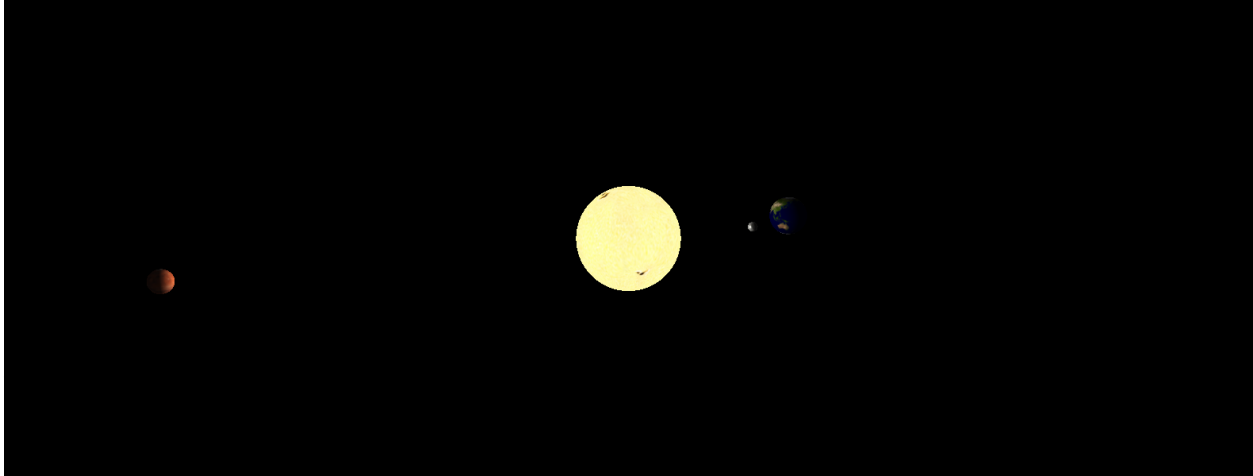


HW 6: Solar Systems

Your task is to create a solar-system simulator. Your program `SolarSystem` will take a single command-line argument: a `.sol` file. This text-based file is formatted as shown below. It describes the solar system to draw, with a single sun in the middle, planets orbiting the sun, and moons orbiting the planets.



Each line of the file is separated into several elements (“tokens”), by tabs. Here is a sample `.sol` file:

20	80	20							
1	1	1	0.1	0.9	0.9	0.0001			
sun.jpg	5	2.8							
	earth.jpg	2	1	20	36.5	0			
		moon.jpg	0.5	2.8	7	2.8	10		
	mars.jpg	1	1.03	40	68.7	0			

- **The first line is the position of the camera.** The numbers are respectively the x , y , and z coordinates. The camera’s focus will remain fixed on the sun.
- **The second line describes the light.** The first 3 numbers are the R, G, and B components of the light. These will be multiplied by the texture. The next 3 numbers are the base intensities of the ambient, diffuse, and specular components. The last number is the linear attenuation constant, k_l . (You may assume that $k_c = 1$ and $k_q = 0$.) A value of 0 indicates no attenuation.
- **Each subsequent line describes one spherical body in the scene.**
 - **The sun line has only 3 tokens: the texture file to apply, the radius, and the rotation period (or “day”) in seconds.** There will be only one sun, and it should occupy the center of the screen.
 - **Planets are tabbed in once, and orbit the sun.** The first 3 tokens are the same as for the sun. After that comes the distance between its center and the

sun's center, followed by the orbital period ("year") in seconds. Finally is the specular shininess, with a 0 indicating no specular component.

- **Moons are tabbed in twice, and they orbit the planet most recently specified.** The tokens are the same as for planets. Note that a planet may have multiple moons.

There is only one light source, which is at the origin (inside the sun). The sun will always appear fully lit, with no need to worry about ADS components. The other bodies must appear to be lit by the sun, roughly half in day and half in night. Lighting must obey all of the parameters laid out in the second line of the `.sol` file. Red, green, and blue should be calculated separately. The values should stay between 0 and 1. Ambient and diffuse lighting should be multiplied by the planet's or moon's texture, while specular lighting should be added separately.

You may use either Phong shading or Blinn-Phong shading, as you prefer. Similarly, you may use either UV spheres or geodesic spheres, though the quality should be high enough that the objects all appear spherical.

You may assume that there will be no more than 16 different bodies to draw. (This might be important when loading textures.) There is only one sun, every moon orbits a planet, and nothing orbits moons. However the exact distribution of planets and moons can vary.

Positive values for days and years indicate counter-clockwise motion (when looking down at the scene from the north). Negative day or year values will mean clockwise motion. (There really are some planets that rotate "backwards", probably due to some ancient collision.)

A final note: the above `.sol` file is inspired by real numbers, but it is *not* to scale. The real Sun has a diameter 100× that of the Earth. Further, the distances between bodies are much, much greater than shown here.

Good luck!