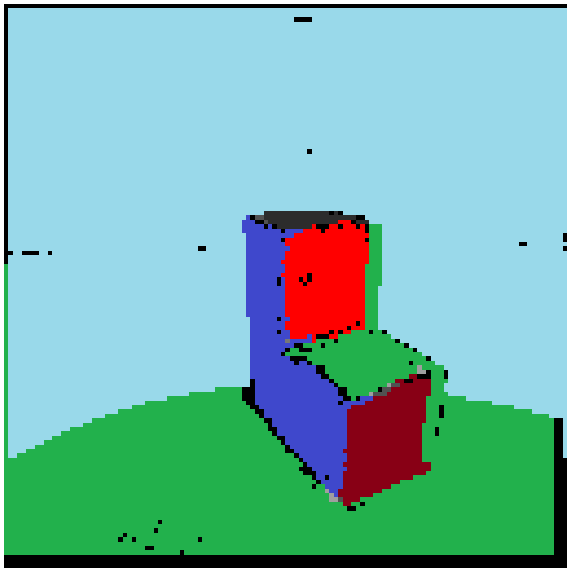

Figure 2: Surface Segments color coded

Fig 2 shows the same segments in color.
The parameters used for this simulation are:

- Distances for cross product: 3 Pixels to the right and 3 pixels below.
- Initial threshold: 100
- Region predicate: If the new pixel's angle is within 20° of the surface's running average. Such a high threshold is justified as we're expecting to segment out orthogonal surfaces.

3 Results

The regions segmented are summarized in the below table.

It can be noted from this table that the algorithm segmented the image into 4 regions and a background wall. The 'grey scale' value here is the grey scale value of the region in

Region	Grey Scale	Number of pixels	Avg Surface Normal		
			i	j	k
1	40	3977	4.53	6.62	-3.86
2	80	707	-8.84	-1.97	-4.48
3	120	438	2.58	-1.96	-4.42
4	160	416	2.79	-1.47	-4.82
5	255	Rest	na	na	na

Table 1: Segmented Regions Summary

Fig 1. The darkest and the largest segmented region is the floor. Here we see that the base of the chair and the floor are segmented as one region, this can be justified as both these surfaces would have very similar surface normals. Also there are two square surfaces on the chair that face the camera. Though these are classified as different regions (region 3 and 4), we can see that these two regions have very similar average surface normals, suggesting that these regions might be oriented at a similar angle.