

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

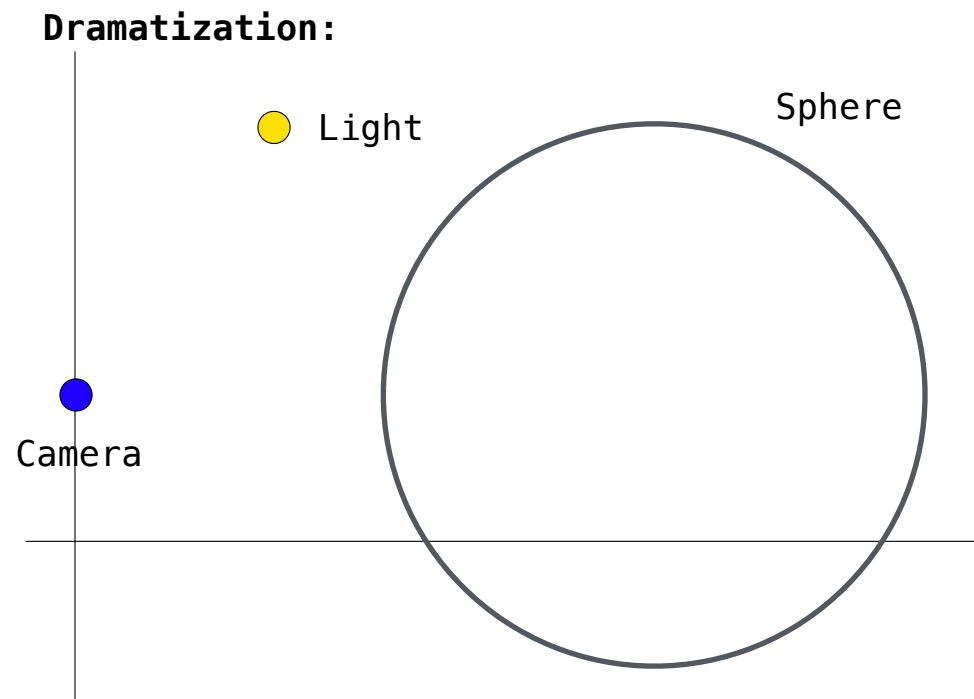
Ray Tracing

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

Dramatization:

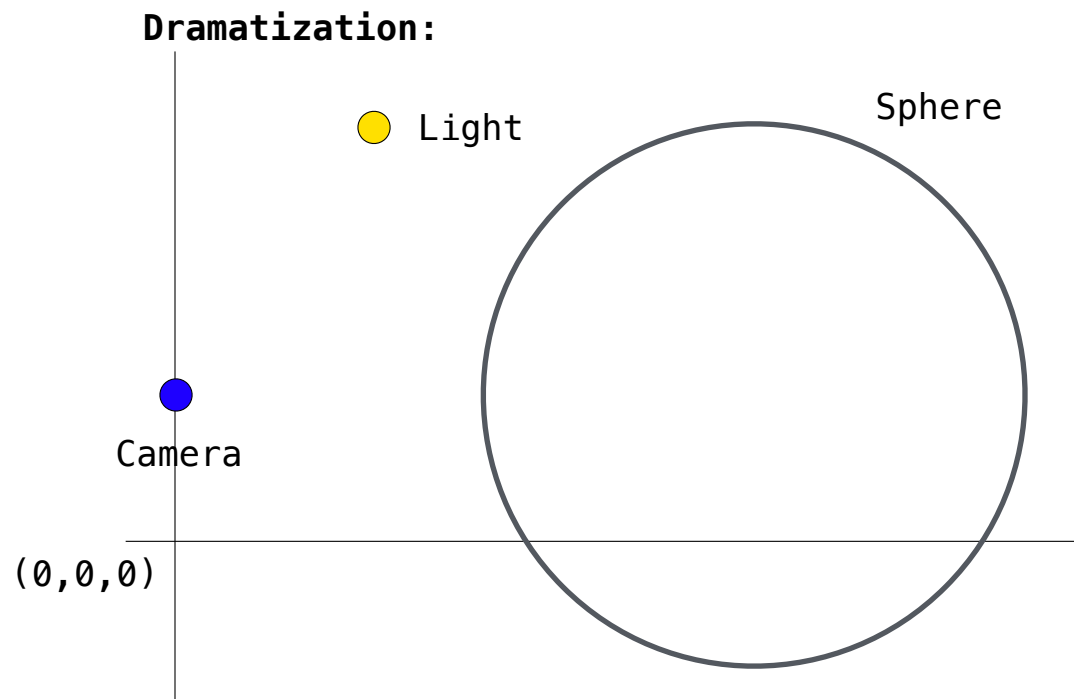
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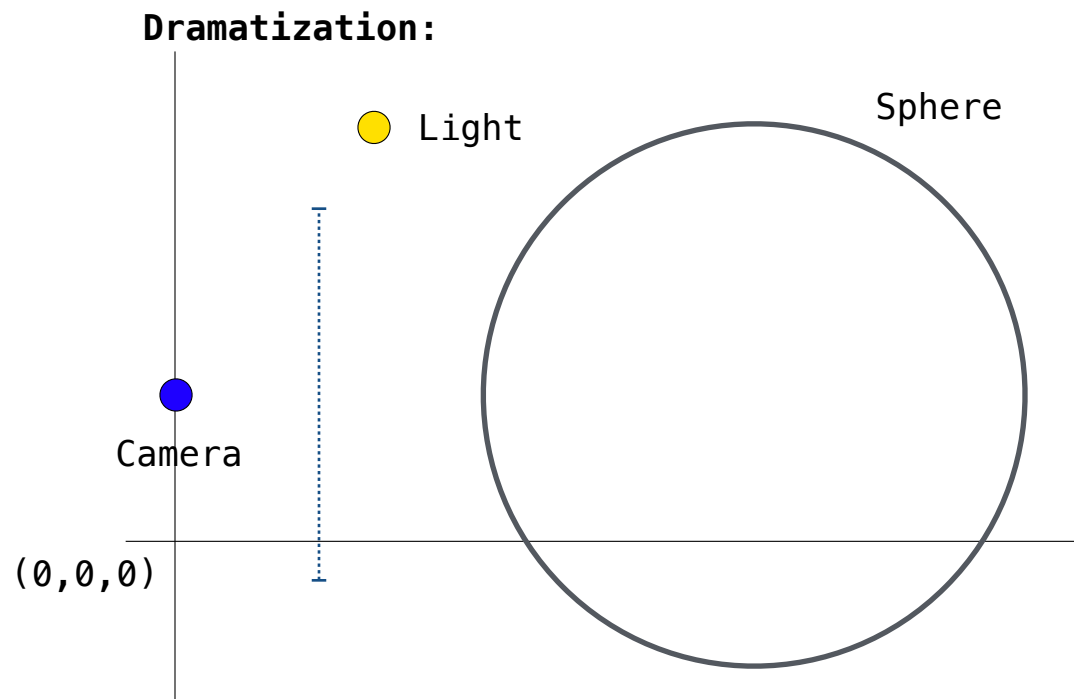
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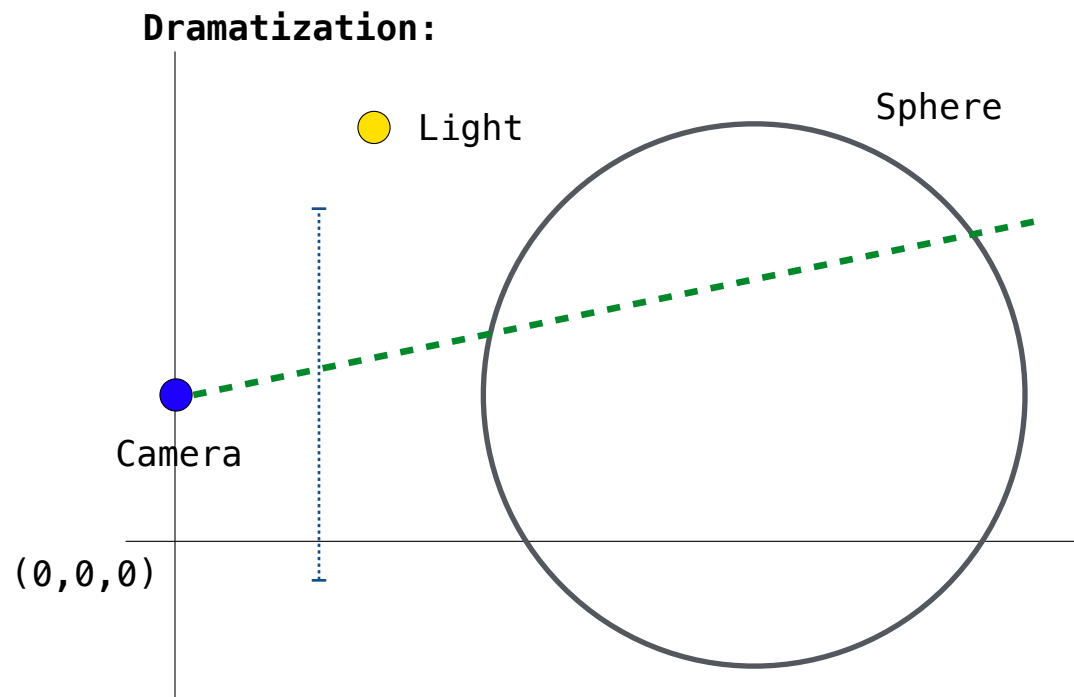
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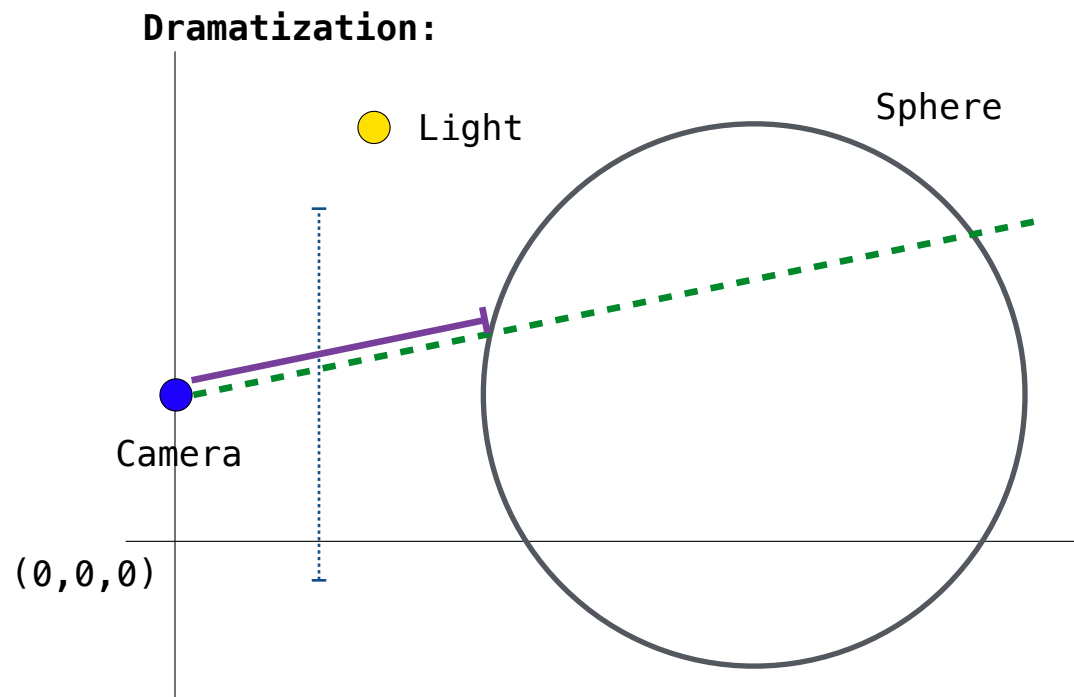
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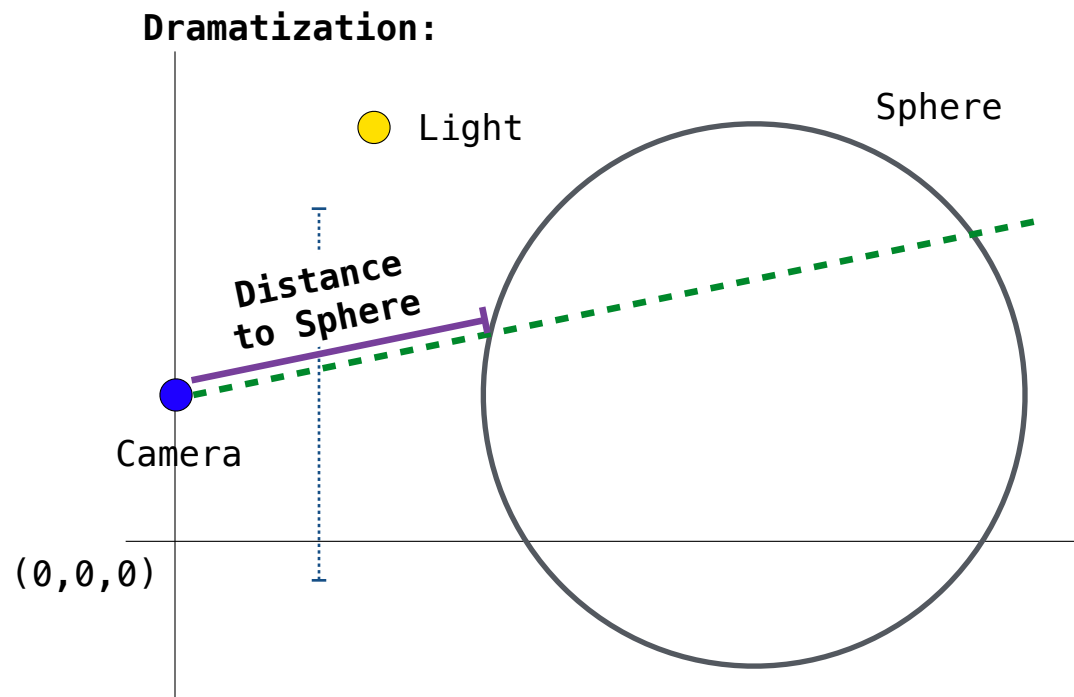
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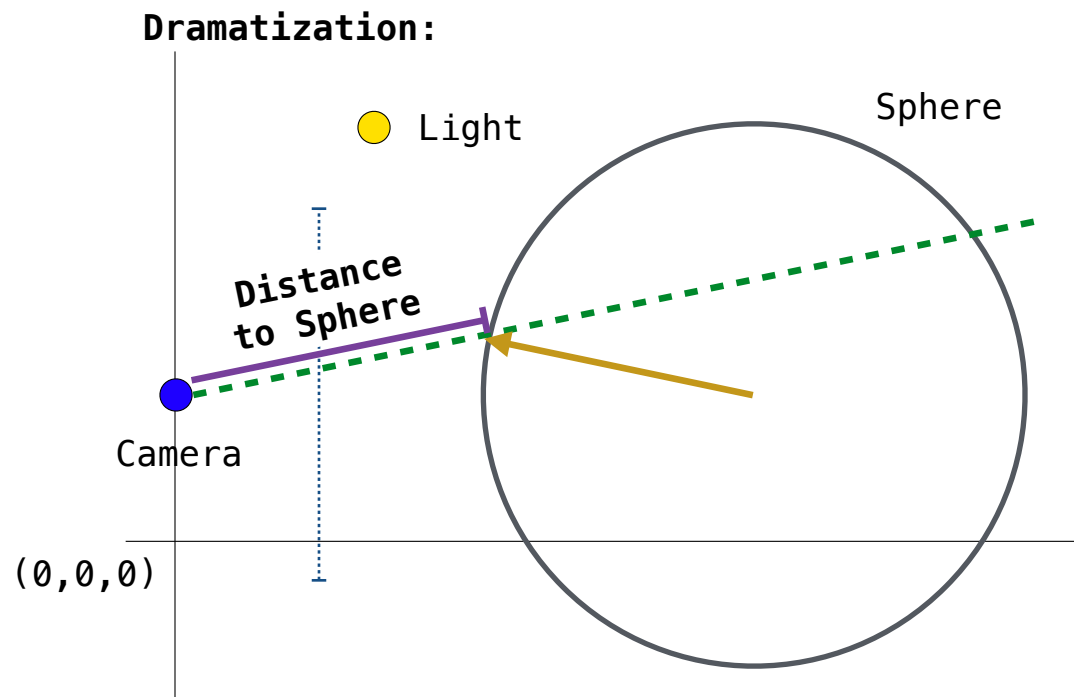
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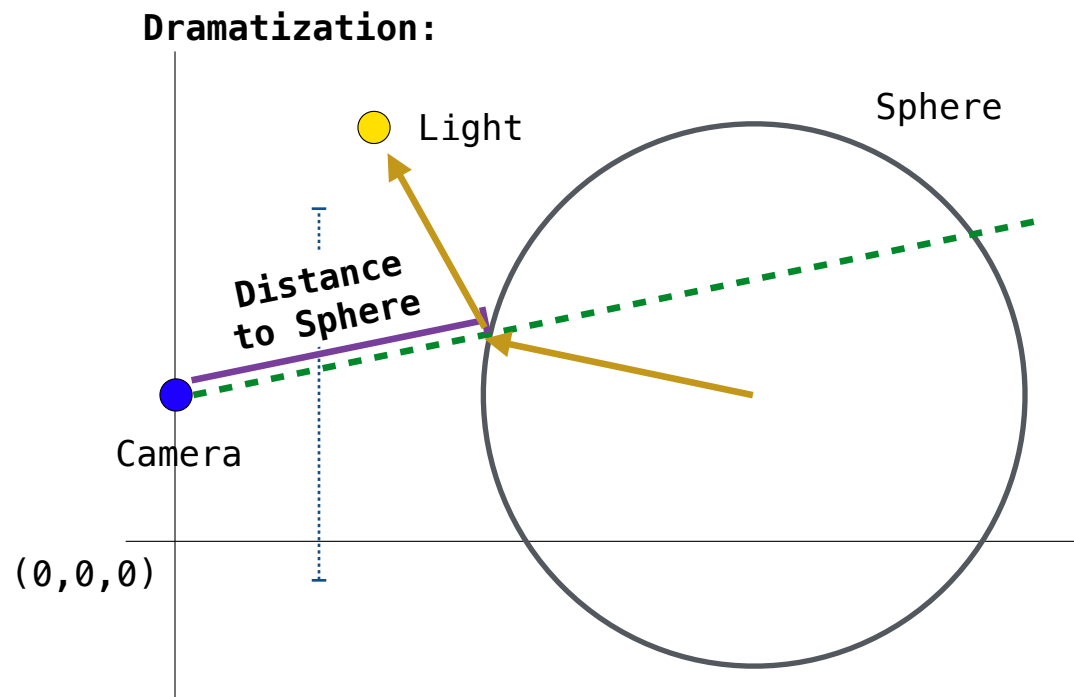
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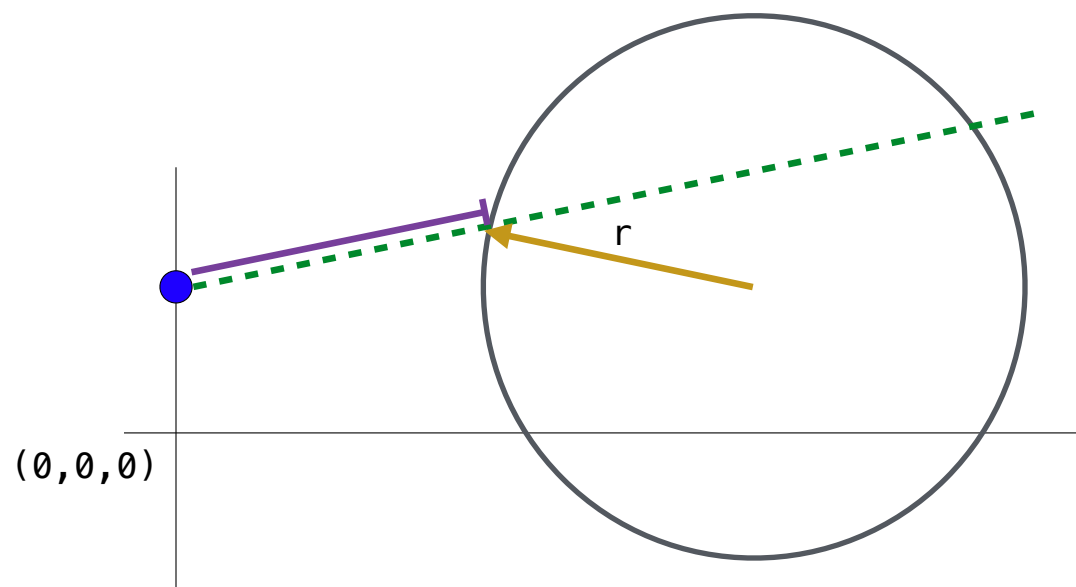


Ray Tracing

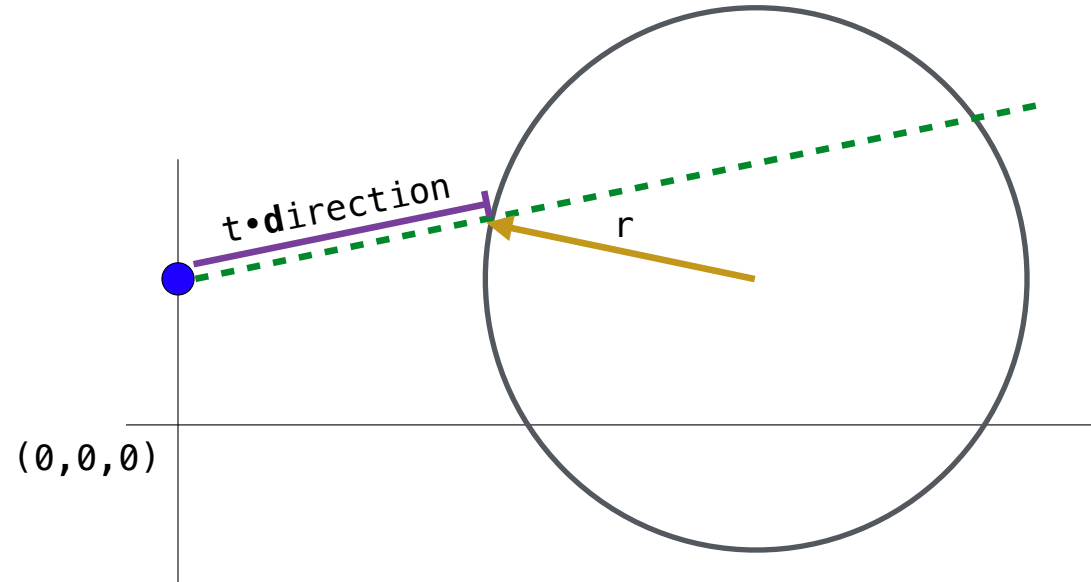
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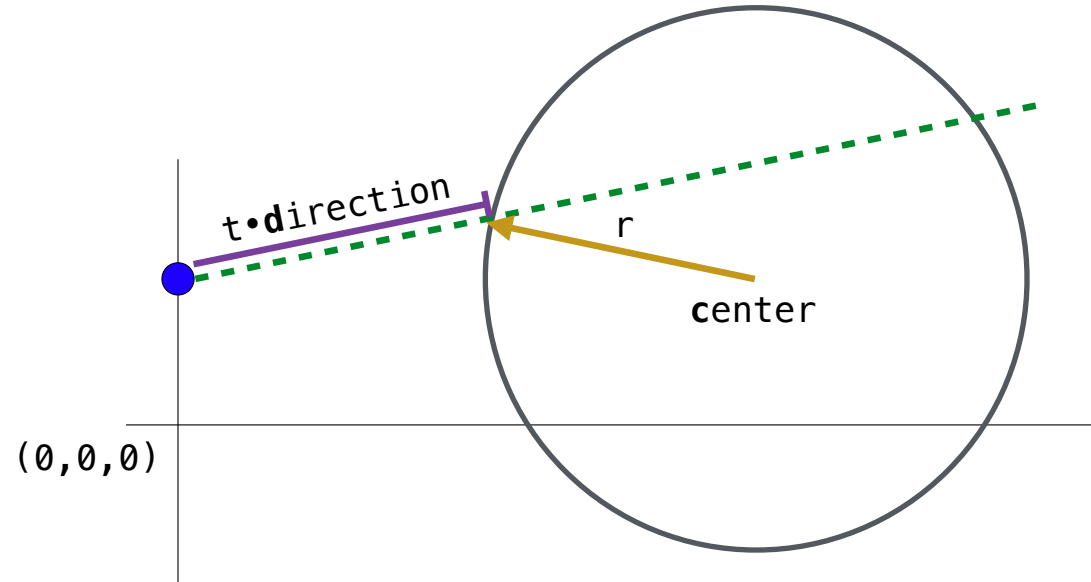
Distance from a Source to a Sphere



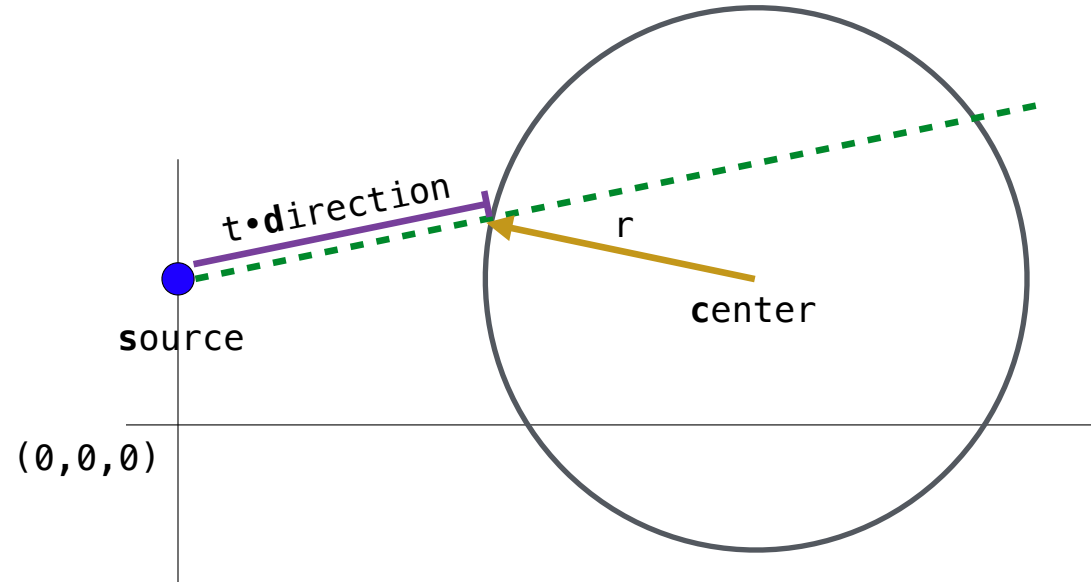
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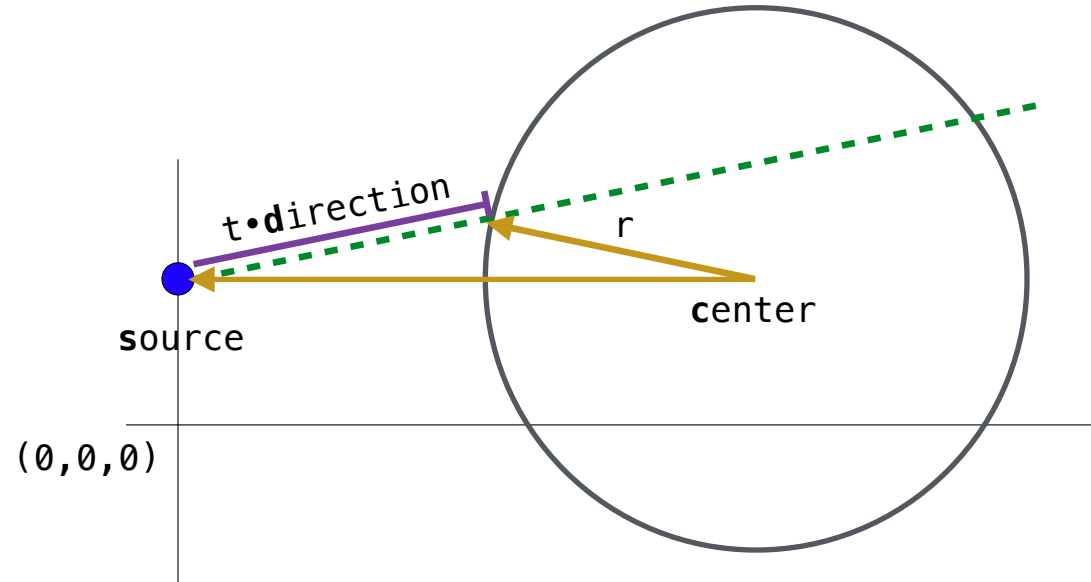
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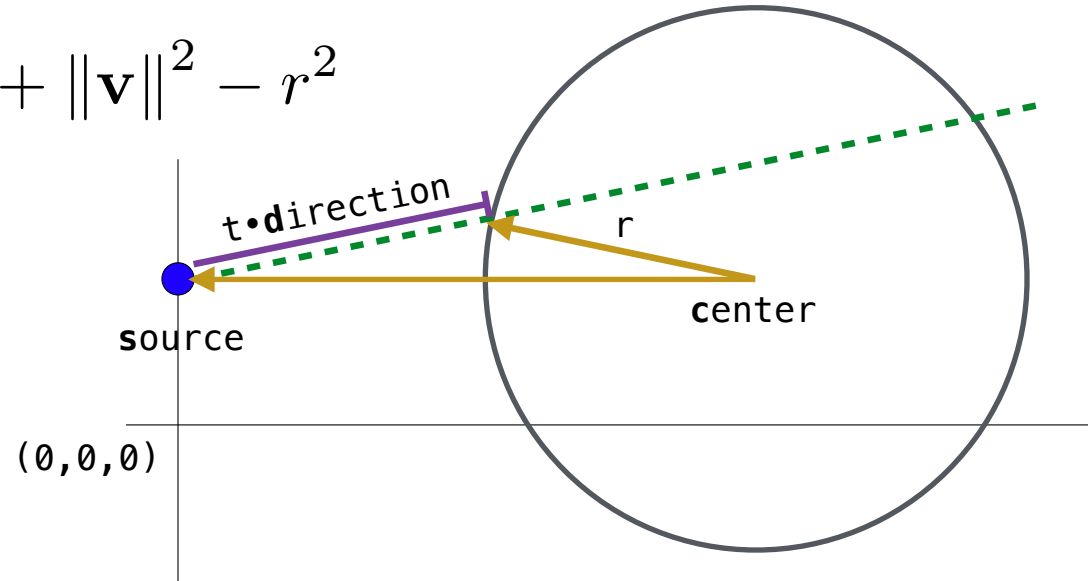


Distance from a Source to a Sphere

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

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

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

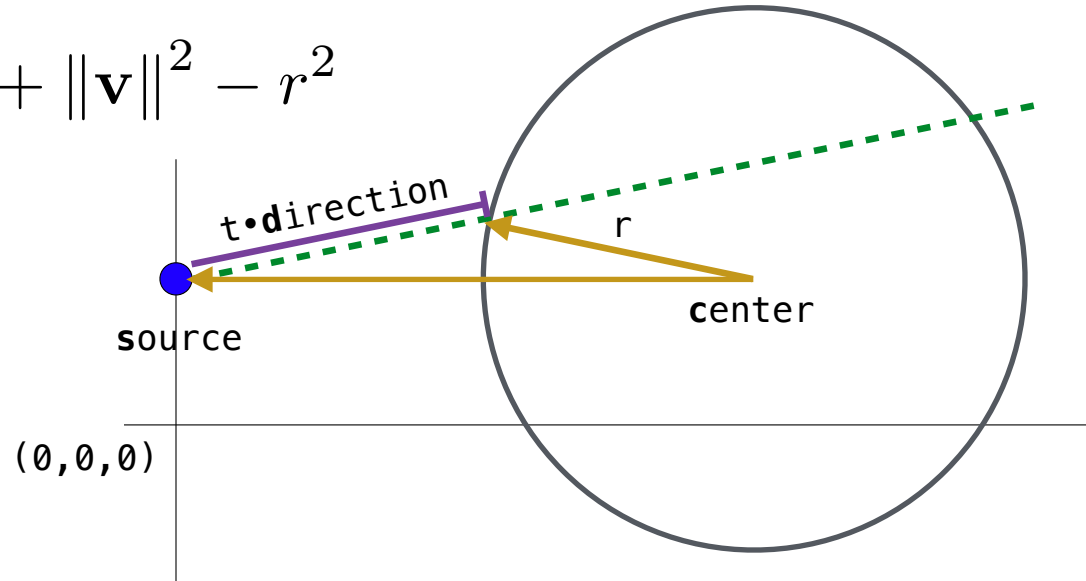


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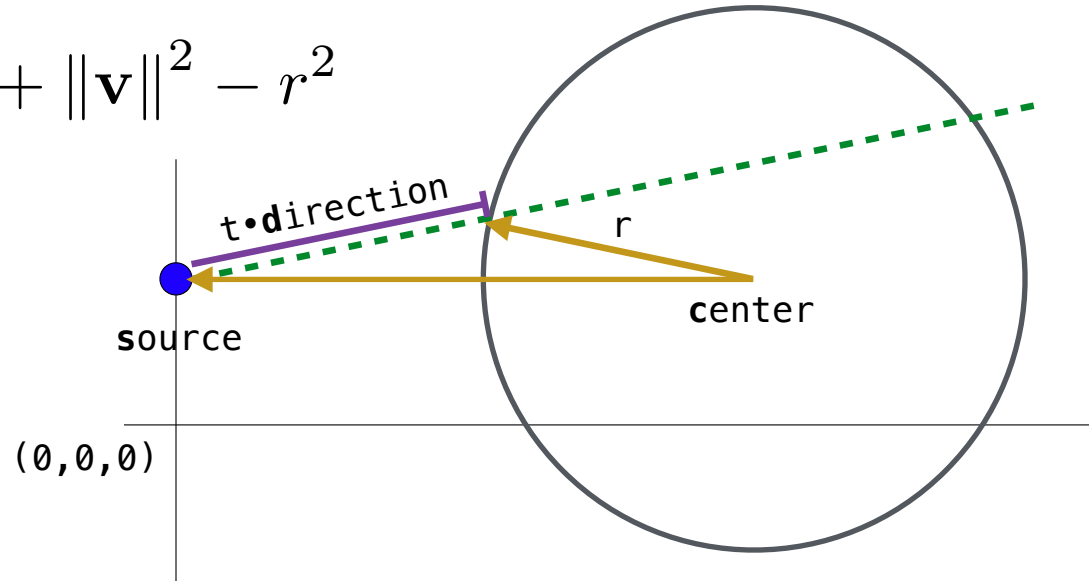
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b



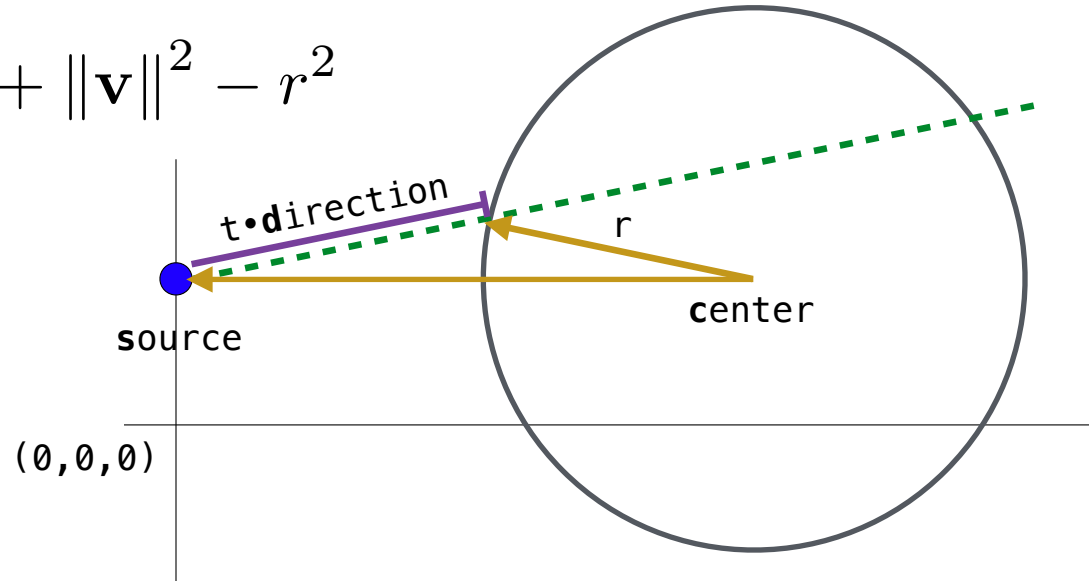
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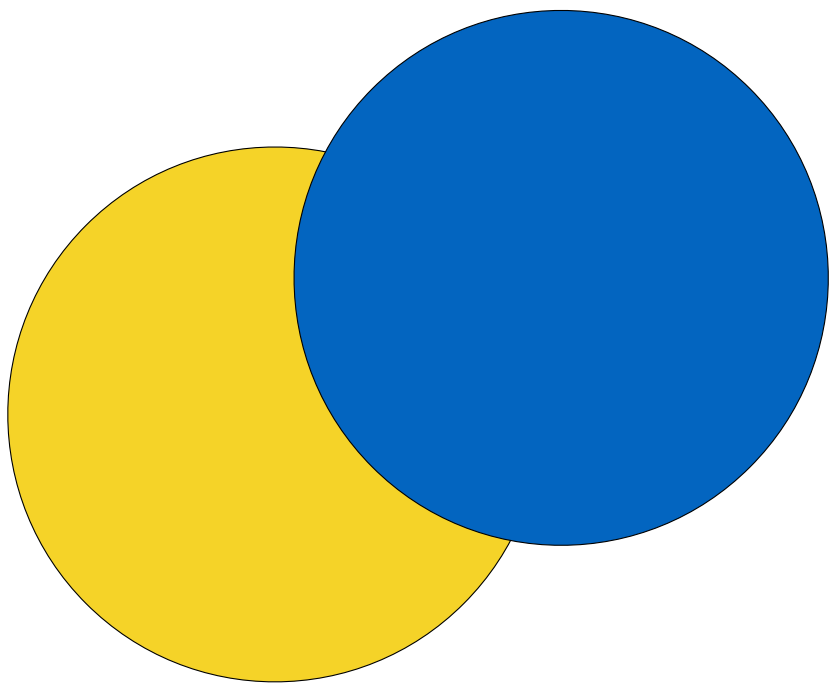
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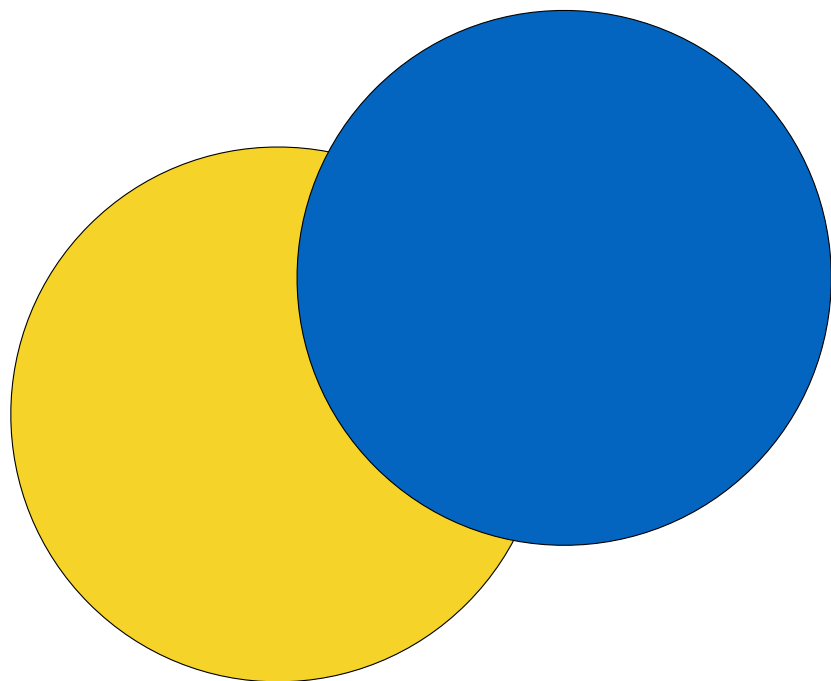


(Demo)

Multiple Spheres

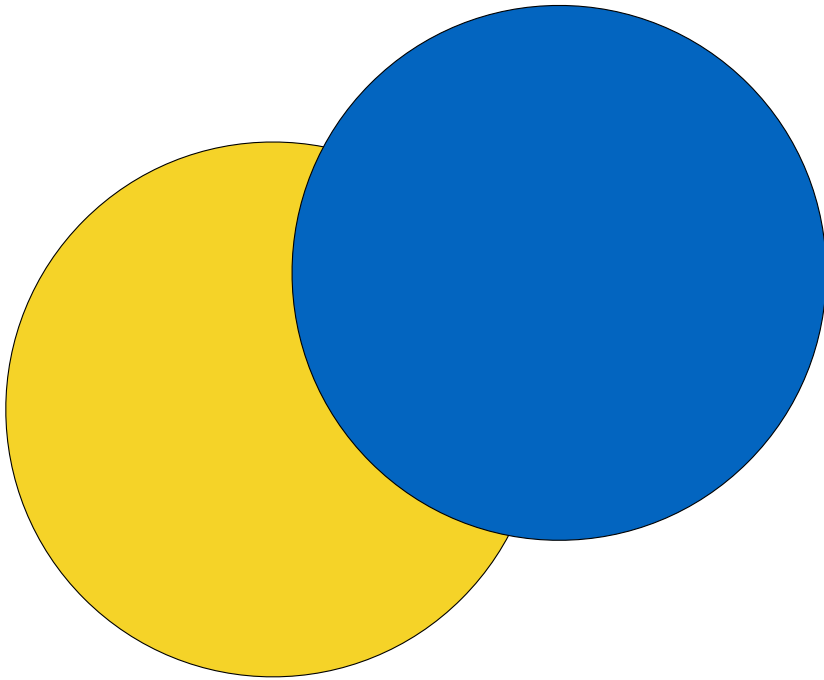


Multiple Spheres



Compute distance to each sphere

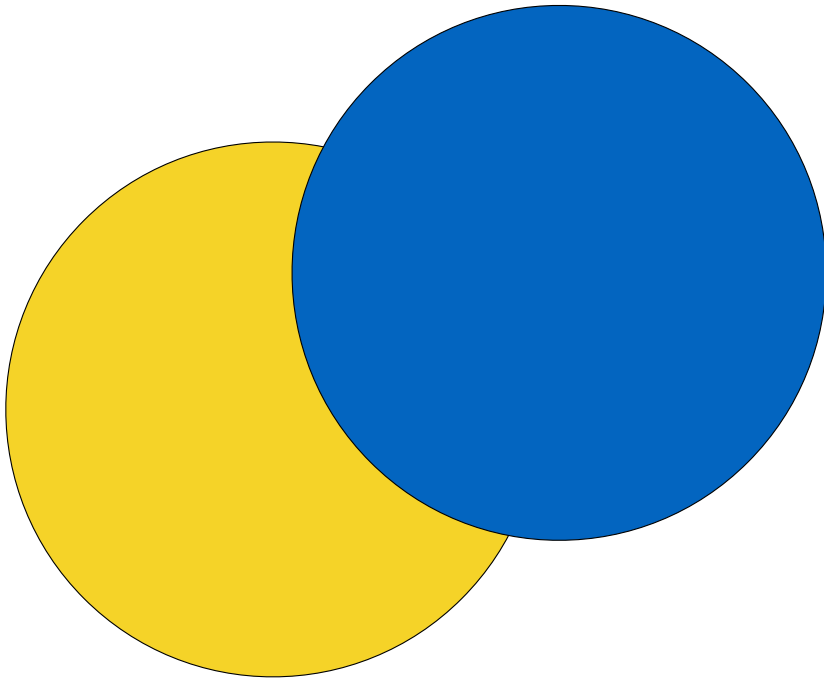
Multiple Spheres



Compute distance to each sphere

Pixel color from the closest sphere

Multiple Spheres



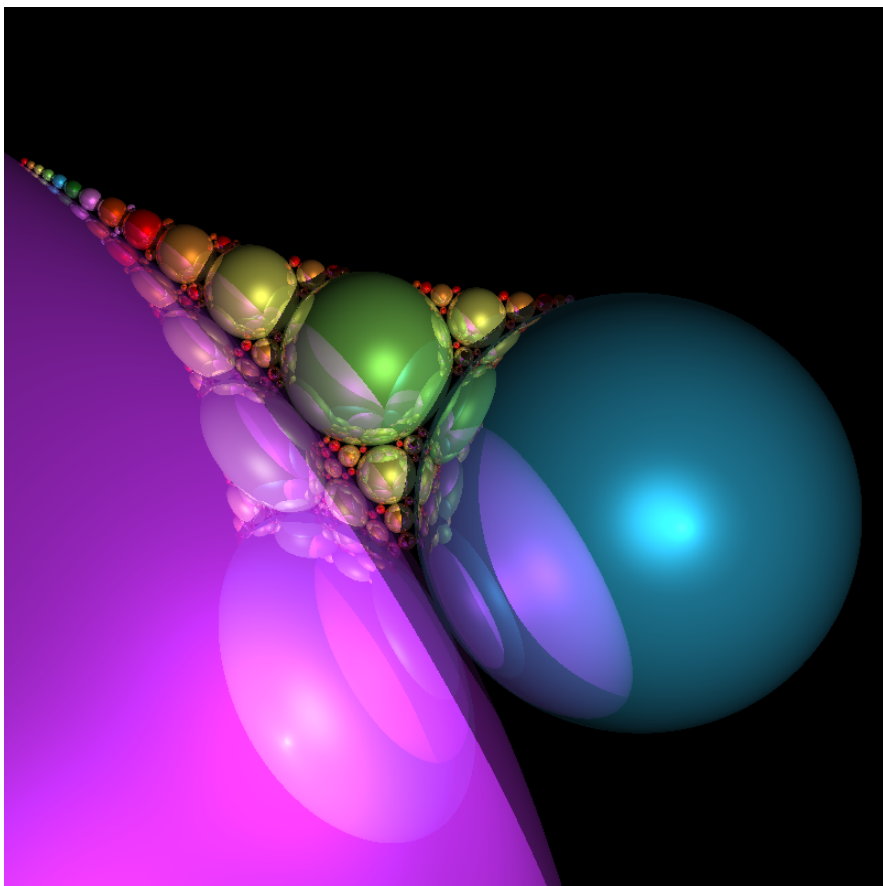
Compute distance to each sphere

Pixel color from the closest sphere

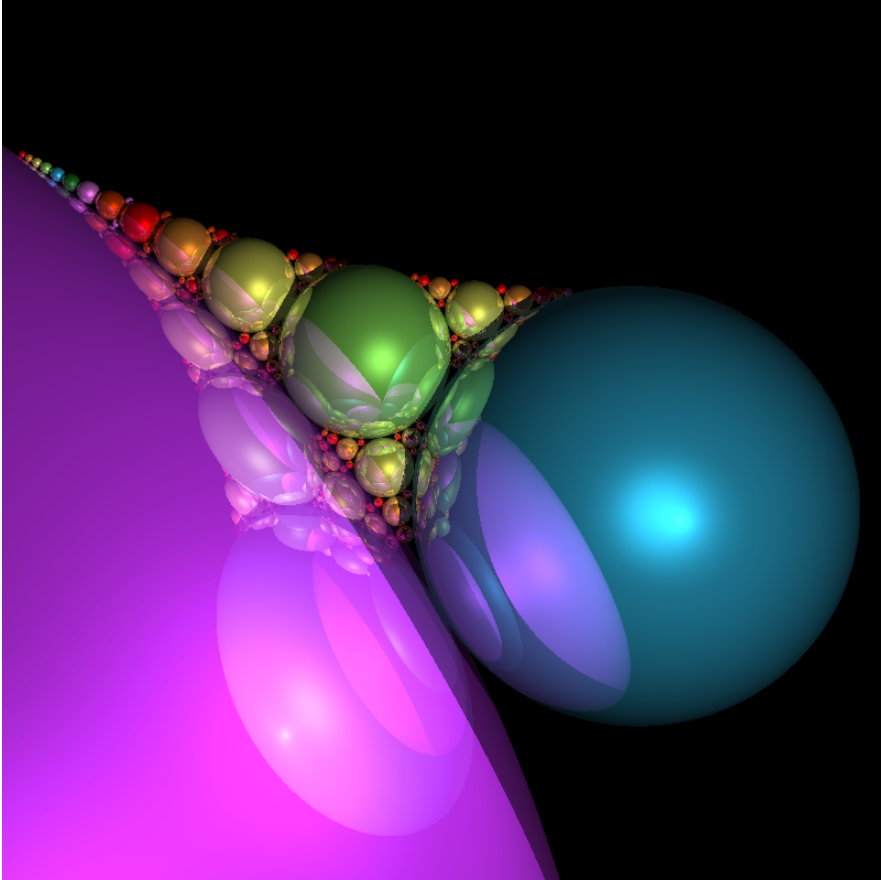
(Demo)

Reflections

Reflections

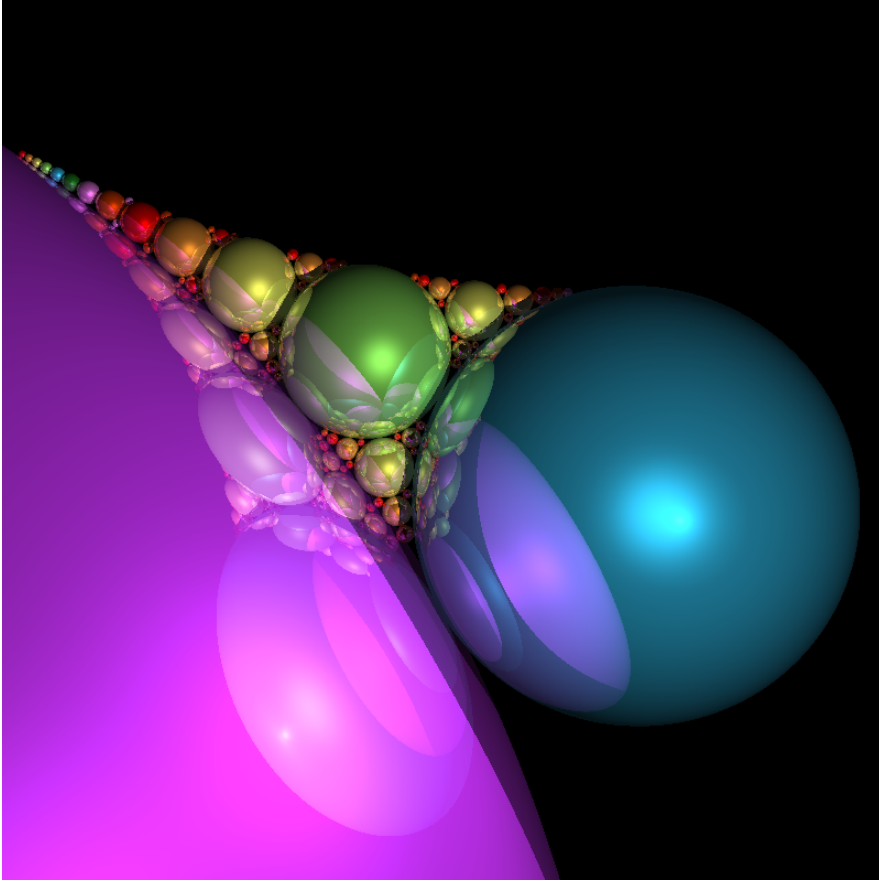


Reflections



Color is a mixture of the sphere & reflection

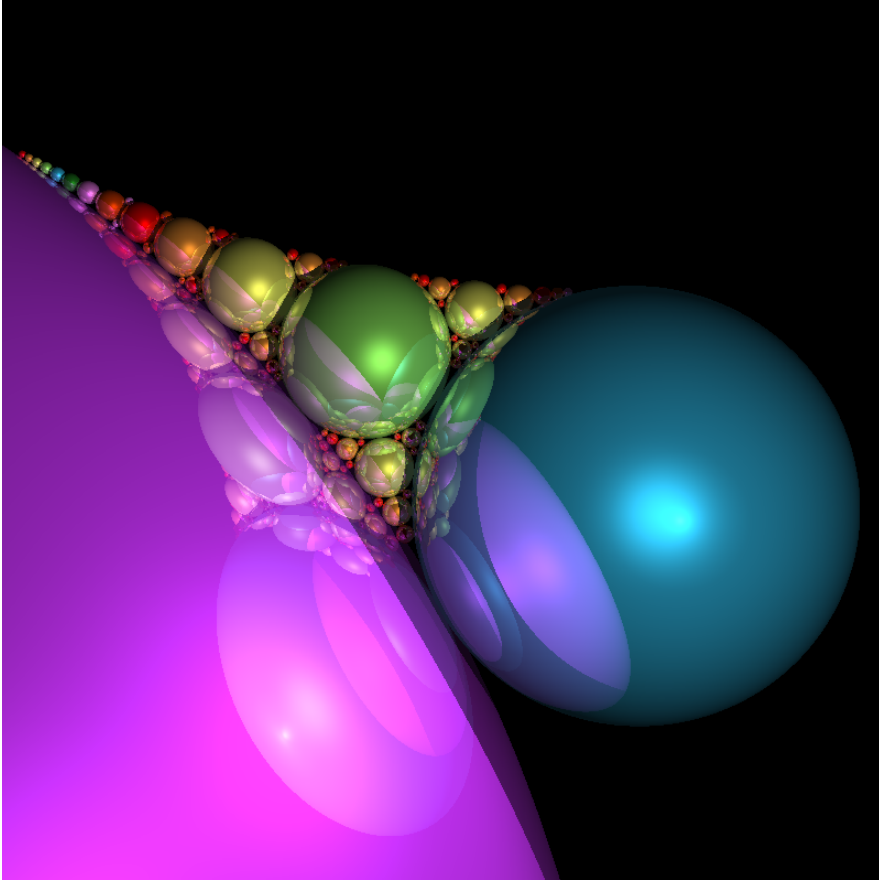
Reflections



Color is a mixture of the sphere & reflection

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

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