mp_intro

Impregnable Introduction

Due: Jan 28, 23:59 PM

Doxygen

Solo MP: This MP is to be completed without a partner.

You are welcome to get help on the MP from course staff, via open lab hours, or Piazza!

Getting the files

From your CS 225 git directory, run the following on EWS:

```
$

git fetch release
git merge release/mp_intro -m "Merging initial mp_intro files"
```

If you see an error about unrelated histories, you may need to run:

```
$

git fetch release
git merge --allow-unrelated-histories release/mp_intro -m "Merging initial mp_intro files"
```

Upon a successful merge, your `mp_intro` files are now in your `mp_intro` directory.

Adding your HSLAPixel class to this project

Before starting this MP, make sure you have finished `lab_intro`.

- Copy your `cs225/HSLAPixel.cpp` and `cs225/HSLAPixel.h` files from `lab_intro` into `mp_intro`.
- Just like in `lab_intro`, these files both go into the `cs225` directory within the assignment folder.

Part 1: Create a Makefile

In CS 225, we feel it's important you understand how a C++ program compiles.

Go through the Makefile Tutorial and create a `Makefile` for this assignment. You may find the `lab_intro` Makefile useful as a reference.

Your `Makefile` must compile together your own solution files, namely `main.cpp`, `intro.h`, `intro.cpp`, and files in the `cs225` directory. Do not have typos in your file names or your `Makefile`! For example, make sure your Makefile compiles a file named `main.cpp`, **not** a file named `main.C` or `test.cpp` or any other such thing.

Please make sure your Makefile does not compile extra files that are not part of this MP. For example, do not add in files from the Makefile tutorial by mistake; the only files the Makefile should be dealing with are the few listed in the paragraph above.

Your Makefile must produce an executable called intro (all lowercase).

After creating a Makefile that builds intro, the following two lines can be added to the end of your Makefile so that you can also build the test cases:

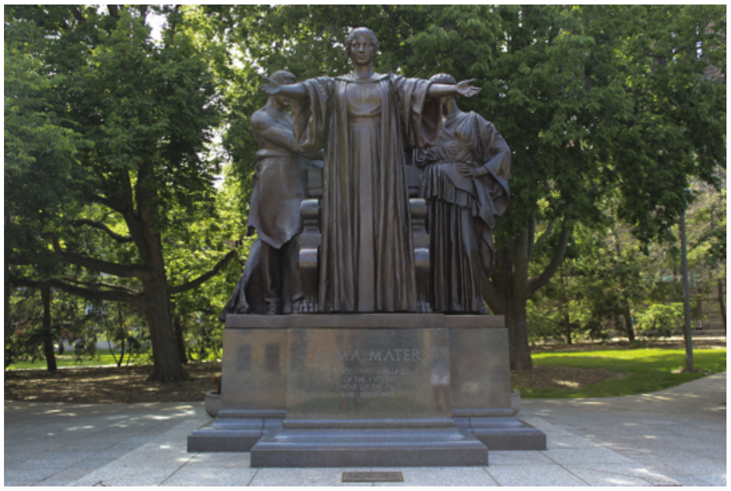
```
$


  test: tests.o PNG.o HSLAPixel.o lodepng.o intro.o
         $(LD) tests.o PNG.o HSLAPixel.o lodepng.o intro.o $(LDFLAGS) -o test

  tests.o: tests/tests.cpp tests/catch.hpp cs225/PNG.h cs225/HSLAPixel.h
         $(CXX) $(CXXFLAGS) tests/tests.cpp
```

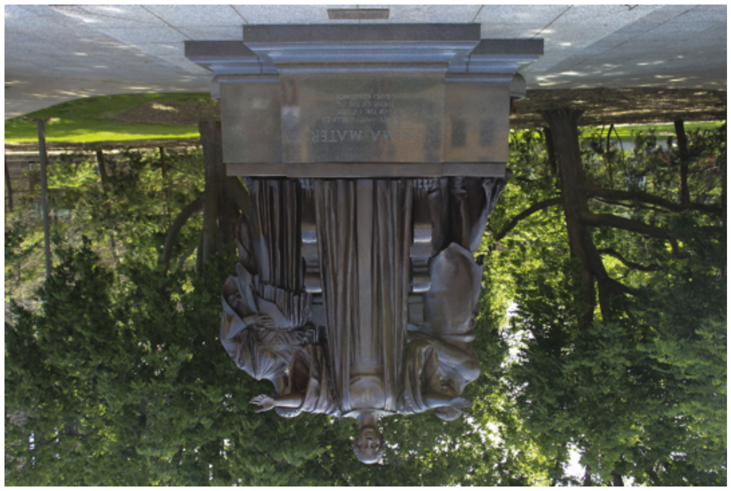
Part 2: Rotate an Image

Open intro.cpp and complete the rotate function. This function must:

- Read in inputFile,
- Rotate the image 180 degrees,
- Write the rotated image out as outputFile

Here's alma.png rotated 180 degrees:


in.png


out.png

In order to complete this, you will need to make use of CS 225's PNG class, which you learned about in lab_intro.

Hint: Take a piece of paper and draw a 5x5 grid on it. Mark the box at (0, 1). Rotate that paper 180 degrees and note where the marked box is now located. Repeat for other squares if necessary.

Can you find the pattern/formula for how the pixel moves?

Testing Part 2

The Makefile you created in Part 1 must produce an intro executable (all lower case intro). The following command must make intro:

```
$

   make
```

A `main` has been provided for you that will call your `rotate` to read in `in.png` and output `out.png`. With that, you may use the given files `in_01.png`, `out_01.png`, `in_02.png`, `out_02.png`, `in_03.png`, and `out_03.png` to test your program. First, copy `in_01.png` to `in.png` by typing

```
$

   cp in_01.png in.png
```

Then run your program:

```
$

   ./intro
```

Finally, compare the output by opening each file and looking at them or using `diff` to compare your output to the expected output:

```
$

   diff out.png out_01.png
```

If `diff` exits without any output, then the files are the same! :)

Part 3: Getting Creative

Daniel O'Brien, fellow Illini and CS 225 alumni, created a website that now attracts over 40,000 followers that displays randomly generated fusions of color that are both mesmerizing and beautiful. Here are just a few:

Generate Your Own Colored Background

Open up `intro.cpp` and complete the `myArt` function. The `myArt` function must:

- Return a `width` x `height` PNG image that contains original art you have created.
    - The `width` and `height` of your image will always be the same – every image generated must be a square.
    - By default, the `width` and `height` are both `800`. Your TA will see your art rendered at 800 x 800.
    - You should focus on making sure your art looks the way you like at 800 x 800. However, your art must scale to any size (eg: be generic).
- Your art must be unique and something you find beautiful or meaningful. There are very few requirements:
    - Your art must contain at least three unique colors.
    - Your art must not contain any external resources (eg: no loading an image from disk/web)

That's it – everything else is up to you! You are highly encouraged to use gradients, fractals, or other designs in your art. More than anything else, have fun! As an extra bit, course staff will award **+1 point** to designs that are particularly unique, creative, beautiful, or stand out from other designs. Feel free to share it both on Piazza and across social media with **#cs225**!

Finally, you will make use of and see your artwork later in the semester. Make it something you'll be happy to see. :)

Testing Part 3

The `main.cpp` provided for you will produce your artwork instead of an image if you run `./intro` with a command line parameter. If you provide a number after `./intro`, it will save your artwork as `art.png`. For example:

```
$

   ./intro 800
```

Sharing Your Art

You just made something awesome that never existed before -- you should share your art (but do not have to)!
*If you share your art on Facebook, Twitter, or Instagram with **#cs225**, I will 👍 or ♥ the post as soon as I see it. I think many of your peers will too!* — Wade

Autograder Testing

We have provided a few automated tests that will test your Part 2 code only. You can run a subset of the test cases that will be used in the autograder with the following commands:

```
$

   make test
   ./test
```

Grading and Submission

You must submit your work to git for grading. We will use the following files for grading:

- `Makefile`
- `cs225/HSLAPixel.cpp`
- `cs225/HSLAPixel.h`
- `intro.cpp`

All other flies will be ignored in grading.

Guide: How to submit CS 225 work using git