Collision Detection Lab

Sphere To sphere Collision

1) Given two spheres S1 : $(x+3)^2 + (y-5)^2 + (z+4)^2 = 1$ and S2: $(x+1)^2 + (y-2)^2 + (z-2)^2 = 4$

a) Find the components , C1 , of the center of the sphere S1.

b) Find the components , C2 , of the center of the sphere S2.

c) Calculate the distance ||C1C2|| between the two centers.

d) Verify the possibility of a collision by computation

2) Given two spheres : $(x-1)^2 + (y-2)^2 + (z-3)^2 = 4$ and S2: $(x-5)^2 + (y-5)^2 + (z-3)^2 = 1$

a) Find the components , C1 , of the center of the sphere S1.

b) Find the components , C2 , of the center of the sphere S2.

c) Calculate the distance ||C1C2|| between the two centers.

d) Verify the possibility of a collision by computation.

Ray- Plane Collision

1) Verify the possibility of a collision by computation between the plane P: $x + 2y + z - 10 = 0$

and the ray L defined by $\begin{cases} x = 1 \\ y = 3 + t \\ z = 1 - t \end{cases}$

2) Verify the possibility of a collision by computation between the plane P: $-2x + 3y + z + 15 = 0$ and the ray L defined by $\begin{cases} x = 1 + 4t \\ y = 5 + 2t \\ z = 1 - 3t \end{cases}$

Sphere To Plane Collision

1) Verify the possibility of a collision by computation between the plane P: $\frac{2}{3}x - \frac{1}{3}y + \frac{2}{3}z + 1 = 0$

And the sphere S : $(x-1)^2 + (y-2)^2 + (z-3)^2 = 9$ where A(0, 3 ,0) is a reference point of plane P.
The sphere is moving at a constant velocity v(1,0,1) m/s .

*2) Verify the possibility of a collision by computation between the plane P: $\frac{\sqrt{3}}{3}x + \frac{\sqrt{3}}{3}y + \frac{\sqrt{3}}{3}z + 1 = 0$

With reference point A(0 , 0 , $-\sqrt{3}$) and the sphere S : $(x-1)^2 + (y+1)^2 + z^2 = 1$ moving at a constant velocity v(-2,0,1) m/s .

Ray To sphere Collision

*1) Verify the possibility of a collision by computation between the ray L defined by $\begin{cases} x = 1 \\ y = 3 + t \\ z = 1 - t \end{cases}$

with the sphere S : $(x+1)^2 + (y-2)^2 + (z-3)^2 = 1$

2) Verify the possibility of a collision by computation between the segment L defined by $\begin{cases} x = 1 + 4t \\ y = 5 + 2t \\ z = 1 - 3t \end{cases}$

with the sphere S : $(x-1)^2 + (y+1)^2 + z^2 = 9$