

# CGS 3032 Interactive Modeling and Animation I

February 14, 2007

## Outline

- Review
  - More on the elastic collision
    - Equations and calculation
    - Multiple examples
- Today
  - Multiple Objects Motion Animation
  - Collision detection
    - *posteriori* methods
    - *priori* methods

## Multiple Objects Motion Animation

- Calculate following
  - Trajectories
  - Precise motion
  - Resting places of all objects
  - Precise impacts between objects (collision)
- Special for animation
  - Real time computation
    - Compromises allowed

## Collision Detection

- What is collision detection
  - Algorithms checking for collision
- When to use
  - Physical simulations
  - Video games
  - Computational geometry
- How to detect collision
  - *posteriori* methods
  - *priori* methods

## *posteriori* methods

- How
  - Simulation is done by a small time step
  - Each time, check if any objects are intersecting
- Pros
  - No time variable involved
  - No need to be aware of the physical variables such as friction, elastic collisions, etc
- Cons
  - Need to correct when objects intersect each other

## Algorithm for *posteriori* methods

- In the *draw* function
  - Update the new location for each object
  - For each pair of objects in scene
    - Check whether objects are intersecting
      - Adjust the location of these objects if so
  - Draw the scene
- Note
  - Should set frame rate large enough

## Some Examples

- For collision between balls
  - Collision happens when

$$\text{dist}(c_1, c_2) \leq r_1 + r_2$$

- For collision between rectangle shapes
  - Collision happens when one corner is inside of the other object
- [Example](#)

## For Arbitrary Shapes

- Speedup for detecting collision between irregular shapes
  - Use bounding box
- When bounding boxes intersect
  - Precise calculation
  - Approximation
    - Approximate each object as a series of line segments
  - Example
    - <http://www.kevindev.com/blog/?p=15>