Artificial Intelligence
The Plan

- Goals of artificial intelligence in gaming
- Tools of AI for gaming
- Case Studies
- Sample Source Code
Goals of AI in Gaming

- Add complexity
- Add challenge
- Add realistic behavior
- Reduce monotony
Tools of AI for Gaming

- Probability
- Statistics
- Searching
- Heuristics
- Optimization
Case Studies

- Catching falling objects
  - Where do you drop the next object?
  - How frequently/quickly do the objects drop?
- Enemy shooting
  - At what angle does the enemy shoot?
  - When does the enemy shoot?
- Game levels
  - When should the game get harder?
  - Should the game get easier? How?
Source Code

In Beat The Bugs!, enemies shoot randomly:

```java
public void setAutoFire(boolean auto)
{
    if(auto && shipSprite.isEnabled())
    {
        double delay=random.nextGaussian()*fireInterval;
        delay=Math.max(delay, 0.001);
        GameLoop.scheduleRelative(this, delay);
    }
    else
    fireInterval=-1;
}
```
Possible Enhancements to Beat The Bugs!

Mixture of random and perfect strategy make for good game AI. Possible ways Beat The Bugs! could be extended include:

- Shoot in the general direction of the hero
- Shoot more often when close to the hero
- Avoid hero bullets
public void advanceTime(double time)
{
    Point2D.Double from=moving.getLocation();
    Point2D.Double to=toward.getLocation();
    nextLocation.x=to.x-from.x;
    nextLocation.y=to.y-from.y;
    double factor=speed*time/from.distance(to);
    nextLocation.x*=factor;
    nextLocation.y*=factor;
    nextLocation.x+=from.x;
    nextLocation.y+=from.y;
}
AttractorTracker

How could you partially cripple exact tracking?

```java
public void advanceTime(double time) {
    Point2D.Double from=moving.getLocation();
    Point2D.Double to=toward.getLocation();
    nextLocation.x=to.x-from.x;
    nextLocation.y=to.y-from.y;
    double factor=speed*time/from.distance(to);
    nextLocation.x*=factor;
    nextLocation.y*=factor;
    nextLocation.x+=from.x;
    nextLocation.y+=from.y;
}
```
Your Game

• Think about what behaviors your game should exhibit.
• How could you combine random and determined strategy to make a more interesting strategy?
• What would be the parameters to the strategies?
• How can you set and change the parameters?