

Digital Geometry Processing

Homework 1

Due Date: March 11, 2016

Important things:

- Before you start this homework, please read this document carefully, and make sure your submission meets all requirements.
- You should submit the **code** and a simple **document** to describe the runtime environment and the functions you have finished.
- Please compress the submission and rename it as “**2015XXX_Name.zip**”.
- You will only get **90%** of the score if your submission is out of the due date.

Task 1: DGP_Load() (15 Point)

Write a function or a class to load the .off file and .obj file.

A. Input:

A file in any format.

B. Output:

A structure including:

- the coordinates of vertices,
- the face list,
- the edge list I (the indexes of vertices connected by each edge),
- the edge list II (the indexes of faces beside each edge),
- the number of face,
- the number of vertices,
- the number of edges.

C. Test:

Filename: “Introduction_Test_shape.txt”

File format:

Line#1: 1.off or 1.obj

Task 2: DGP_Show() (15 Point)

Show a shape with colors.

A. Input:

a shape, colors of vertices or faces (default: no colors)

B. Test:

B.1 Display the normalized area of each face.

B.2 Read the labels in the following file.

Filename: “Introduction_Test_labels.txt”

File format:

Line#1: the label of face 1

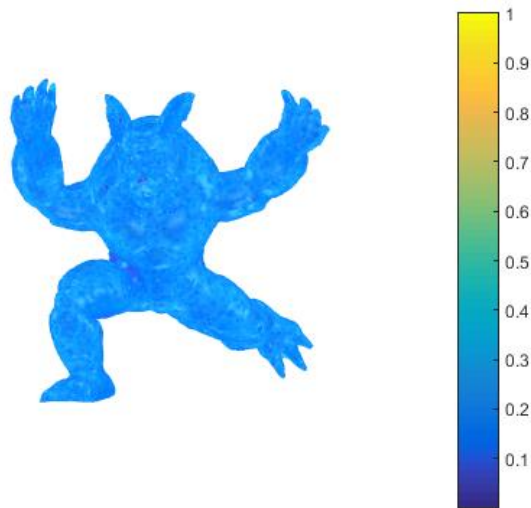
Line#2: the label of face 2

C. Results:

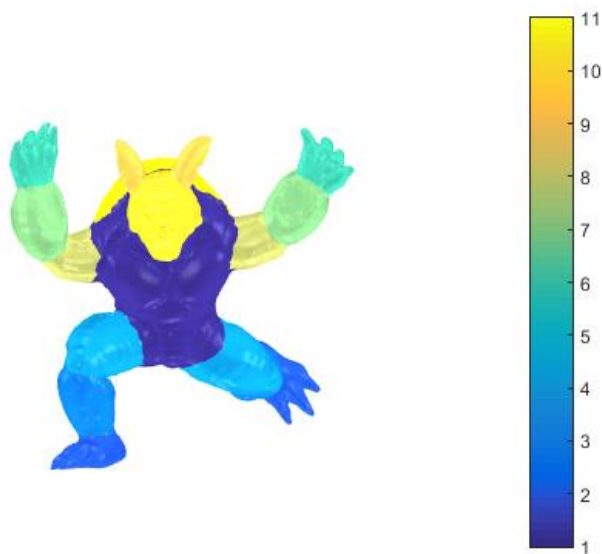
C.1 Shape display



C.2 Colored by continuous values



C.3 Colored by discrete labels



Task 3: DGP_VerNei() (15 Point)

Find vertex neighbors.

A. Input:

the index of a vertex.

B. Output:

the indexes of vertices that connect with the input vertex directly,

the indexes of faces that surrounding the input vertex.

C. Test:

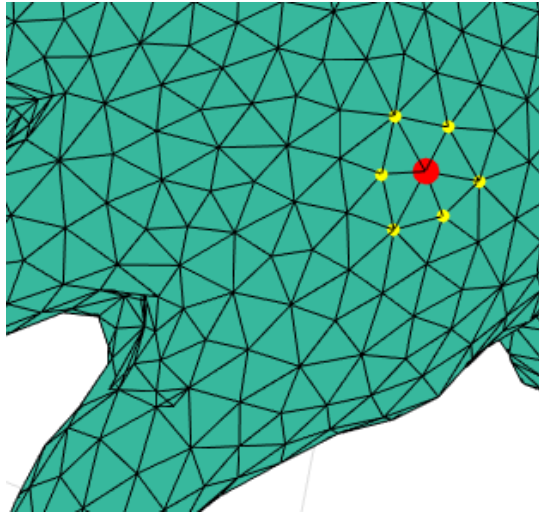
Filename: "Introduction_Test_vernei.txt".

File format:

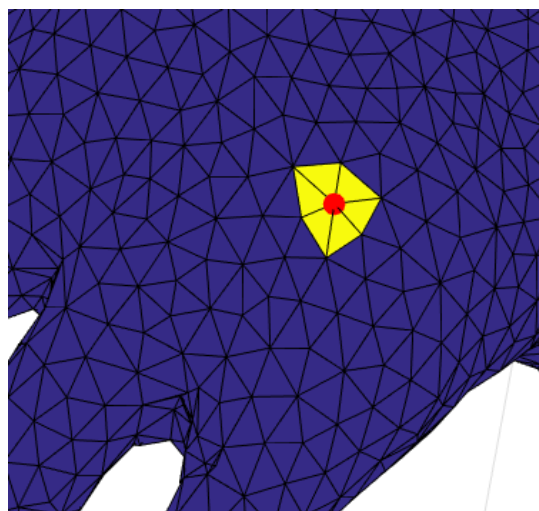
Line#1: 1000

D. Results:

D.1 The indexes of surrounding vertices



D.2 The indexes of surrounding faces.



Task 4: DGP_FaceNei() (15 Point)

Find face neighbors

A. Input:

the index of a face.

B. Output:

the indexes of faces surrounding the input face.

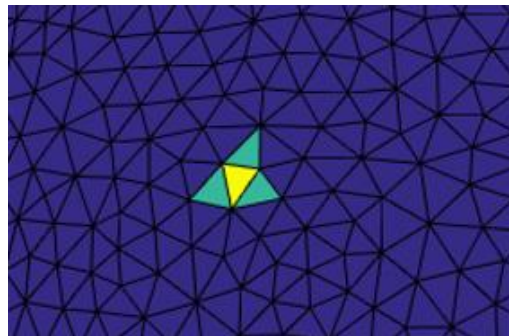
C. Test:

Filename: "Introduction_Test_facenei.txt"

File format:

Line#1: 1000

D. Results:



Task 5: DGP_Ver2face() (20 Point)

Find the region formed by given vertices.

A. Input:

the set of indexes of vertices,

a flag to indicate whether a face can be selected if given its two vertices.

B. Output:

the set of indexes of faces in the region.

C. Test:

Filename: "Introduction_Test_ver2face.txt"

File format:

Line#1: the index of vertex 1

Line#2: the index of vertex 2

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D. Results:



Task 6: DGP_ShapeValue() (20 Point)

Calculate the properties of the shape.

A. Input:

a shape.

B. Output: a structure including:

the area of each face.

the normal of each face.

the length of each edge.

C. Test:

Filename: "Introduction_Test_facenorm.txt".

File format:

Line#1: 1000

D. Results:



Ending