Task2 - Transfer Function Widget Design & Implementation

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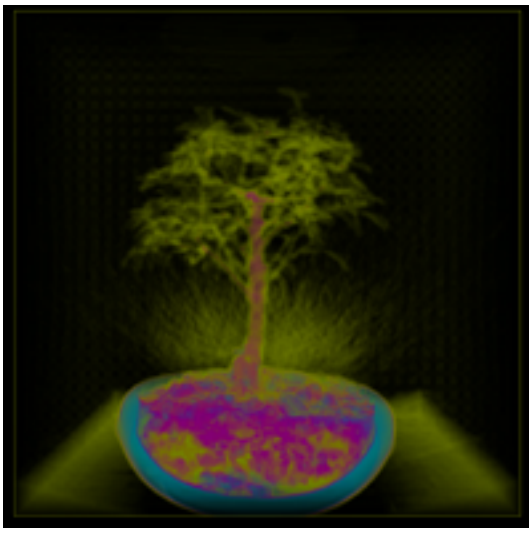
2a. Design

Option 1
In the first design we provide a color wheel for user to pick up a color, while for the other different steps, our algorithms will decide different colors which are inverse colors of the one user picked. And for the alpha channel we directly use the `value` passed in to `updateTransferFunction` function.

For example, if the user picks a color which is `RGB(Value(r), Value(g), Value(b))`, the other two inverse colors will be `RGB(Value(b), Value(r), Value(g))` and `RGB(Value(g), Value(b), Value(r))`.

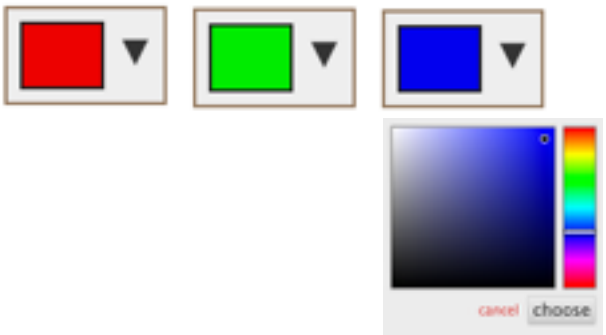
And the step we just equally divide by 3.

As the result, it will like the follows:



Option 2

The second design provides three separately color picker, so user can choose different color manually. And the alpha channel is using the `value` passed in to `updateTransferFunction` function. Steps we just equally divide by 3.
The illustration is shown below.



Option 3

In the Design 3, we fully provide all control including colors and steps to user. As shown in the follow image, user can user two range slider to adjust thresholds of steps, and can choose color for each step individually.

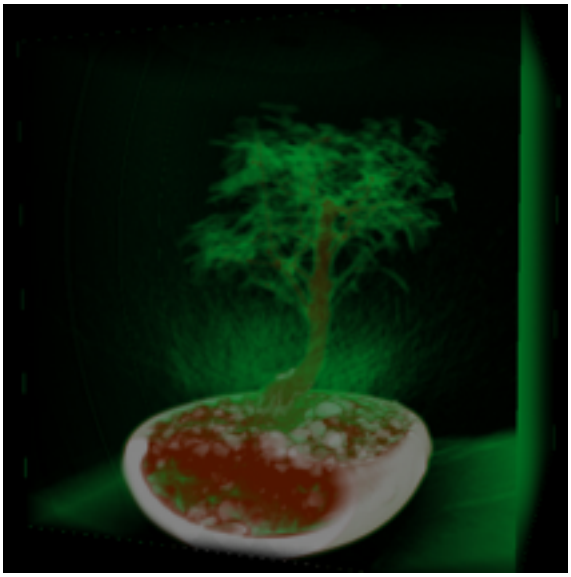
2b. Implementation

Here I have implemented *both* option 1 and option 3.
The default `index.html` implemented design 3, and the design 1 is in `index-design1.html` and `script-design1.js`.

2c. Analysis

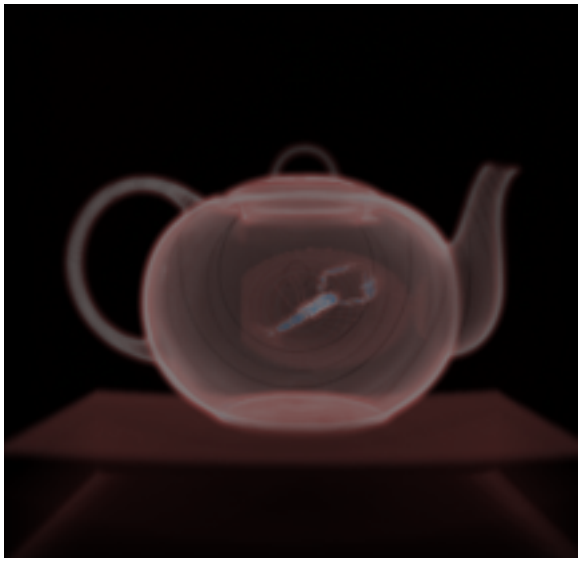
2c.1 Intersting structures

In the Bonsai volume, we can not only see leaves of bonsai, but also some floccule near the root.



In the foot volume, we can clearly observe the structure of the bone, especially the gap of joints.

In the teapot volume, we can see a lobster in the centre of teapot.



2c.2 Comparison

For the Design 1, it has several advantages:

a) User can pick all colors.
b) User do not need to choose all colors, the transfer function will choose the contrast one, which can clearly reveal the detail and feature of volumes.
c) It's very easy to use.

But it also have some disadvantages, for example, user can not control all colors as he wish. But this is my favourite design, it is simple enough and has a not only fancy but good result.

For the Design 2, it has obviously advantage compared with Design 1, it provides flexibility to control every color for step explicitly.

For the Design 3, it is more controllable than Design 2, not only provide color pickers, but also a linear ranger to adjust the boundaries of each step, which can help user to reveal more details of volume.
Some weaknesses of Design 3, is it only provide limits thresholds for steps, but if we have more steps which means we will have more colors when rendering, it is may not helpful for revealing details of volume, but even cause some visual mess.