RANSAC Plane Fitting for VTK

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Abstract

RANdom SAmple Concensus (RANSAC) is an iterative method to estimate parameters of a model. It assumes that their are inliers in the data which are well explained by the chosen model. We propose a new class for VTK, vtkRANSACPlane, which estimates the best plane in a point set using the RANSAC method.

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2 RANSAC

3 Algorithm

To estimate the best plane in a set of points, we perform the following procedure.

3.1 Parameters

Several parameters are available to customize the algorithm to the data set.

- *doubleInlierThreshold* - If a point is less than this distance from the estimated plane, it is considered an inlier.
- *unsignedintMaxIterations* - If a plane that fits the data is not found in this number of iterations, the algorithm quits.
- *doubleGoodEnough* (valid range $(0,1)$) - If an estimated plane fits *GoodEnough* percent of the input points, return the current estimated plane.

3.2 Estimation loop

The core of the algorithm is as follows:

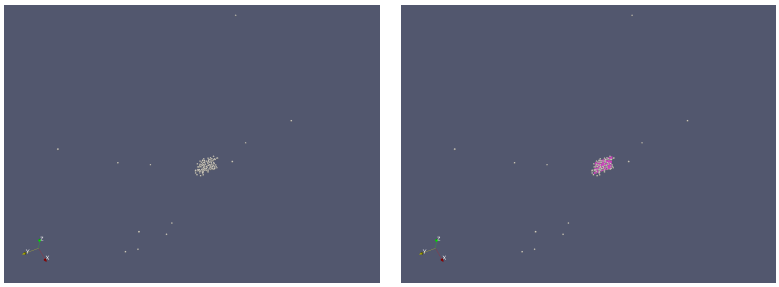
- Pick 3 points at random.
- Compute the plane that fits these points.
- Determine the number of inliers. That is, for each point in the set, compute the distance to the plane. If the distance is less than the specified *InlierThreshold*, then the point is an inlier.
- Repeat this process, always saving the plane paramters which produce the most inliers.

3.3 Stopping

Stop when one of two criteria is met. 1) *MaxIterations* has been reached. 2) *GoodEnough* percent of the input points are considered inliers.

4 Demonstration

As a demonstration, we have created a point set of noisy samples of a plane + some erratic points. The pink plane shows a small patch of the estimated plane. One can see that this estimation was not confused by the outliers in the data set.



(a) Input Point Set (b) RANSAC plane

Figure 1: RANSAC plane estimation demonstration.

5 Code Snippet

```
vtkPolyData* inputPoints = Reader->GetOutput();

//estimate normals
vtkSmartPointer<vtkRANSACPlane> RANSACPlane = vtkSmartPointer<vtkRANSACPlane>::New();
RANSACPlane->SetInlierThreshold(0.1);
RANSACPlane->SetMaxIterations(1000);
RANSACPlane->SetInput(inputPoints);
RANSACPlane->Update();
```