Information Visualization

Final task

システム情報学研究科
システム科学専攻
学籍番号：　178x028x
氏名：　劉　星イウ

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1. Functions:

1-1. Users can change the shading models with original model (no reflection), lambertian reflection model, phong reflection model, blinn-phong reflection model and cook-torrance reflection model by selecting in the drop-down list.

1-2. Users can add/delete slice planes and change the height of these slice planes by dragging the slider bar.

1-3. Users can change the color of these models by selecting colors in the GUI controller.

1-4. Users can change the isovalue of these models by dragging the slider bar.

2. How to use:

2-1. Open the html page.

2-2. Don't change the "slice" item, just select the "shadingmodel" and "color" items, drag the slider bar to set the isovalue, click the "save" button. Then a lobster will be shown in the screen with selected shading model, color and isovalue. And the isovalue will be shown above the slider bar.

The default settings:
Shadingmodel: original;
Slice: noslice;
Color: #fa000 (red);
Isovalue: 128.

2-3. Don't change the "slice" item, you can change other items, click the "save" button and the lobster will be changed.

2-4. If you change the "slice" item as "sliceplane" and click the "save" button, the slider bar will be changed from "ISO" to "Z-axis", a new button "Clear SlicePlanes" and a slice plane will be shown, and the lobster will disappear.

You can drag the slider bar and continue clicking the "save" button, then more slice planes will be added with the selected Z-axis value.

If you click the "Clear SlicePlanes", all slice planes will be deleted.

Then if you change the "slice" item as "noslice" and click "save" button, it will return to step 3. A lobster will be shown again.

2-5. You can click "Clear SlicePlanes" button at any time if there are any slice planes, and these slice planes will be deleted immediately.

2-6. You can click "Reload All" button at any time, and the page will be reloaded immediately.

3. Notice:

3-1. If the "slice" item is selected as "sliceplane", the "shadingmodel" item and "color" item are invalid.

3-2. The original model's color can't be changed, that means, if the "shadingmodel" item is selected as "original", the "color" item is invalid.

4. Characteristics:

4-1. Shading model:

(1). Original model: the extracted isosurfaces from the lobster data without any reflection or shading. The color can't be changed.

(2). Lambertian reflection model: the implementation of lambertian reflection based on the original model with vertices interpolated. The color can be changed.

(3). Phong reflection model: the implementation of phong reflection based on the original model with vertices interpolated. The color can be changed.

(4). Blinn-phong reflection model: the implementation of blinn-phong reflection based on the original model with vertices interpolated. The color can be changed.

(5). Cook-torrance reflection model: the implementation of cook-torrance reflection based on the original model with vertices interpolated. The color can be changed.

4-2. Slice:

(1). No slice: set the models in common mode.

(2). Slice plane: the implementation of slice plane extraction based on isosurface extraction algorithm. The height of slice planes can be changed.

4-3. Color:

There is a color map for users to select colors.

4-4. Isovalue-change slider bar:

The isovalue of these models can be changed from 1 to 128 by dragging this isovalue-change slider bar.

4-5. Z-axis-change slider bar:

The Z-axis of slice planes (the height of slice planes) can be changed from 0 to 1 by dragging this Z-axis-change slider bar.

5. The points that concentrate my efforts:

5-1. Add the GUI controller. I read the dat.UI as reference, then I used the gui.add function to add the GUI controller.

5-2. Change the color. The color from GUI controller is a style like "#FFFFFF", it's hex, but I used the RGB color style like "(255,255,255)". So I need to change hex to RGB. I searched this question from internet, then I found a function which uses

```
var result = /^#?([a-f\d]{2})([a-f\d]{2})([a-f\d]{2})$/i.exec(guiControls.color);
var R = parseInt(result[1], 16);
var G = parseInt(result[2], 16);
var B = parseInt(result[3], 16);
```

Then it can change hex to RGB.

Later, I need to change RGB to hex as "0xFFFFFF" style. I used the function "getHexString(R,G,B)" but the lobster's color can't be corresponding correctly with the color I selected in the color map. I found that was because of the "getHexString(R,G,B)" function. So I found another function to do this:

```
'0x' + ((1 << 24) + (R << 16) + (G << 8) + B).toString(16).slice(1)
```

And the RGB can be changed to hex as "0xFFFFFF" style correctly.

5-3. I found that if I used GUI slider bar to change the isovalue or Z-axis, the browser responded very slowly. Maybe it was because of the very long code. So I gave up using

GUI slider bar, and used slider bars and buttons in html file instead.

5-4. The slice planes. I found it was hard to remove the slice planes in real-time operations, so I had to add a button to delete these slice planes.

5-5. Make a combination of the shading models (original model, lambertian reflection model, phong reflection model, blinn-phong reflection model and cook-torrance reflection model), slice planes, color-changing and isovalue-changing. Making these things into one .js file and one .html file was also not easy for me.

6. Disadvantages:

6-1. I can’t remove slice planes in real-time operations. I want to change slice planes’ height, not add slice planes. But I didn’t.

6-2. The code is too long, which causes the browser responds very slowly. Maybe I can shorten the code later.