61A Extra Lecture 9

Announcements

Pixels

(Demo)

Ray Tracing

Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

Ray Tracing

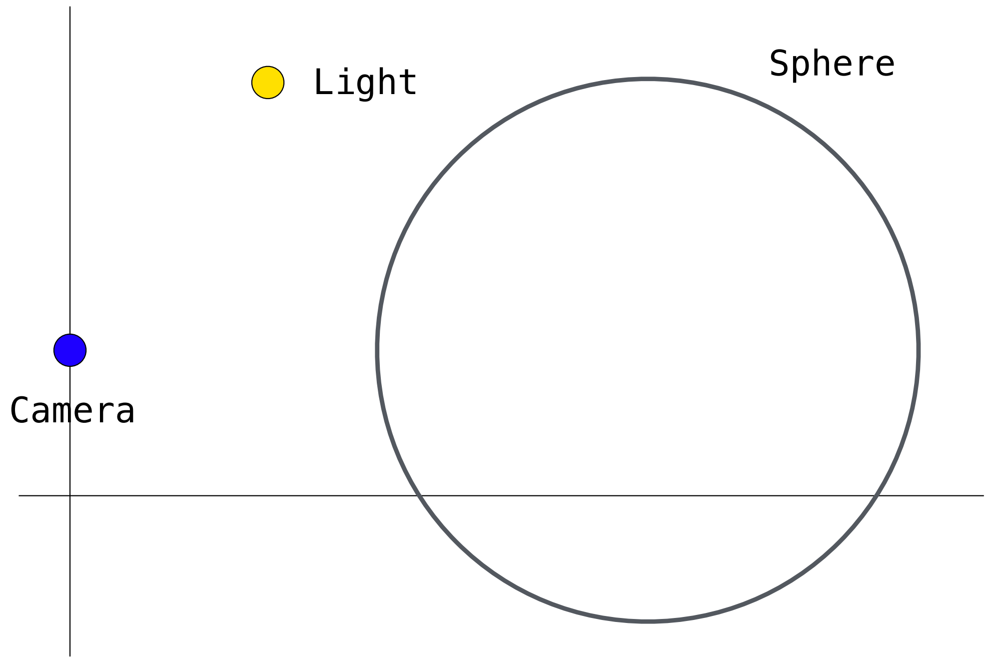
A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

Dramatization:

Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

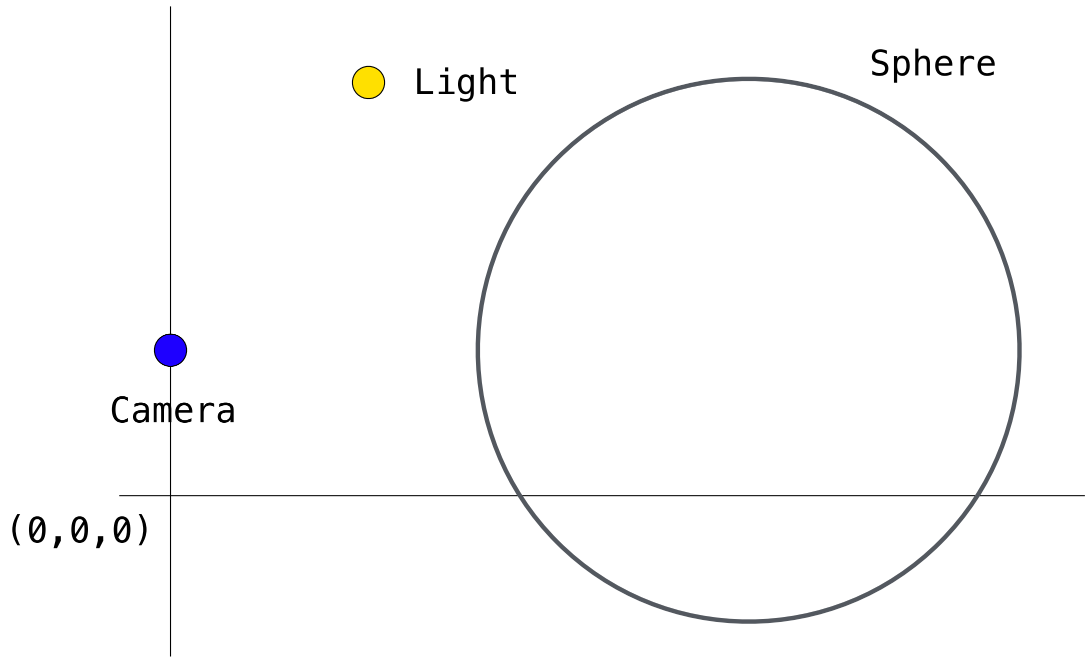
Dramatization:



Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

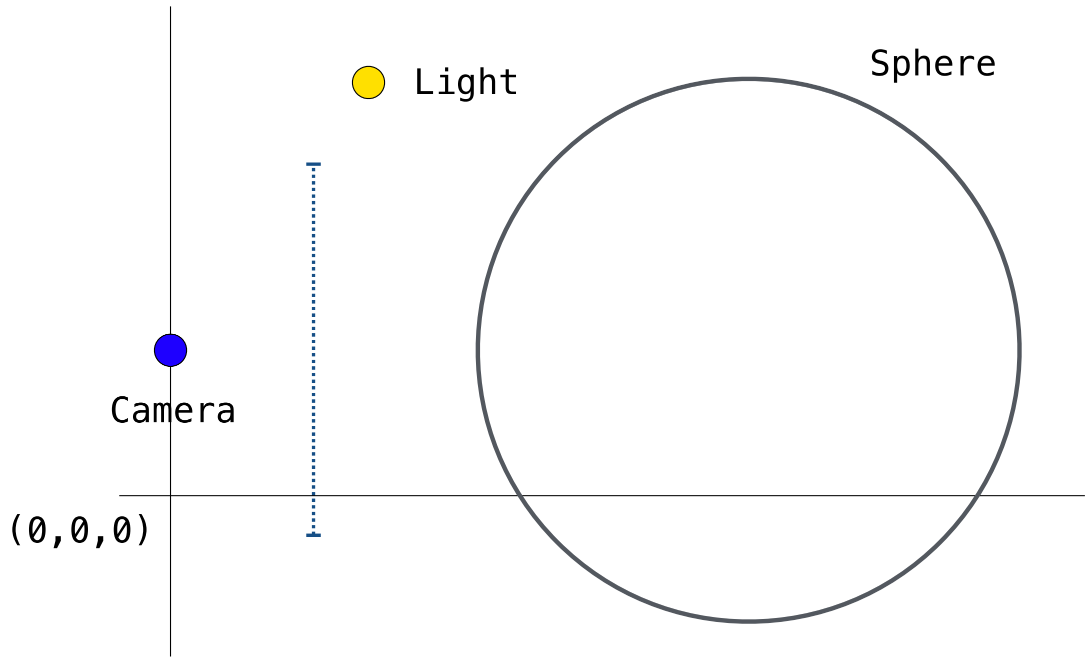
Dramatization:



Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

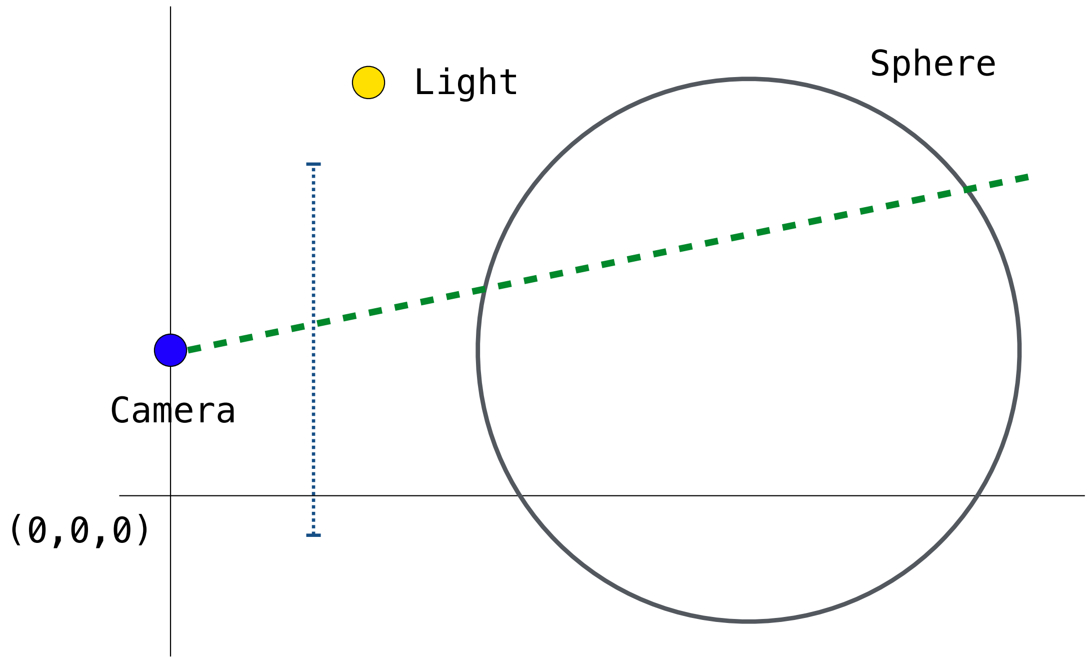
Dramatization:



Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

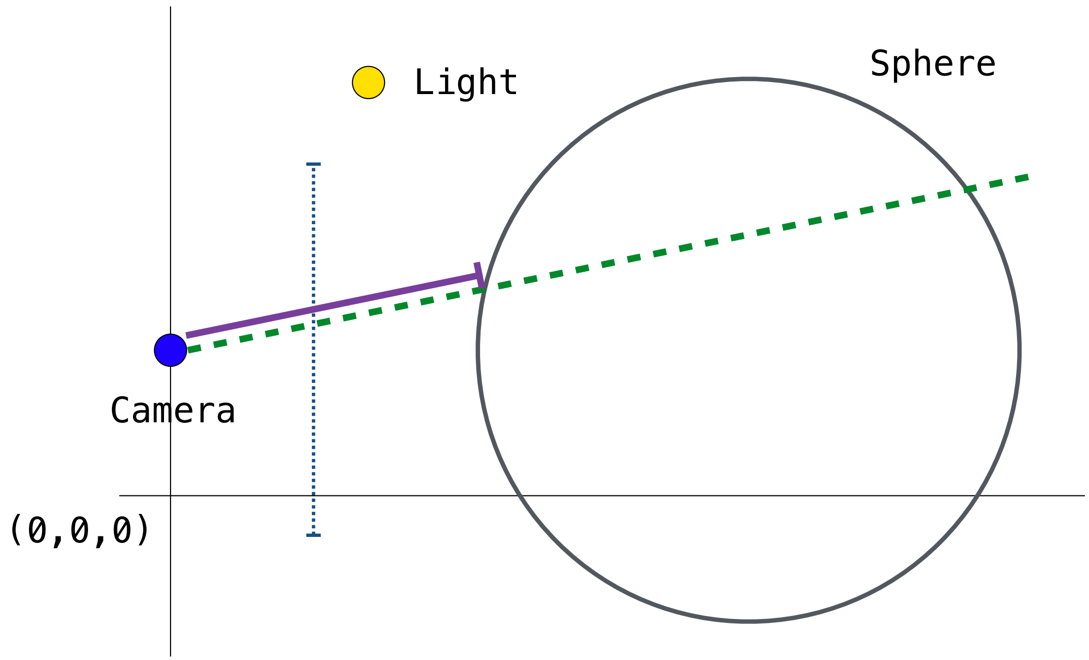
Dramatization:



Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

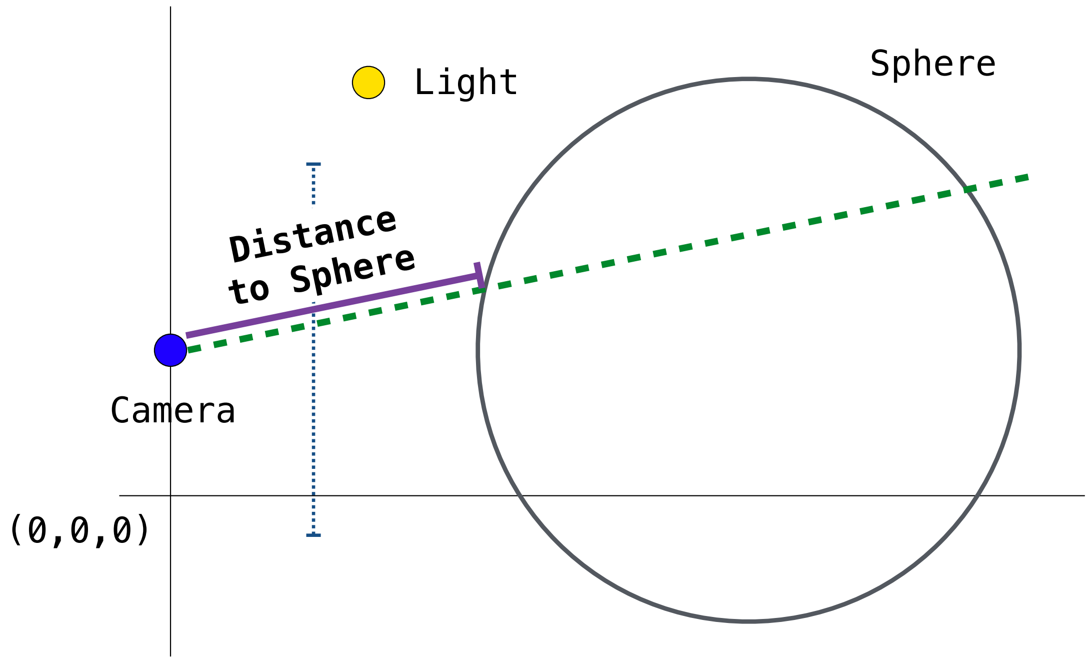
Dramatization:



Ray Tracing

```
A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel
```

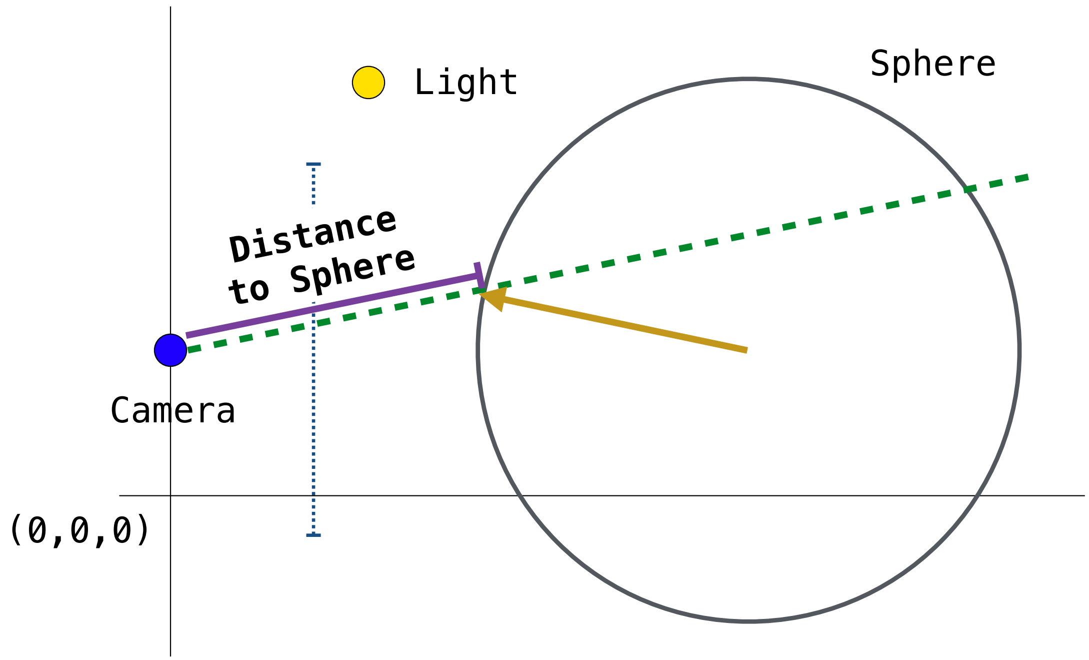
Dramatization:



Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

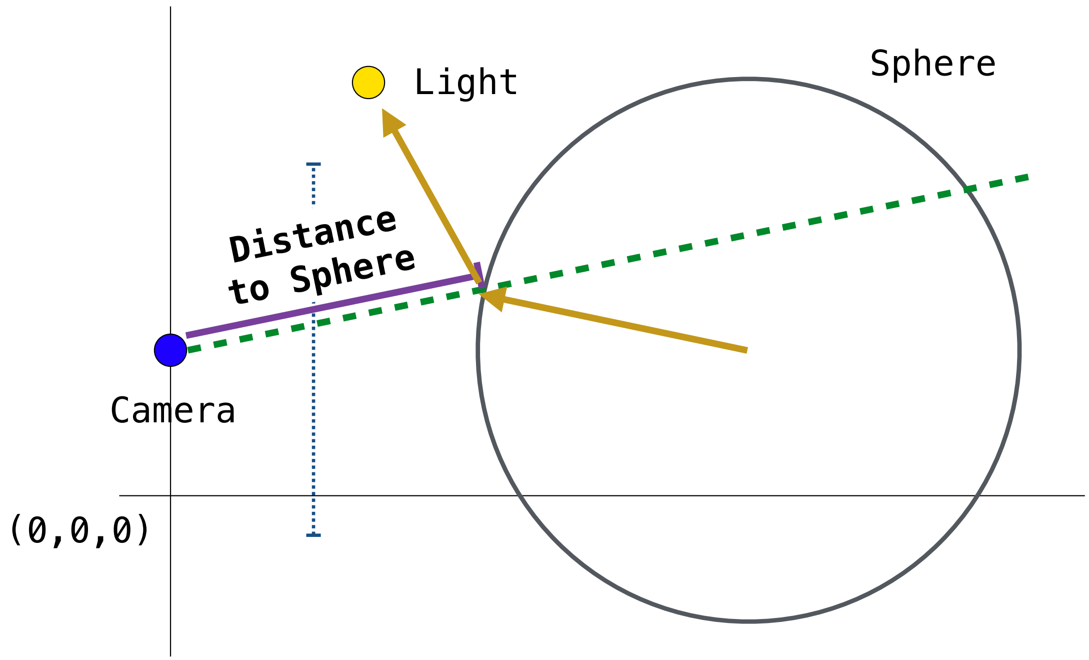
Dramatization:



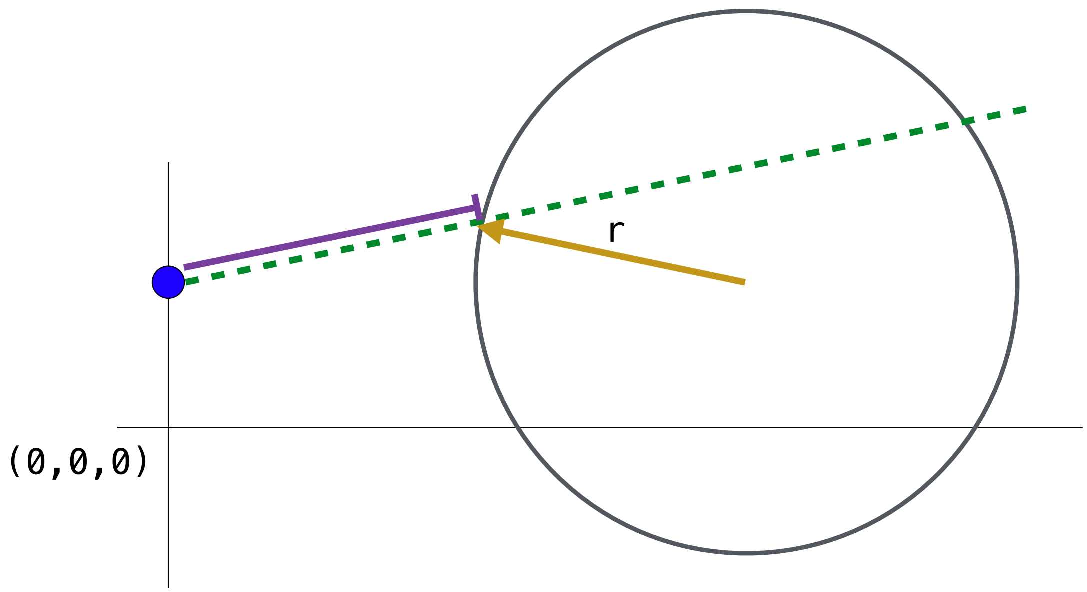
Ray Tracing

A technique for displaying a 3D scene on a 2D screen by tracing a path through every pixel

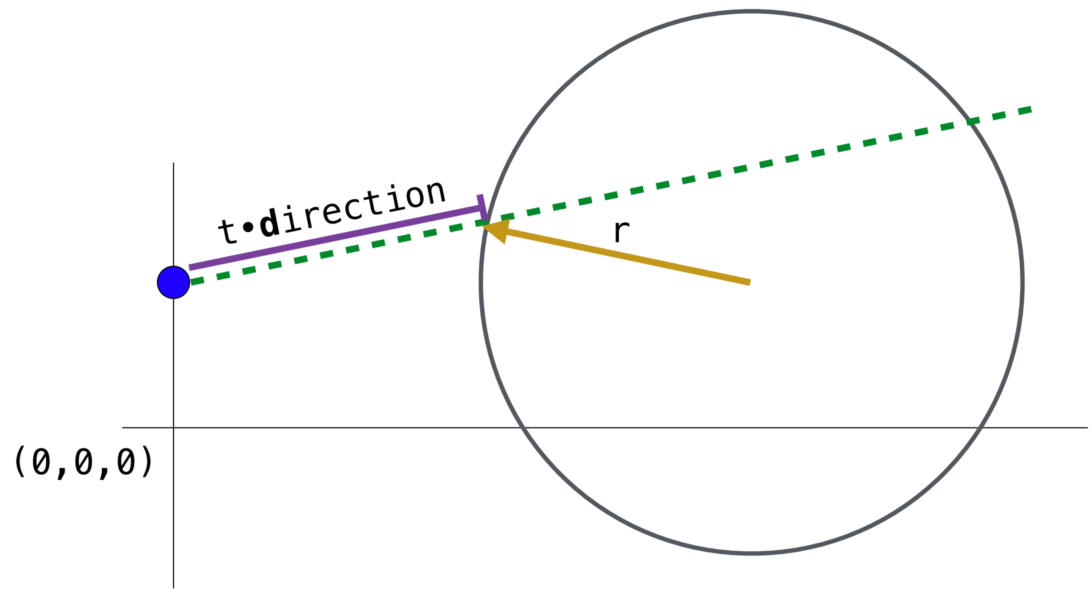
Dramatization:



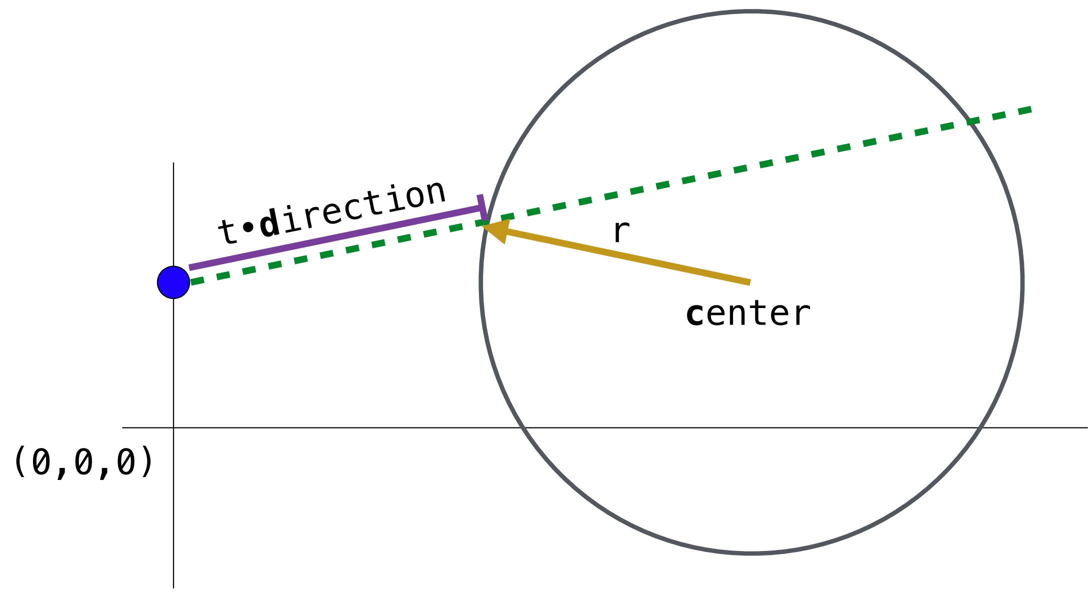
Distance from a Source to a Sphere



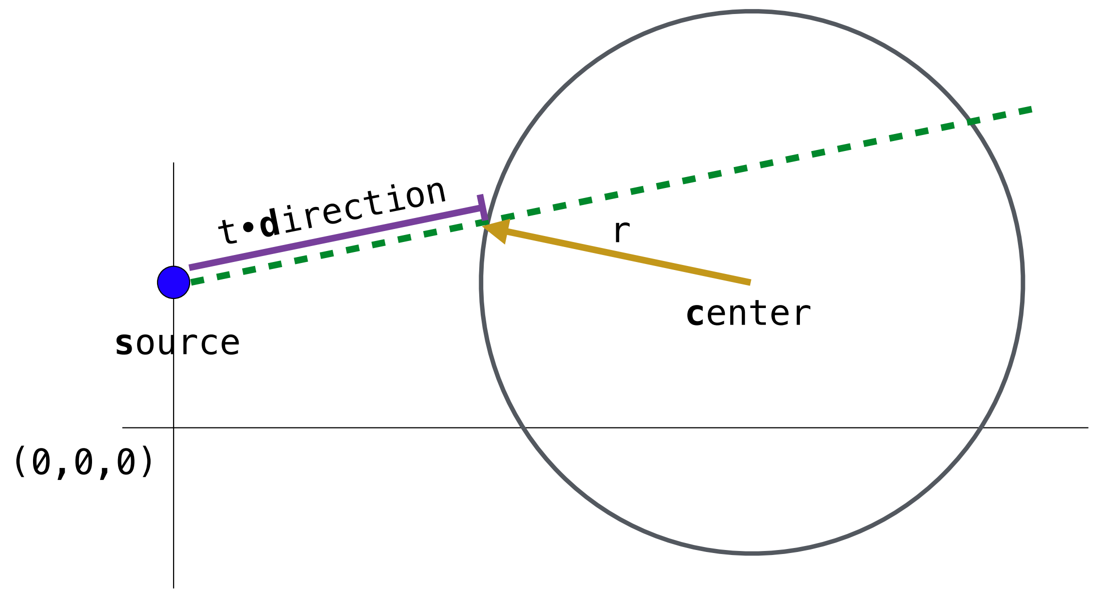
Distance from a Source to a Sphere



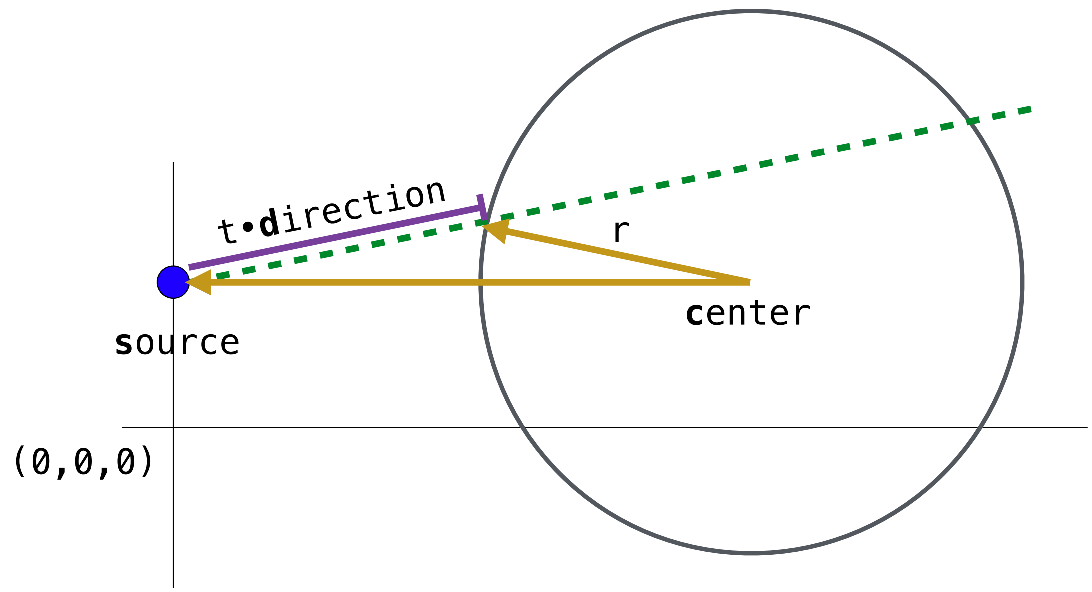
Distance from a Source to a Sphere



Distance from a Source to a Sphere



Distance from a Source to a Sphere

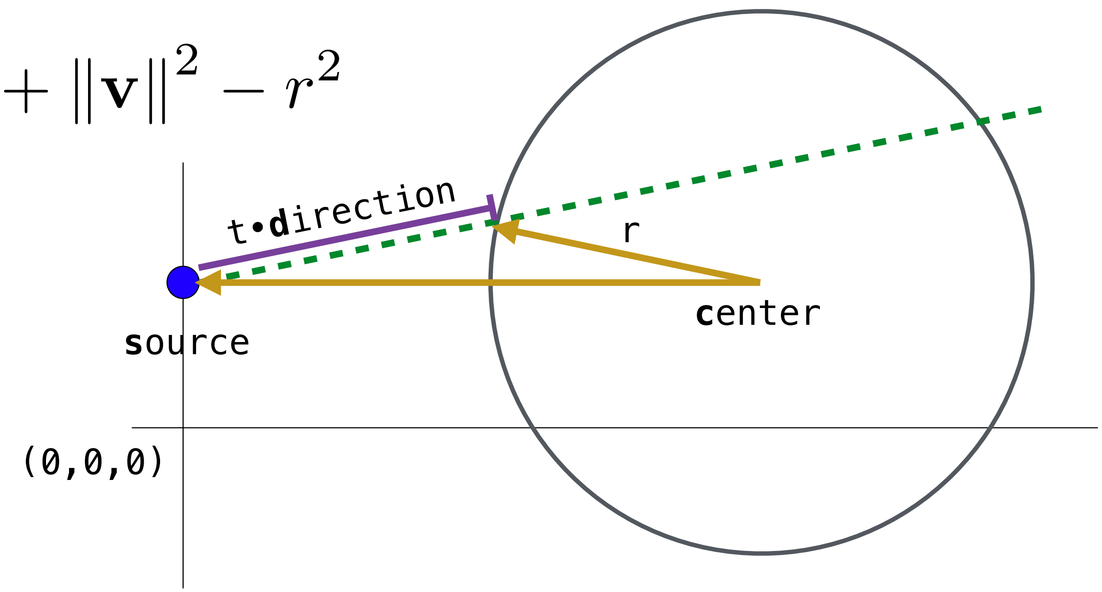


Distance from a Source to a Sphere

$$r^2 = \|\mathbf{s} - \mathbf{c} + t\mathbf{d}\|^2$$

$$0 = \|t\mathbf{d} + \mathbf{v}\|^2 - r^2$$

$$0 = t^2 \|\mathbf{d}\|^2 + 2t(\mathbf{v} \cdot \mathbf{d}) + \|\mathbf{v}\|^2 - r^2$$

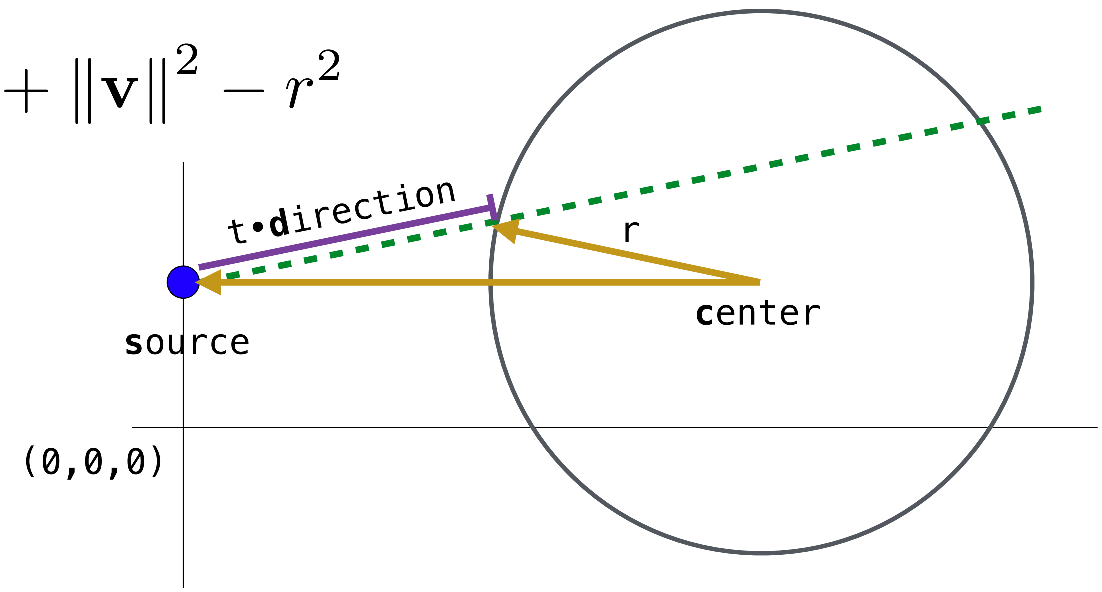


Distance from a Source to a Sphere

$$r^2 = \|\boxed{\mathbf{s} - \mathbf{c}} + t\mathbf{d}\|^2$$

$$0 = \|t\mathbf{d} + \boxed{\mathbf{v}}\|^2 - r^2$$

$$0 = t^2 \|\mathbf{d}\|^2 + 2t(\mathbf{v} \cdot \mathbf{d}) + \|\mathbf{v}\|^2 - r^2$$

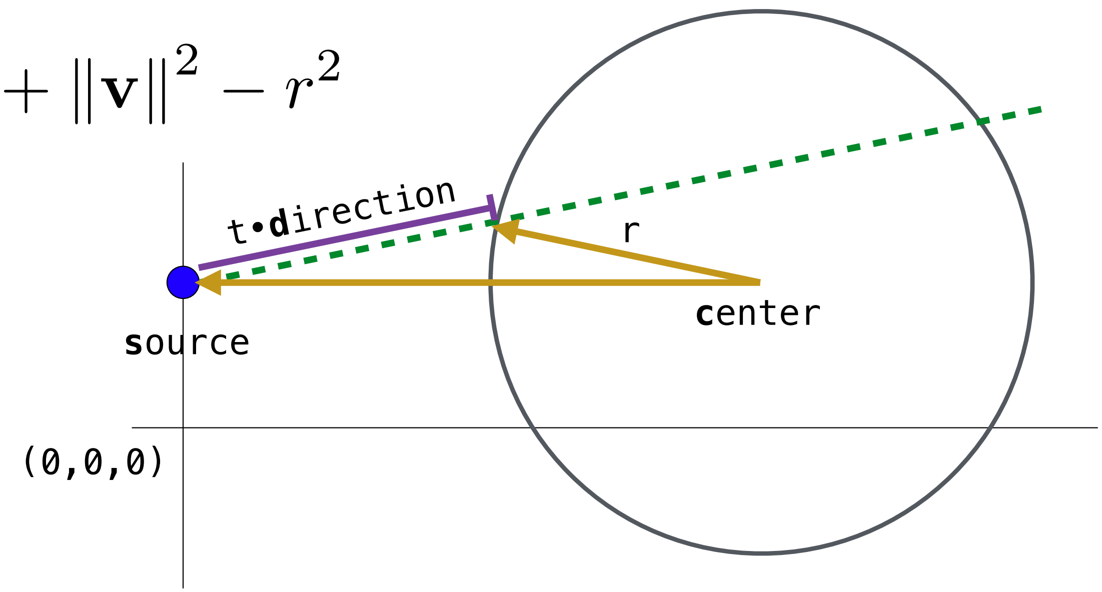


Distance from a Source to a Sphere

$$r^2 = \|\boxed{\mathbf{s} - \mathbf{c}} + t\mathbf{d}\|^2$$

$$0 = \|t\mathbf{d} + \boxed{\mathbf{v}}\|^2 - r^2$$

$$0 = t^2\|\mathbf{d}\|^2 + 2t(\underbrace{\mathbf{v}\cdot\mathbf{d}}_{\mathbf{b}}) + \|\mathbf{v}\|^2 - r^2$$

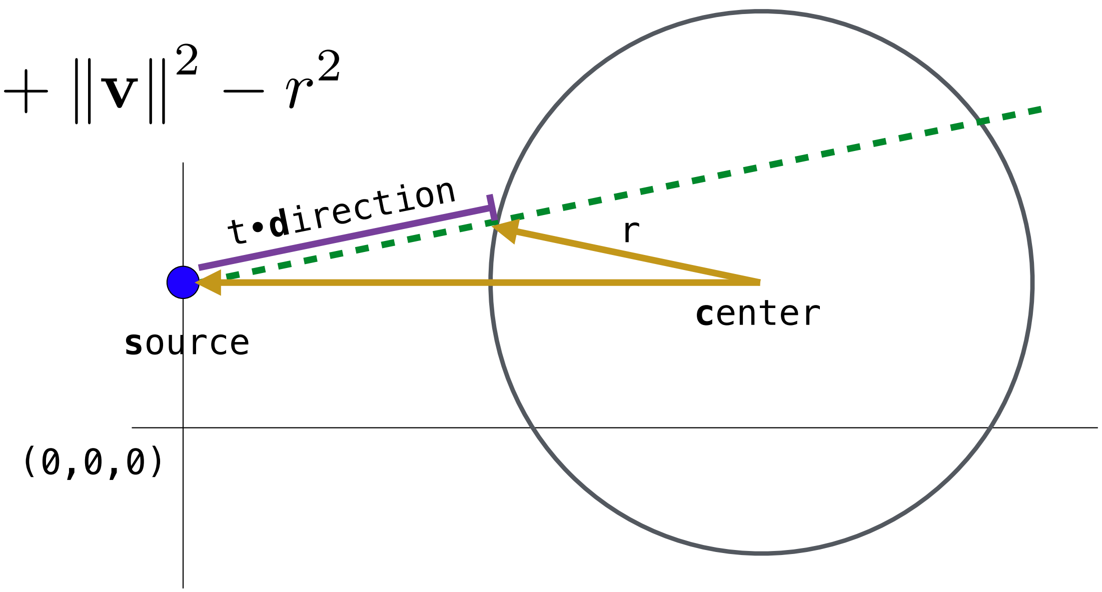


Distance from a Source to a Sphere

$$r^2 = \|\boxed{\mathbf{s} - \mathbf{c}} + t\mathbf{d}\|^2$$

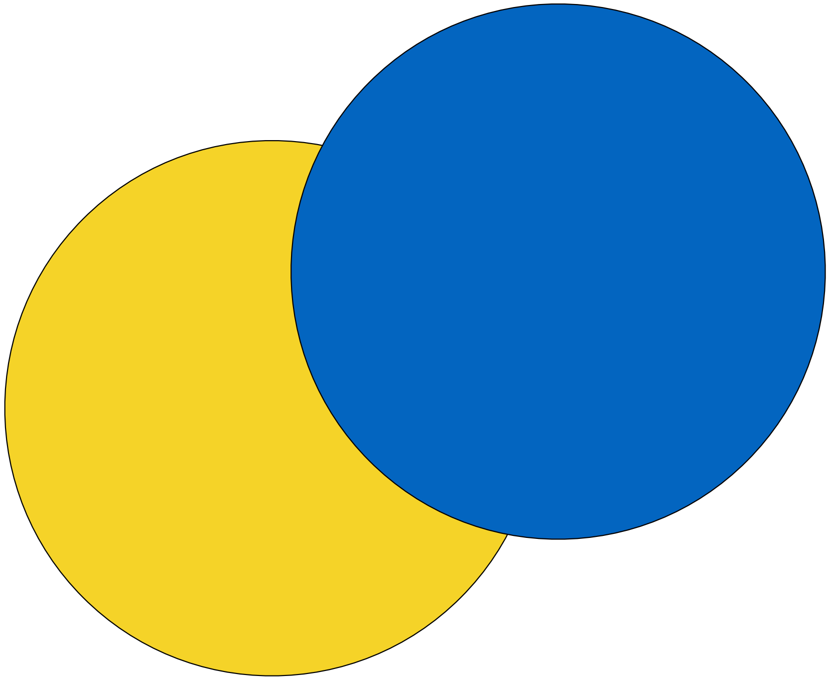
$$0 = \|t\mathbf{d} + \boxed{\mathbf{v}}\|^2 - r^2$$

$$0 = t^2\,\|\mathbf{d}\|^2 + 2t(\underbrace{\boxed{\mathbf{v} \cdot \mathbf{d}}}_{\mathbf{b}}) + \|\mathbf{v}\|^2 - r^2$$

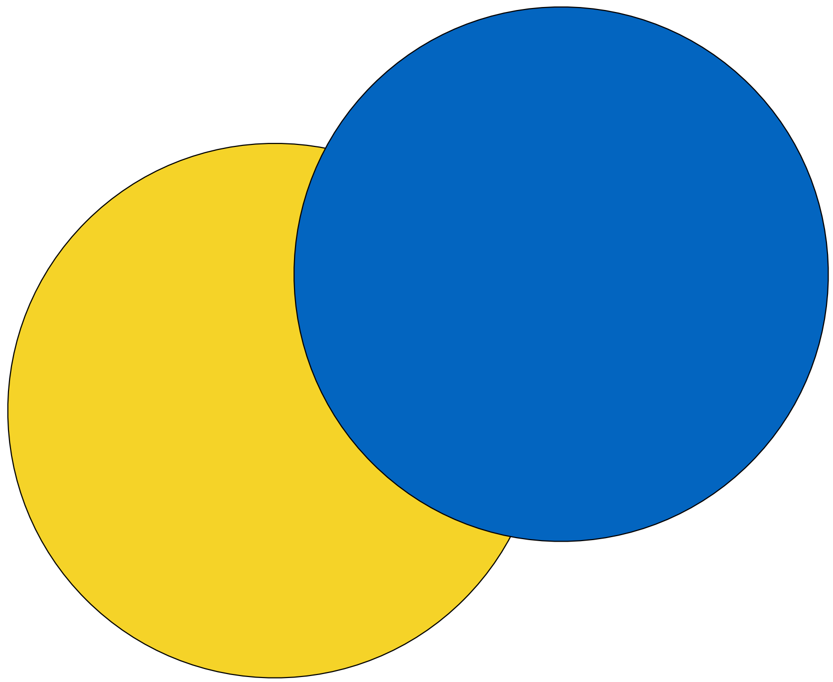


(Demo)

Multiple Spheres

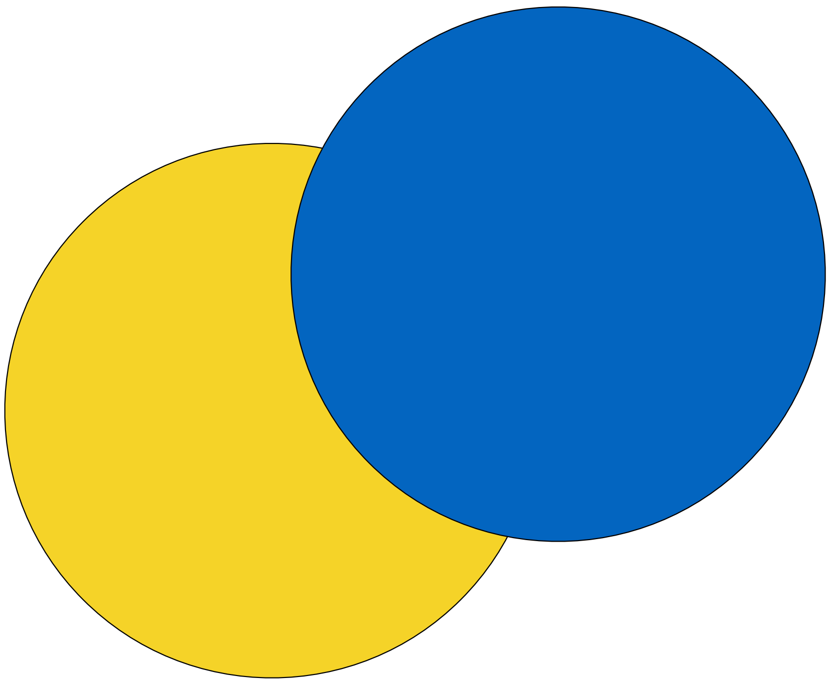


Multiple Spheres



```
Compute distance to each sphere
```

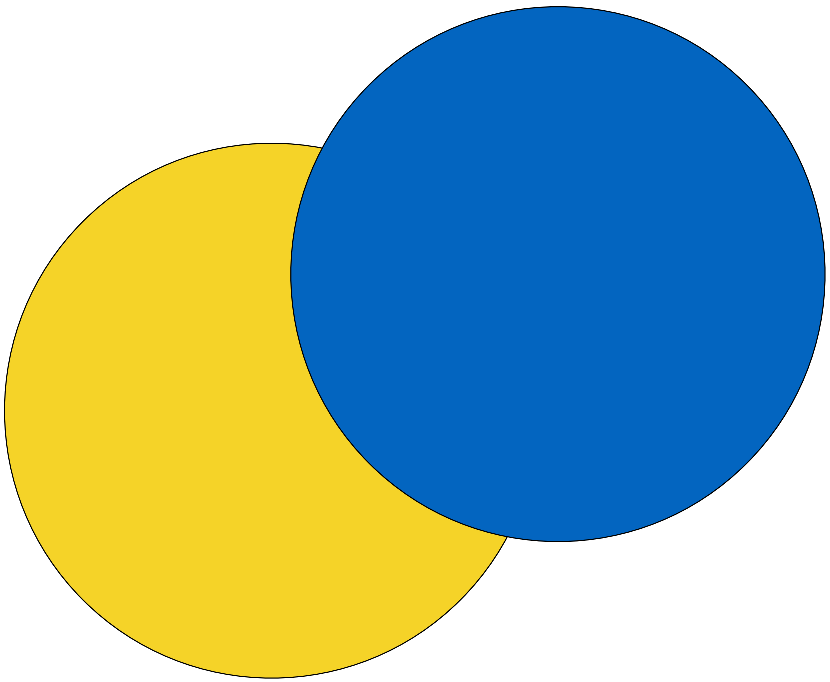
Multiple Spheres



Compute distance to each sphere

Pixel color from the closest sphere

Multiple Spheres



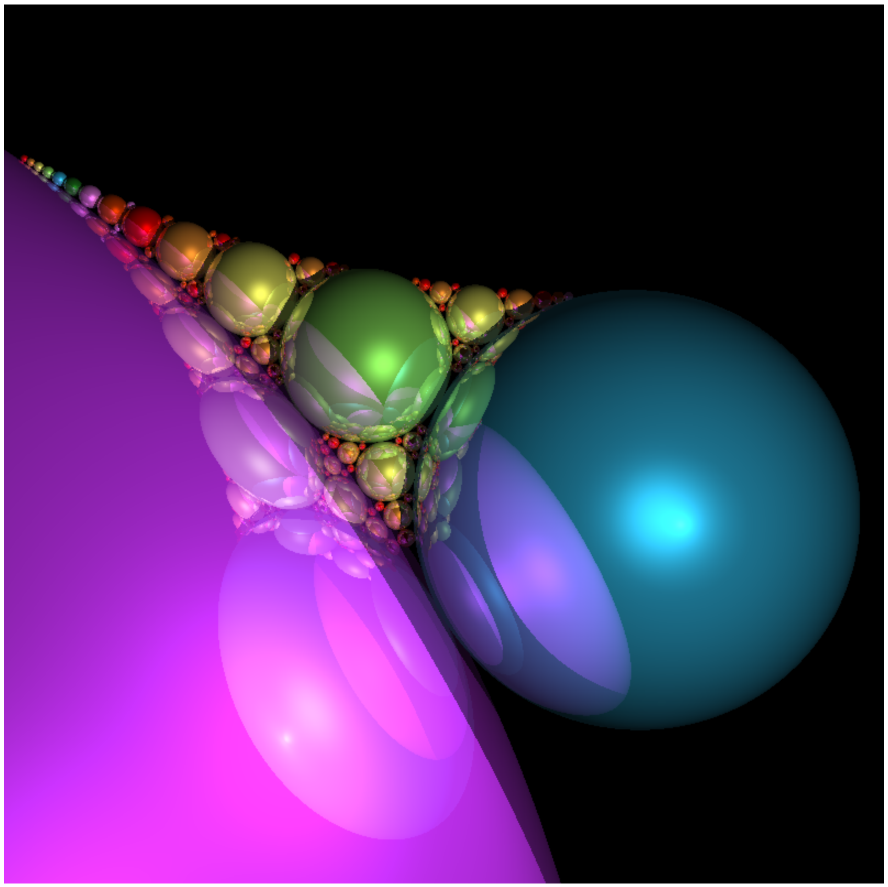
Compute distance to each sphere

Pixel color from the closest sphere

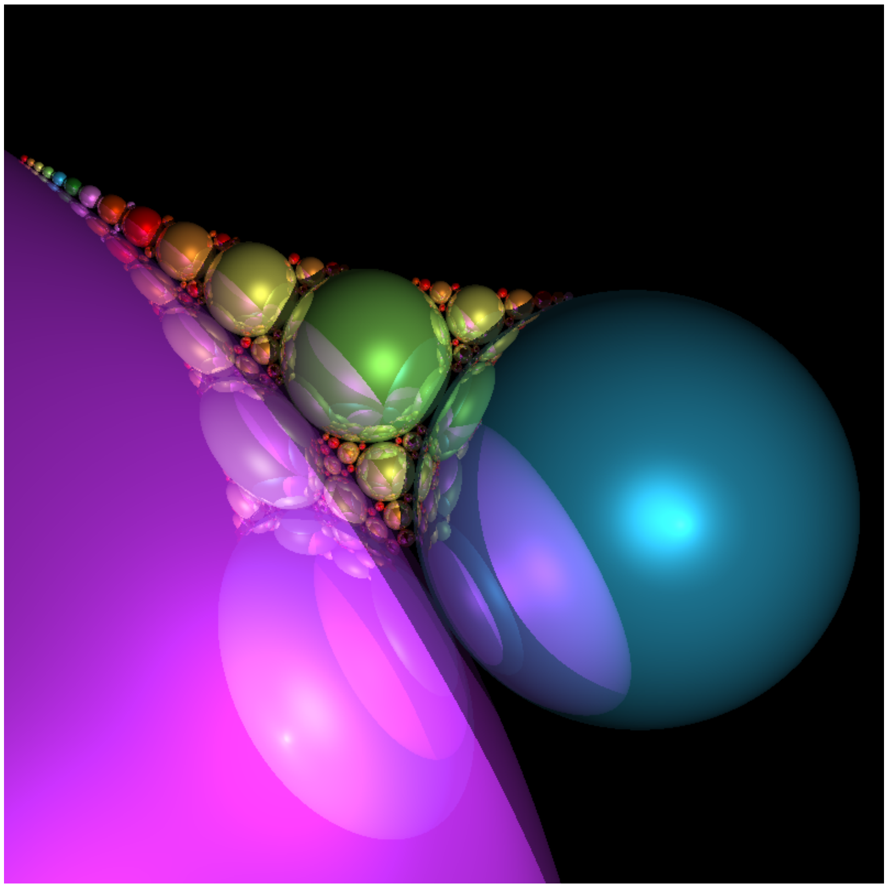
(Demo)

Reflections

Reflections

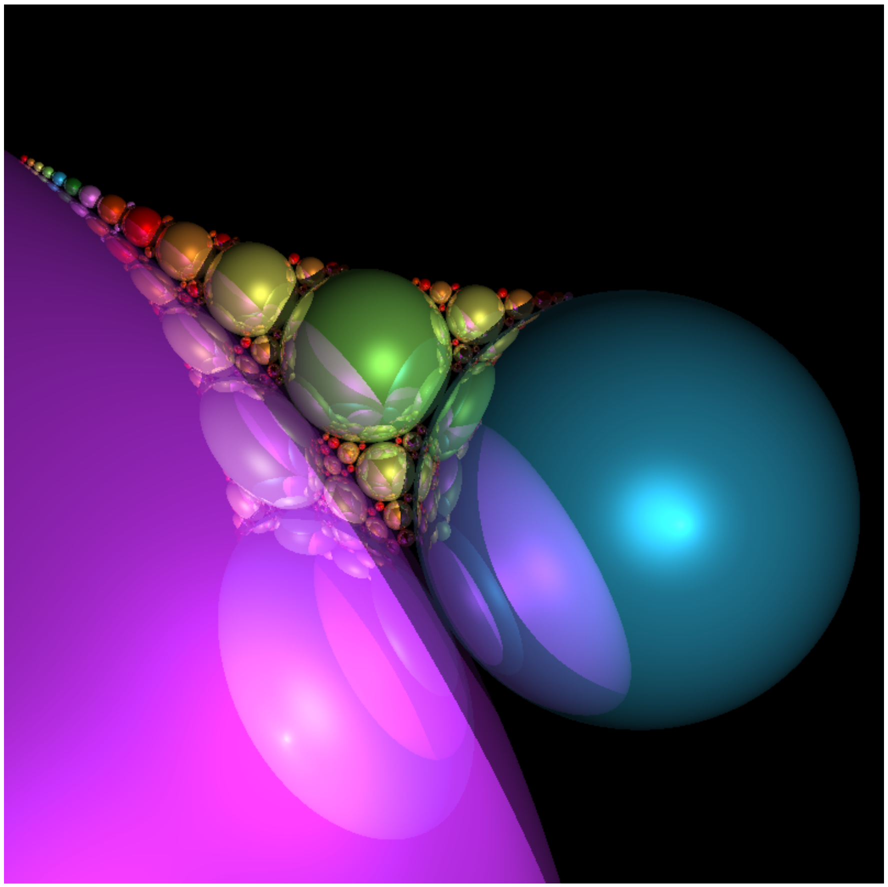


Reflections



Color is a mixture of the sphere & reflection

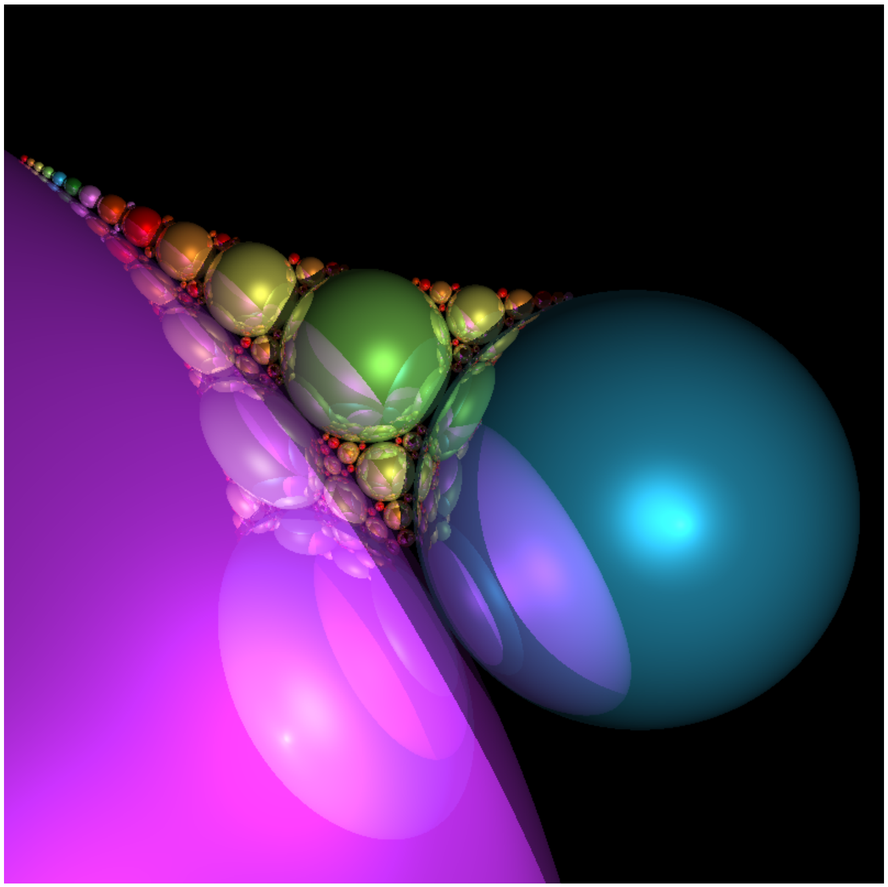
Reflections



Color is a mixture of the sphere & reflection

The **source** of a reflection is the surface of the sphere, instead of the original camera

Reflections



Color is a mixture of the sphere & reflection

The **source** of a reflection is the surface of the sphere, instead of the original camera

(Demo)