A Voodoo Reader and Viewer for VTK

Release 0.00

David Doria

February 17, 2010

Rensselaer Polytechnic Institute, Troy NY

Abstract

Voodoo is a popular, free structure from motion software package. It takes several, ordered images as input and computes the camera parameters of each image as well as a point cloud of an estimate of the 3D structure of the scene. This document presents a set of classes (vtkCalibratedImageCollection, vtkCalibratedImageCollectionReader, vtkVoodooReader) to enable a set of images and their associated 3D scene to be viewed in the same space. These classes are implemented using tools from VTK.

Latest version available at the Insight Journal [http://hdl.handle.net/10380/3153]

Contents

1 Introduction

Structure from motion is a popular technique to compute the 3D structure of a scene from a sequence of images. This procedure takes a set of images as input and produces 3D point cloud of the scene structure, as well as the extrinsic camera paramters at every frame. Voodoo is a popular free software package which performs this operation. It is useful to be able to visualize this 3D data along with the associated images. We

propose a set of classes as an addition to VTK which allows a point set and multiple images to be visualized in the same 3D space.

2 Storing Sets of Images and Their Associated Cameras - vtkCalibratedImageCollection

vtkCalibratedImageCollection is a class to store a collection of images and their associated parameters. It is simply a wrapper class that contains a vector of vtkImageCamera's. This is necessary because the VTK pipeline requires an object derived from *vtkDataObject* to pass through the pipeline.

3 Reading Sets of Images and Their Associated Cameras - vtkCalibratedImageCollectionReader

vtkCalibratedImageCollectionReader is a class

4 Reading Voodoo Output Files - vtkVoodooReader

vtkVoodooReader is a class to read ASCII files produced by Voodoo. The file that Voodoo outputs contains the camera parameters for each image, as well as a list of the reconstructed 3D points.

vtkVoodooReader acts the same as most of the built in VTK readers. The Voodoo output file must be specified with *SetFileName*, and the directory which contains the images that were used as the input to Voodoo must be specified with *SetImageDirectory*. The reader has two outputs:

- *vtkPolyData* ∗ *GetPoints*()
- *vtkCalibratedImageCollection* ∗ *GetCameras*()

GetPoints returns a PolyData with a vertex at every point in the list of 3D reconstructed points. *GetCameras*() returns all of the cameras and their associated images.

```
vtkSmartPointer<vtkVoodooReader> reader =
  vtkSmartPointer<vtkVoodooReader>::New();
reader->SetFileName(inputFilename.c_str());
reader->SetImageDirectory(inputImageDirectory.c_str());
reader->Update();

vtkCalibratedImageCollection* imageCollection =
  reader->GetCameras();

for(unsigned int i = 0; i < imageCollection->GetNumberOfCameras(); i++)
  {
  vtkImageCamera* camera = imageCollection->GetCamera(i);
  ...
```

5 Visualizing Voodoo Cameras, Images, and Points

We have provided an example application to visualize the images and the 3D points. A screenshot of this application is shown in Figure 1.

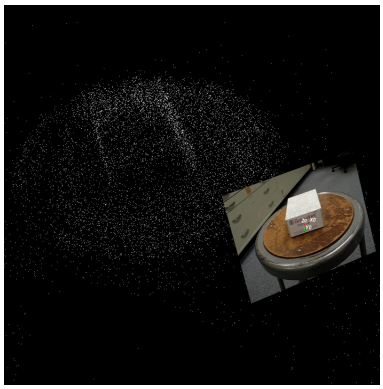

Figure 1: Camera, Image, and 3D Points