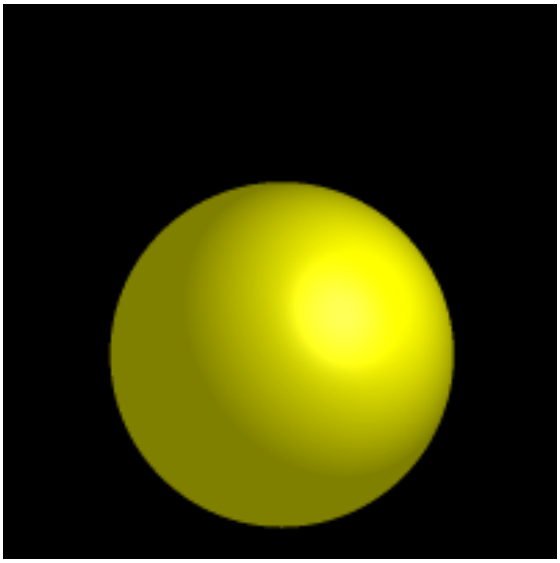
Manual Test Plan



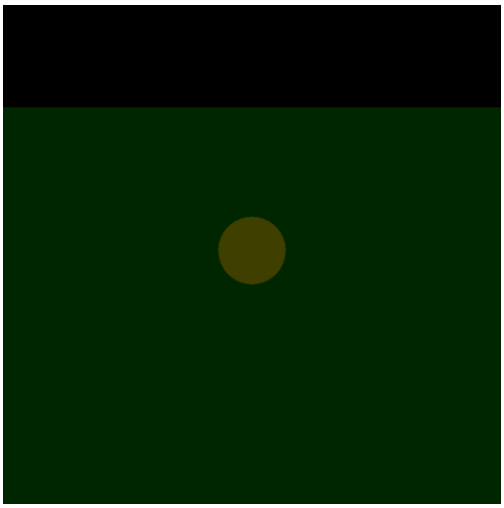
Setup

Bitmap Test

Test the bitmap library by creating a bitmap image 1 pixel tall by 1 pixel wide. Set pixel (0, 0) to be red (256, 0, 0). Check output to confirm pixel is red. Documentation can be found here.

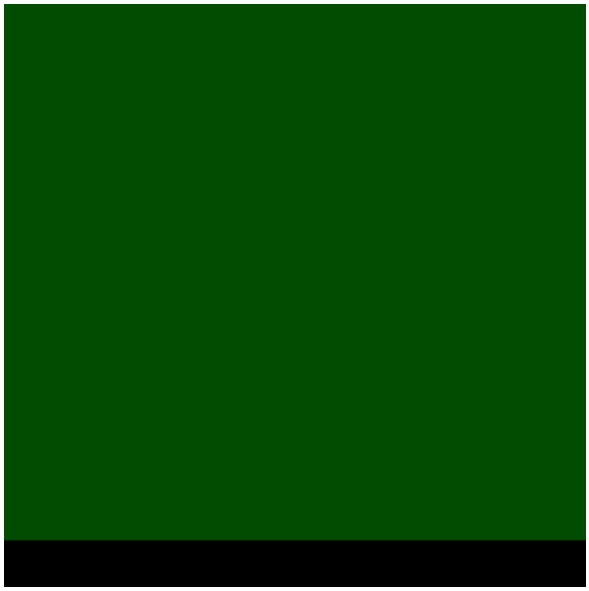
Setup Build Function

All scenes are controlled by altering the build function within World/World.cpp. In the build function setup a simple scene using a green ground plane (roughly a = (0, 0, 0) and n = (0, 1, 0)) and a yellow sphere (roughly center = (0, 10, 0) radius = 10). Use a Matte material for each object. Assign a pinhole camera at (0, 100, 100) looking at the origin. Scenes without lights must have an ambient light. A radiance value of two should be adequate for all renders for the AmbientLight.



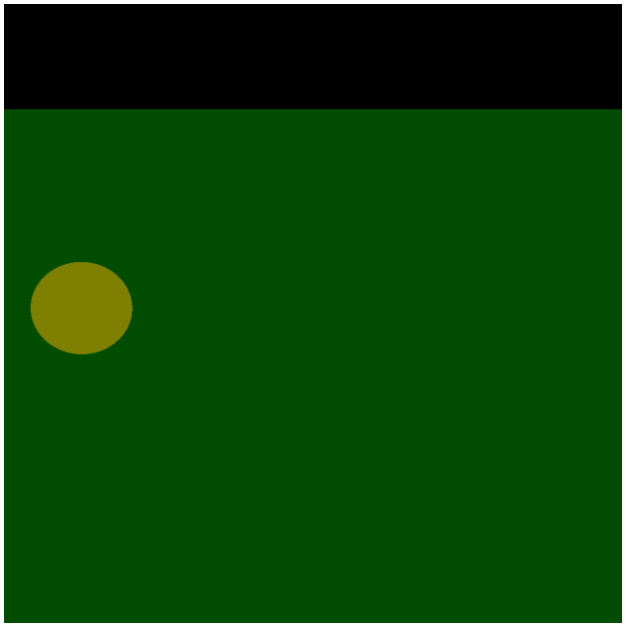
Object Intersections

The basic scene should be adequate to test primitive intersections. Move the camera look at point around the scene to confirm that the ground plane creates a horizon line and extends out to infinity. Move the camera below the ground plane to confirm that the sphere no longer appears. Move the camera around the sphere by changing the eye coordinates to confirm the sphere is circular from all angles.



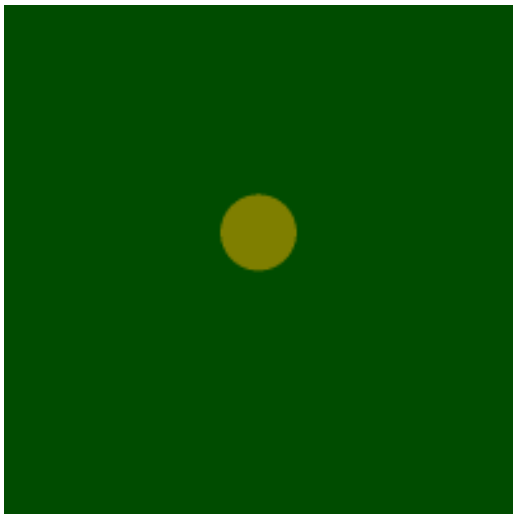
Camera Support

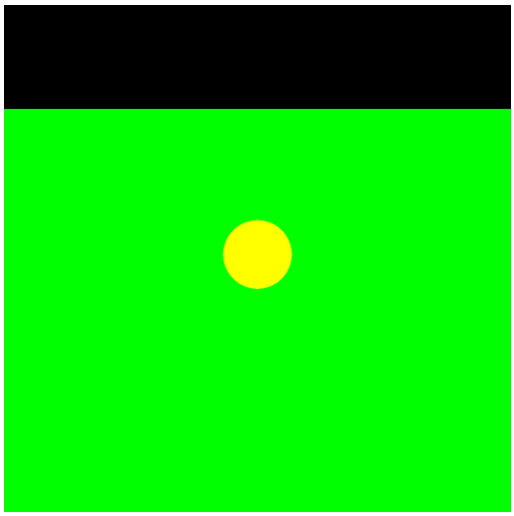
Go through each camera argument and alter them to confirm a change. Changing the eye argument should change only the angle and scale of the scene. Changing the lookat argument should allow for centering the render about another object within the scene. Changing the zoom should zoom the render in and out uniformly. Changing the d argument (ViewPlane distance) should adjust the field of view of the render.



Ambient Lights

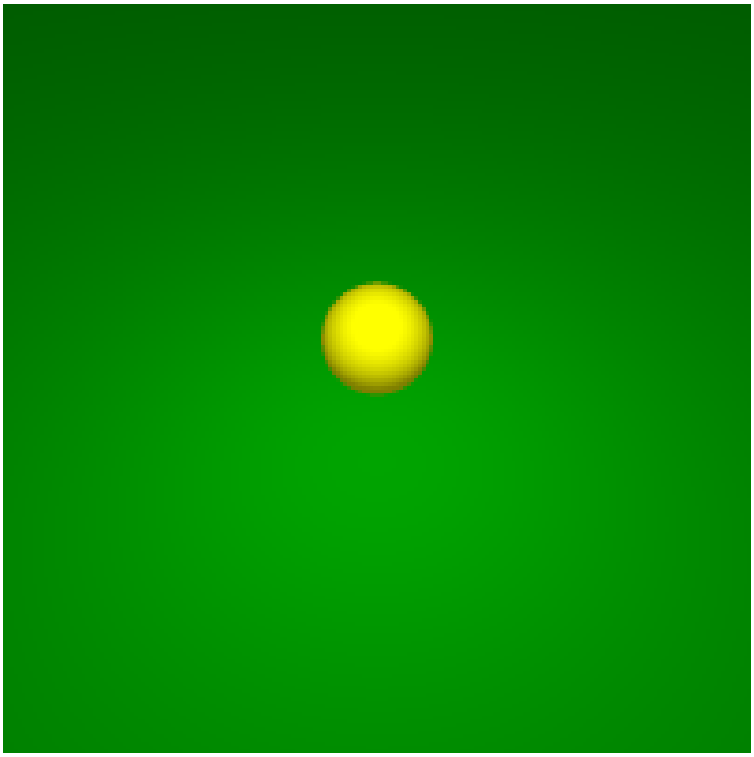
Adjust the AmbientLight's radiance. Check that the chroma of all objects changes. A radiance level of zero should cause a black screen. This would be a good place to check the color clamping functionality. Out of gamut colors in the default state should stay their materials' base color but if you include vp.set_gamut_display(true); in your build function the objects should be shaded white with an ambient radiance of 1000.





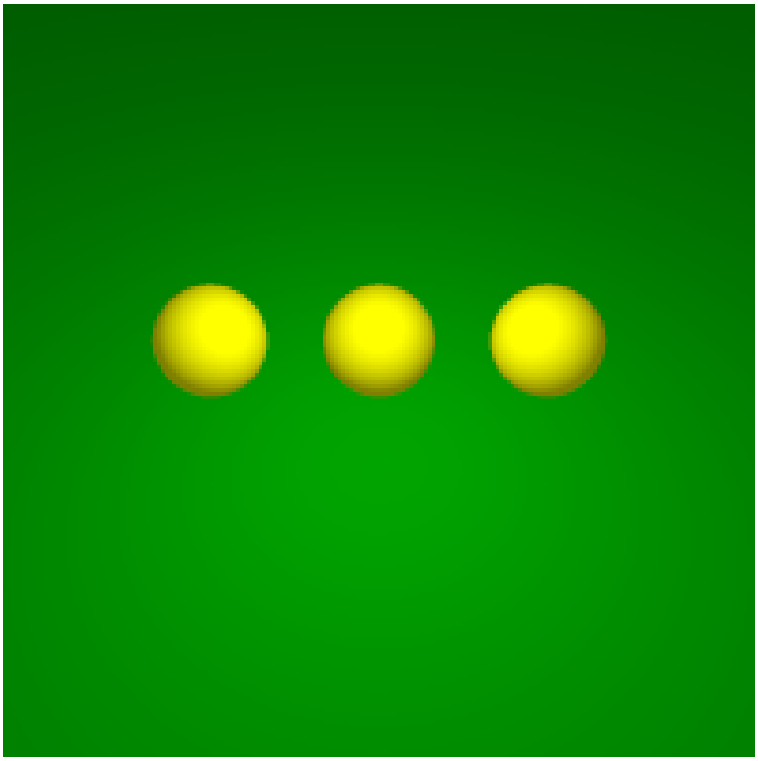
Diffuse Reflection

Assign a point light at (0, 50, 20). Check to ensure the objects are now shaded instead of solid. Rotating the camera should show the shading to be dependent of viewpoint. There should be a clear gradient from light to dark. Shadows should be disabled by default. Changing the color and reflectance constants should change the color of the object.



Point Lights

Assign two more spheres of the same size 20 units to the right and left of the first sphere. The spheres on either side should be lit from opposite sides. Moving the point light under the ground plane should still result in all objects being shaded by default.



Directional Lights

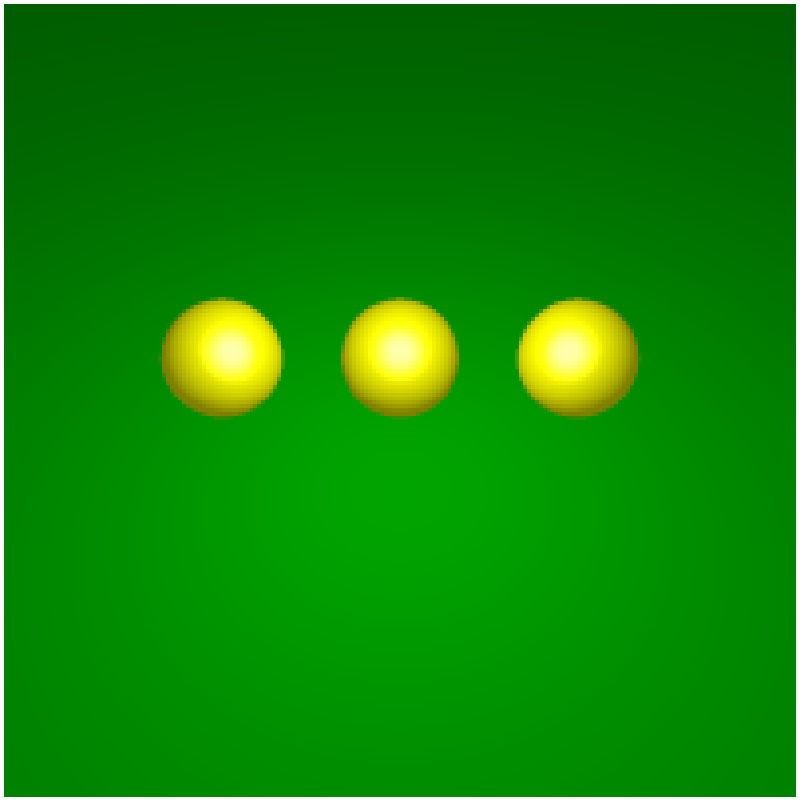
Use the previous scene. Replace the point light with a directional light with a direction (1, -1, 0). The three spheres should all be lit from the same side. Again changing the light direction to be coming from under the ground plane should still result in all objects being shaded by default.

Shadows

Use the previous scene. Set shadows to true for all objects, lights, and materials you wish to be shaded. You should be able to identify shadows from each sphere on the other spheres and the plane. Turning off shadows for one light should still allow shadows for a second light coming from a different direction. Turning off shadows on a GeometricObject should make it not cast shadows but still be able to have shadows drawn on it. Create a new Material that is identical to the initial Sphere Material but it has shadows disabled. Assign this material to a Sphere. This sphere should be able to cast shadows on other objects but will not have shadows rendered on its surface.

Specular Reflection

Replace the Matte material with a Phong material with the respective colors of each object. You should be able to make out three distinct zones for all curved objects. There should be a dark zone, a large medium shaded zone, and a specular highlight. There should be a clear gradient between each of these zones. Changing the exp value for the material should change the size of the highlight.



Sampling

To change the sampling adjust the number of samples with vp.set_samples(num_samples). The number of samples should always be a perfect square. Setting the number of samples to one will enable Regular sampling. Any other value will enable MultiJittered sampling. Increasing the number of samples will likely increase the render duration but reduce the appearance of jaggies in a render.

Perfect Specular Reflection (Mirror)

Create a new material instance of Reflective. Star t with the following values.

```
auto* reflective = new Reflective;
reflective->set_ka( k: 0.25);
reflective->set_kd( k: 0.5);
reflective->set_cd( r: 0.75,  g: 0.75,  b: 0);
reflective->set_ks( ks: 0.15);
reflective->set_exp( exp: 100);
reflective->set_kr( k: 0.75);
reflective->set_cr(WHITE);
```

Assign this material to two out of the three Spheres. You should be able to see the reflection of the diffuse sphere in the shaidng of the other spheres. There should also be combound reflections from the two nearby reflective surfaces.