

CS230

Game Implementation Techniques

Lecture 7

A series of horizontal lines in teal and white, located on the right side of the slide, extending from the edge of the title area.

Overview

- Static Collision
 - Point/Circle
 - Circle/Circle
 - Point/Rectangle
 - Rectangle/Rectangle

Static Collision - Point/Circle

- Can be used for small objects, or objects' corners
- Compare the “Point to Center” distance to the radius
- Broken down to 3 cases:
 - $|CP| < R$: The point is inside the circle -> Collision
 - $|CP| > R$: The point is outside the circle -> No collision
 - $|CP| = R$: The point lies on the perimeter of the circle. It can be considered as either colliding or non-colliding, but be **consistent**.

Static Collision - Circle/Circle (1/2)

- Multiple “mathematical” cases
- In games, it’s enough to compare the centers’ distance to the sum of the radii
 - Point centerA, centerB
float radiusA, radiusB

RadiusSum = radiusA + radiusB

CentersDistance = Length(centerA, centerB)

if(CentersDistance <= RadiusSum)

Collision

else

No Collision

Static Collision - Circle/Circle (2/2)

- “Length” can be avoided
 - Square root operations are expensive
- Solution: Square both sides
 - Point centerA, centerB
float radiusA, radiusB

$\text{RadiusSumSq} = (\text{radiusA} + \text{radiusB})^2$

$\text{CentersDistanceSq} = \text{LengthSquared}(\text{centerA}, \text{centerB})$

if($\text{CentersDistanceSq} \leq \text{RadiusSumSq}$)

Collision

else

No Collision

Static Collision - Point/Rectangle

- Rectangle is defined as:
 - Top, Bottom, Left & Right
- Point defined as:
 - P.X, P.Y
- Algorithm:
 - Point P;
float left, right, top, bottom;

if(P.X < left) then no collision
if(P.X > right) then no collision
if(P.Y < bottom) then no collision
if(P.Y > top) then no collision

Collision!

Static Collision - Rectangle/Rectangle (1/2)

- Collision bounding rectangles A and B
- Algorithm:
 - float leftA, leftB
float rightA, rightB
float topA, topB
float bottomA, bottomB
 - if(leftA > rightB) then no collision
if(leftB > rightA) then no collision
if(topA < bottomB) then no collision
if(topB < bottomA) then no collision

Collision!

Static Collision - Rectangle/Rectangle (2/2)

