

Algorithm 0: Brush - Due 3:00PM on September 12

Name and Account:

Question 1:

You will blend the color of the brush with the color on the canvas using the mask mentioned in the handout. For any color component (red, green, or blue), what is the final color intensity on the canvas (F), given the original color intensity of the canvas (C), the value of the mask at that point (M), the current brush color (B), and the current flow rate (R)? (Assume for your convenience that all of these values are between 0.0 and 1.0. Remember that you will not be so lucky when you write this code in a few days! The CS123Canvas expects values between 0 and 255)

$F =$

Question 2:

Given a click point (`mouseX`, `mouseY`), canvas dimensions (`width`, `height`), and a mask radius `R`, you will need to figure out what area to iterate over in your drawing loop. If the following represents the core of your drawing loop, fill in the blanks shown in the C++ code below: (Remember that the mask will always have an odd width and height; a radius of 1 is a mask of width 3, a radius of 2 is a mask of width 5, et cetera)

```
// given: width, height, R, mouseX, mouseY
// You can use MIN(j,k), MAX(j,k), or "if" statements in the blank space if
// it makes your job easier.

int rowstart = _____ ;

int rowend = _____ ;

int colstart = _____ ;

int colend = _____ ;

int rowcounter;
int colcounter;
for (rowcounter=rowstart; rowcounter<rowend; rowcounter++) {
    for (colcounter=colstart; colcounter<colend; colcounter++) {
        // ...
        // [do stuff to the image at (rowcounter, colcounter) ]
        // ...
    }
}
```

Question 3:

On a modern microprocessor, the cache allows for especially efficient access to contiguous memory locations; that is, it is faster to access memory in sequential order than to jump around a lot. As stated in the extra credit section of the handout, the data for brush is stored in row-major order.

For an image canvas with dimensions "width = 256" and "height = 256", answer the following questions:

1. What is the pixel index of a pixel at row = 19 and col = 188 ? (Where the first pixel is at row 1 column 1)
2. What is the row and col of the pixel at pixel index 34233?
3. How many bytes separate the beginning of one pixel from the beginning of the next horizontally adjacent pixel in memory? (That is, two pixels that are to the left or right of each other on the screen)
4. How many bytes separate the beginning of one pixel from the beginning of the next vertically adjacent pixel in memory? (That is, two pixels that are above or below each other on the screen)