Graphics and Animation
Assignment 2

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1 Implicit Functions and Cropping

The aim of this assignment is to use a plane to clip a polygonal data, and display the clipped out and remaining parts of the data. You are also expected to show the plane and its intersection with the polygonal data.

This assignment can be completed in any programming language that supports VTK. Please download and use one of the models from https://www.thingiverse.com. Alternatively, you could use any other royalty-free three-dimensional model to complete the assignment.

1. Read the 3D model using an appropriate reader, *i.e.,* `vtkOBJReader`, `vtkPLYReader`, or `vtkSTLReader`.

2. Create a plane using `vtkPlane` class. Set the center of the plane to be the center of the 3D model. You can use `GetCenter()` function to obtain the center. Set the normal vector to $[1, 0, 1]^T$ or any other orientation.

3. Clip the data using `vtkClipPolyData` class. Set the clipping value of the implicit function to zero. Use surface and wireframe representation to display the clipped out and remaining parts of the data, respectively.

4. Show the intersection area between the plane and polygonal data. Hint: Use `vtkCutter`, `vtkStripper` and `vtkTriangleFilter` classes.

5. Display the plane. You can use `vtkSampleFunction` and `vtkContourFilter` classes to create a polygonal data from the implicit plane function. Set the bounds of the plane polygonal data to be the same as 3D model (Hint: Use `GetBounds()` function).

The output display should contain the following components: 1) Clipped out part of the 3D model set as a wireframe representation; 2) Remaining part of the 3D model as a surface representation; 3) Intersection area between the implicit plane and 3D model; and 4) The implicit plane that you created in step 2 above.

1.1 Grading (12 Marks)

You are required to submit the following information for this assignment:

1. Provide the details such as name and file size of the model used for the assignment (1 Mark)
2. Provide the number of vertices for the original model, clipped out part, remaining part and intersection part of the model (2 Marks)
3. A screen-shot image showing the output (2 Marks)
4. A commented source code (Please include the source code as a part of the report in human readable format) (6 Marks)
5. A README section containing details on how to run the code and other information such as VTK version used for writing the code. (1 Mark)

1.2 Submission

Please submit a report containing the information mentioned above as a PDF file via eClass on or before February 15, 2022. A penalty of 10% per day will be applied for late submissions. Please complete the assignment on your own without discussing the details with anyone else. A blind marking approach will be used for grading the assignment. Therefore, please do not include your name in the report or on the submission filename.