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SANTA BARBARA · SANTA CRUZ

CSE 165: Introduction to Object-Oriented Programming
Lab 4

1. In this lab you will be creating a "clone" of the MS Paint program. That is, the user should be able to draw things on the screen by dragging with the mouse.

2. You do not need to include all the features found in the real MS Paint. All you need to do is have the ability to switch between different colors, and the ability to switch between a paintbrush tool and an eraser tool.

3. Optionally, you may implement more tools, such as drawing lines, shapes, etc. You may also implement a selector for the brush thickness.

4. You are *required* to make use of data abstraction and encapsulation techniques covered in class. This means making objects that interact with each other. When designing your objects, try to make the reusable in other projects. For example, this program requires the user to click on buttons, so you can create a "Button" object, which will be useful in other projects. What this means is that I should be able to take your header file and source file (for example `Button.h` and `Button.cpp`), and use them in my program without having to modify your source code at all.

5. In this project it would be useful to be able to display text on the screen. Here is a function that can do that using GLUT's built-in functionality (there are probably better libraries for this out there, but this will suffice).

   The function defined below takes in a string, the $xy-$ coordinates, the font—which specifies both the style and the size (more on that later), and the color in RGB format.

```
void renderText(
    string text,
    float x,
    float y,
    void* font = GLUT_BITMAP_HELVETICA_18,
    float r = 1,
    float g = 1,
    float b = 1
){
    glColor3f(r, g, b);
    float offset = 0;
    for (int i = 0; i < text.length(); i++) {
        glRasterPos2f(x+offset, y);
        glutBitmapCharacter(font, text[i]);
        int w = glutBitmapWidth(font, text[i]);
        offset += ((float)w / width)*2;
    }
}
```

There is not a large font selection. Valid font values are:

```
GLUT_BITMAP_TIMES_ROMAN_24
GLUT_BITMAP_TIMES_ROMAN_10
GLUT_BITMAP_HELVETICA_18
GLUT_BITMAP_HELVETICA_12
GLUT_BITMAP_HELVETICA_10
GLUT_BITMAP_8_BY_13
GLUT_BITMAP_9_BY_15
```

To use the above function to print the text Hello World starting at the origin, call it inside your draw function:

```
renderText("Hello World", 0, 0);
```

This will use the default font, which is Helvetica, size 18, and the default color, which is white. You can specify different values for the default parameters:

```
renderText("Hello World", 0, 0, GLUT_BITMAP_TIMES_ROMAN_24, 1, 0, 0);
```

The above example uses Times New Roman, size 24, and it is red.