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?

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

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;
}
```

AttractorTracker

Perfect Tracking toward a Sprite

```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;
}
```
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?