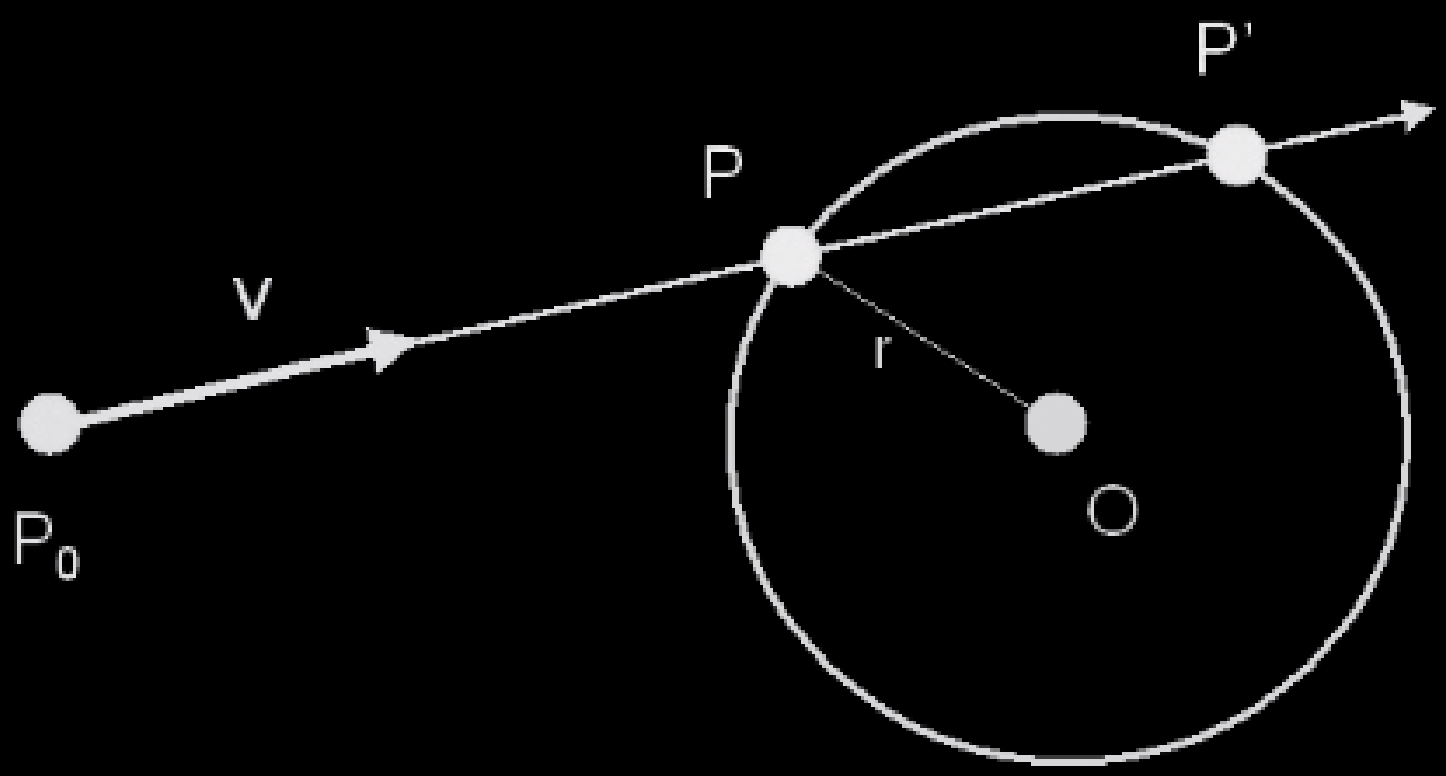
Oriol Manzano
@oriolmanzano.com

How to perform ray sphere intersection?



Oriol Manzano
@oriolmanzano.com

1-Define the Sphere: A sphere is defined by its center C and radius r.

Oriol Manzano
@oriolmanzano.com

2-Define the Ray: Like before, a ray is defined by its origin O and direction D, where D should be normalized.

Oriol Manzano
@oriolmanzano.com

3-Compute Intersection: The idea is to solve a quadratic equation derived from the geometric problem. The equation takes the form

$$At^2 + Bt + C = 0,$$

where:

- $A = D \cdot D$
- $B = 2D \cdot (O - C)$
- $C = (O - C) \cdot (O - C) - r^2$

Oriol Manzano
@oriolmanzano.com

4-Solve the Quadratic Equation: The solutions of the quadratic equation, if they exist, give the distances along the ray at which intersections occur. These are found using:

- **discriminant=** $B^2 - 4AC$
- **If the discriminant is negative, there's no intersection.**
- **If it's zero or positive, calculate t using**

$$(-B \pm \sqrt{discriminant}) / (2A)$$


Oriol Manzano
@oriolmanzano.com

5- Calculate Intersection Points: If intersections exist, use the smallest positive t to calculate the intersection point using

$$P = O + tD.$$