

## CS 404: Problem Set 3 Key

**Essential Knowledge—Please give a brief answer (1-2 sentences) for each**

1. True or False. If you don't register your code with the Library of Congress (and pay the \$35 fee), someone may legally copy your code without your permission. Answer "true" or "false" and give a short explanation.

FALSE—Any original work created in a "fixed medium" (including a computer hard drive) is automatically protected by copyright. Registering with the Library of Congress is merely a means of documenting the originality of your work.

2. You just invented a revolutionary algorithm to compute the optimal route a traveling salesman (or political candidate) should take between cities, allowing him/her to visit all  $n$  cities using the least amount of gasoline<sup>1</sup>. To keep Microsoft from stealing your idea, what should you do?

Get a good lawyer and then get a patent. Patents protect ideas and inventions, copyright law protects documents.

3. You're given a version of LAPACK that has been compiled and stored in a Windows dynamically-linked library (DLL). What two things must you do to call routines in this library?

Link your code to the .lib file. Then, make sure that the .dll is in your path.

### More OpenGL

4. Download RAD1Dgl2.tar from the course website (near the problem sets). This is an extension of the RAD1D version with OpenGL calls

---

<sup>1</sup>Don't laugh. This is a real problem known as the traveling salesman problem (for obvious reasons). Presently, no one has developed a polynomial time algorithm (an algorithm that takes  $n^p$  steps, where  $p$  doesn't depend on  $n$ ) to solve this problem. The interesting aspect of the traveling salesman problem is that if you could solve it in polynomial time, you could solve a whole class of important problems without known polynomial-time solutions.

used on Friday. I have added the routine `EmphasizeTime` to `GLout.c`. In the main subroutine, I register this with GLUT as the “`glutSpecialFunc`” – the function that is called when the user presses “special” keys on the keyboard. Look at the code for `EmphasizeTime`. What keys does it respond to? What variables does it modify? I’ve placed a link to the GLUT manual on the course website, although you should be able to figure out this question without it.

`EmphasizeTime` responds to the arrow keys (up/down or left/right). When the up or right arrows are pressed, the variable `GLtslice` is incremented. Pressing the down or left keys causes `GLtslice` to be decremented. The idea is that `GLtslice` points to a particular time-slice from the samples of  $C$  stored in `GLC`.

5. The variable modified in `EmphasizeTime` allows the user to pick a particular time from the samples of  $C$  stored in `GLC`. Your job is to add OpenGL calls to `DrawC` so that time-slice selected by the user is plotted as a green line. Remember, to create a colored line in OpenGL, you first pick a color, then call `glBegin(GL_LINE_STRIP)`. You then specify a series of line segments by calling `glVertex2d`. Finally, the line is ended by calling `glEnd()`. When you get your green lines to work, copy your `DrawC` routine into an e-mail and send it to me.

Add the following lines to `DrawC` after the loop over  $k$  and before the call to `glFlush`:

```
glColor3f(0.0, 1.0, 0.0); /* set color to green */
glBegin(GL_LINE_STRIP); /* tells OpenGL to begin listening
                        for a series of points forming a line */
for(j=0;j<GLm;j++){
    /* Take the points from the column of
       GLC indicated by GLtslice */
    glVertex2d(A*((GLdouble)GLx[j])+B,
              C*((GLdouble)GLC[j][GLtslice])+D);
}
glEnd();
```