Mission Sidequest 5-1
Wizard

Start date: 30 August 2012
Due: 05 September 2012, 23:59

Readings:

- Textbook Sections 1.3 to 1.3.1

In Missions 2 and 3, you learned to appreciate the beauty (and the vital importance) of abstraction. Without knowing how the runes were drawn and how primitive operations like stack were defined, you made use of them anyway to build up complex runes. To be more than a Padawan however, it is inevitable that you have to look under the hood, or even worse (or better), conjure up such primitives yourself.

In this side quest, we expose you to such wizardry. Complete this side quest successfully and you will get the “Pure Wizardry” achievement.

Information:

In the following, let $R$ be the rectangular region bounded by the vertices $(0,0), (1,0), (1,1), (0,1)$, which is the region displayed in the viewport.

You may want to use the following test_curve as input to test your functions.

```javascript
var test_curve = function(t){
    return make_point(t, 0.5 + (Math.sin(4 * (Math.PI * t)) / 2));
}
```

This side quest consists of two tasks.

Task 1:

Implement stack with the same behavior as the stack function you encountered in Mission 2.

To be specific, stack takes as input two curves $c_1$ and $c_2$ that lie entirely within $R$. The output is a curve that also lies entirely within $R$, such that $c_1$ is visibly stacked over $c_2$ when drawn.

For example, `stack(test_curve, test_curve)` gives the output shown in the top right viewport of Figure 1 when drawn.
Task Files

- lib/list.js
- lib/misc.js
- lib/graphics.js
- lib/hi_graph.js
- sidequest_5-1_1.html
- sidequest_5-1_1.js

Task 2:

Implement \texttt{stack_frac}, again with the same behavior as the \texttt{stack_frac} function you came across in Mission 2.

To be specific, \texttt{stack_frac} takes as input a fraction \texttt{frac} and two curves \texttt{c}_1 and \texttt{c}_2 that lie entirely within \texttt{R}. The output is a curve that also lies entirely within \texttt{R}, such that when drawn, \texttt{c}_1 is visibly stacked over \texttt{c}_2 with \texttt{c}_1 taking up \texttt{frac} of the display. For example, \texttt{stack_frac(1/5, test_curve, test_curve)} gives the output shown in the bottom left viewport when drawn.

Task Files

- lib/list.js
- lib/misc.js
- lib/graphics.js
- lib/hi_graph.js
- sidequest_5-1_2.html
- sidequest_5-1_2.js

Submission

To submit your work to the Academy, copy the contents from the template file(s) into the box that says "Your submission" on the mission page, click "Save Code", then click "Finalize Submission". Note that submission is final and that any mistakes in submission requires extra effort from a tutor or the lecturer himself to fix.
draw_points_on(2000)(test_curve);
draw_points_on(4000)
(stack(test_curve, test_curve));
draw_points_on(4000)
(stack(frac(1/5, test_curve, test_curve));
draw_points_on(6000)
(stack(frac(1/5, test_curve, stack(frac(3/4, test_curve, test_curve))));

Figure 1: Examples.