

**Spring 2010  
3D Photography**

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**Project I [Range Image Segmentation]  
Points: 100**

**Due: February 23rd**

**Project Description**

One of the earlier stages in range image analysis is segmentation. The input to this module is a range image acquired from a specified viewpoint. This range image is expressed as a two-dimensional array of 3-D points. 3-D points that are neighbors in this array are probably neighbors in the actual 3-D surface, unless the points lie on a shape discontinuity. Each 3-D point is expressed with four coordinates. The first three are the Cartesian x, y, z coordinates expressed in the local coordinate system of the range scan. The fourth is a number that encodes the power of the returned laser beam.

The segmentation module groups 3-D points that are part of the same surface by giving them the same label. One way to do this is to override the fourth coordinate of each point with the point's label.

Given a range image R acquired from one particular viewpoint segment this image into planar components. Visualize the result by displaying each segment (i.e. set of points that lie on the same surface) with different colors.

**References:**

Geometry and Texture Recovery of Scenes of Large Scale, Ioannis Stamos and Peter K. Allen, CVIU 88, 94-118, 2002.  
Segmentation Through Variable-Order Surface Fitting, Paul Besl and Ramesh C. Jain, IEEE PAMI 10(2), March 1998.