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Construct 3D point cloud from multi-viewed images

Background

One commonly used representation for a 3D model is triangle mesh, and we can construct triangle mesh using point cloud that sampled from real world object. Instead of using a scanner, we can use images that taken from different view of the object to compute the point cloud.

Objective

The goal for this project is to construct point cloud from a set of multi-view images. It will be done by implement the paper: *M. Brown and D. G. Lowe, "Unsupervised 3D object recognition and reconstruction in unordered datasets," (3DIM 2005)*.

One potential change to the complete implementation of the paper is that instead of feeding input of images from different objects and some noise (irrelevant image), the input for this project might be a set of images describe the same object.

Key Words

3D, point cloud, feature matching, RANSAC, homographic transformation, affine transformation, geometry, camera model

Implementation

Implement 3D object reconstruction by Brown and Lowe include:

1. Extract features from each input image
2. Match features between different images use k-d tree and k-nearest-neighbours
3. Find the transformation between each image using RANSAC
4. Find connected component between images
5. Compute rotation, translation and camera parameter for each camera position
6. Construct point cloud

Testing/ Image set

The project will use three image sets find here. Only the image set from the paper will be used for this project.

More image set may be used during testing.

Extra work

The project will also try to find other methods to improve the result from Brown and Lowe's implementation, potentially using neuron network.