

3D Photography

Project II

Topic: 3D Point-Based Registration: the ICP algorithm

Due: October 19

The goal of this homework is the experimentation with the ICP algorithm for the registration of two point clouds.

The **first** task is to use a range image R_1 and then create the range image R_1' by applying a known rotation R and translation T to it (use the formula that provides a rotation matrix from a set of three angles-see online notes). Select now a random set of points from R_1 . Since points between R_1 and R_1' are in one to one correspondence, you have now a set of perfect correspondences between the two images. Using the algorithm described in the online notes you can now compute the rotation and translation between R_1 and R_1' . Verify you're your computation is correct (you can easily compare it with the known R and T).

Now you are ready for implementing a simple version of ICP. Since you have a method for the computation of a transformation from a set of correspondences, your **task** now is to automatically determine the set of corresponding points. You can use any of the variations described in class. The fastest would be the one that given a random set of points from R_1 computes the closest points in R_1' based on a simple projection. You can then do a pruning by discarding correspondences whose distance is larger than a threshold, and whose normals do not agree (again you need to use a threshold). Document on a readme file which variation you are using.

Experiment with different sets of random selection of points from R_1 and display the final result by showing the two point clouds after registration (use a different color for each cloud). Also display the set of correspondences with its own color.

Finally, experiment with point-to-plane vs. point-to-point distance [extra credit].