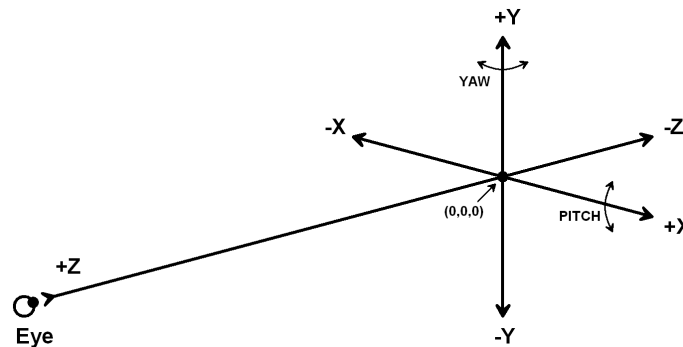


CMPSCI 145
Fall 2009
Professor William T. Verts

Download from the class web site the program called "Sphere Tracing (version 0.9)" and unpack the .ZIP file into a new folder on your hard disk (there will be a single .EXE file called **SphereTracing.exe** inside, along with a sample file called **sample.sph**). You will create one or more sphere drawings yourself, and each one needs to be saved somewhere. The folder where the program is stored is as good a place as any.

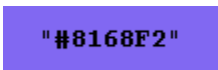
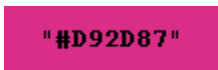
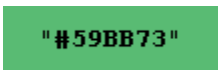
Practice

Run the Sphere Tracer program. The window will be automatically maximized. Click-drag the black horizontal splitter bar downwards until there is a large area for the ray-traced image visible at the top of the screen but still several lines of the spreadsheet visible at the bottom. You'll have to fiddle with this to get the balance right for your particular monitor and screen resolution. You are initially looking down the positive Z-axis towards the origin, where the positive X-axis points to the right and the positive Y-axis points up:




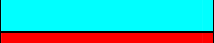






Play with the program for a while to get a feel for how it works. Enter several spheres into the spreadsheet (X, Y, Z, Radius, and Color) and ray-trace the results. Play with the Background Color and Brightness (in the Colors tab) and the Eyeball Distance down the Z-axis (in the View tab). Play with the Pitch (rotate around X) and Yaw (rotate around Y) controls in the View tab, but as a suggestion do one or the other at any one time, not both. Adjust the image size in the Image Size tab.

Colors are defined just as they are in HTML for Web pages: a hash mark followed by six hexadecimal digits (two digits for each of the three primary colors red, green, and blue). For any primary color, "off" is 00 and "full power" is FF; intermediate colors may be formed by using values between 00 and FF, such as 23, 6A, BC, F7, etc. Each digit is picked from the set 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F. For example, "quarter power" has the value 40 in hexadecimal, "half power" has the value 80, and "three-quarter power" has the value C0. Here are some typical sample colors (you would enter them into the sphere tracer program without the quotes):

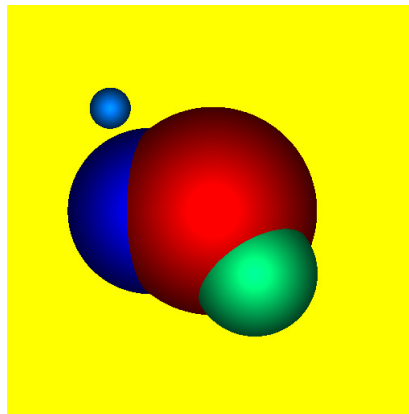


A table of the basic saturated colors is shown below.

Hex Code	Color Name	Color
#000000	Black	
#0000FF	Blue	
#00FF00	Green	
#00FFFF	Cyan	
#FF0000	Red	
#FF00FF	Magenta	
#FFFF00	Yellow	
#FFFFFF	White	

Exercise the program thoroughly, and get used to the data entry spreadsheet. Discard your picture when done (or save it for your own later use if you like).

As a continuation of the exploration exercise, load the **Sample.sph** file that comes with the program and then ray-trace it. You should see the following picture appear, containing four spheres at a yaw angle of 180°:



Play with it some more. When you are all done, exit the program and restart it to insure that all session settings are restored to the default values.

Specific Instructions

1. In the Image Size tab, make sure that both Width and Height are set to 256, and that the Scale is set to 100%. In the Colors tab, set the Background Color to something *other than* Yellow, and set the Brightness to 125%. In the View tab, set the Foveal Angle to 2.0, and set the Eye Distance to 400.0.
2. Draw something pretty! Create a picture using at least ten spheres, with several different sizes and colors. Have some fun with this! (Your grade does not depend on the quality of your artwork, but please be creative!)



Make sure that the object you create is viewable from **all** rotation angles. If it looks "right" from only one viewpoint, but "breaks apart" when rotated, then the spheres are **not** in the correct positions.

3. When your picture is complete, set the pitch, yaw, eyeball distance, background color and brightness to their final preferred values. Save your sphere spreadsheet data as **lastname_firstinitial.SPH** (I would use **VERTS_W.SPH**, for example).

You are not required to submit more than one file. If you do create more than one file that you would like to submit, save the first as **lastname_firstinitial1.SPH**, the second as **lastname_firstinitial2.SPH**, and so on (in my case I would save the files as **VERTS_W1.SPH**, **VERTS_W2.SPH**, etc.).

4. Package your **.SPH** file(s) into a **.ZIP** archive with *the string SPHERE, your last name, an underscore, and the initial letter of your first name* as the name of the archive (for example, I would create an archive called **SPHERE_VERTS_W.ZIP**). Email the **.ZIP** archive as an attachment to **literacy@cs.umass.edu** (do not send it to me directly, and do not send a **.BMP** image in this assignment). In your email message set the subject line to: "CMPSCI 145 Spheres" and please make sure the body of your message contains your name, as it is often difficult to tell just from the return address.

Final Thoughts

In the Bézier assignment I had you write a short essay comparing and contrasting the **.BEZ** file containing the *model* of a picture against the **.BMP graphic image** of that same picture. While you are not required to write another essay, please think about how you would compare the **.SPH** file that *models* a set of spheres against the **.BMP graphic image** that shows those spheres. (There may be something like this on the final exam.)

Grading Policy

For grading, I will be looking at the image(s) to see if...

1. ...the size is exactly 256x256 pixels at a scale of 100%,
2. ...the brightness is 125%,
3. ...the eye distance is 400.0,
4. ...the foveal angle is 2.0,
5. ...the background is not Yellow,
6. ...there are at least ten spheres of different sizes and colors, and
7. ...that the object you create is "consistent" from all rotation angles.

We will not be grading on artistic ability!