PHYS 114 Contemporary Physics II - Rec 1

January 9, 2008

Angular Momentum

Feel free to use old code you have written before, as long as it belongs to you.

- Create a 'solar system' of three planets. Let each planet have a mass equal to 1,2,3 kg respectively. These bodies are to interact via the gravitational forces. Give the planets some initial velocity so they have an interesting, semi-stable trajectory.
- While the simulation is running, denote the center of mass of the system by a small green sphere. This should be continuously updated to reflect the current center of mass.

As a series of text labels, print the following the the screen during the simulation:

- The angular momentum of the system using the origin as the reference point:

$$\mathbf{L}_0 = \sum \mathbf{r}_i \times \mathbf{p}_i \tag{1}$$

- The angular momentum of the system using the reference point $< 7, -2, 3 >$:

$$\mathbf{L}_1 = \sum \mathbf{r}'_i \times \mathbf{p}'_i \tag{2}$$

- The angular momentum of the center of mass about the origin:

$$\mathbf{L}_{CM} = \mathbf{R} \times \mathbf{P} \tag{3}$$

- The angular momentum about the center of mass (the double primes denote the coordinates using the center of mass as the origin)

$$\mathbf{L}_{aboutCM} = \sum \mathbf{r}''_i \times \mathbf{p}''_i \tag{4}$$

For full credit, identify at least two constants of motion from the above equations. Include this information as text to the user or as a comment in your code. Please don't forget your name in the beginning of your comments as well!