Introduction to Java and Agent-Based Economic Platforms (CF-904)

2. Object-Oriented Programming for JAS

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Classes in Java

- A **class** is the model from which individual objects are created. In object-oriented terms, an object is an *instance* of the the *class of objects*.
- Example:

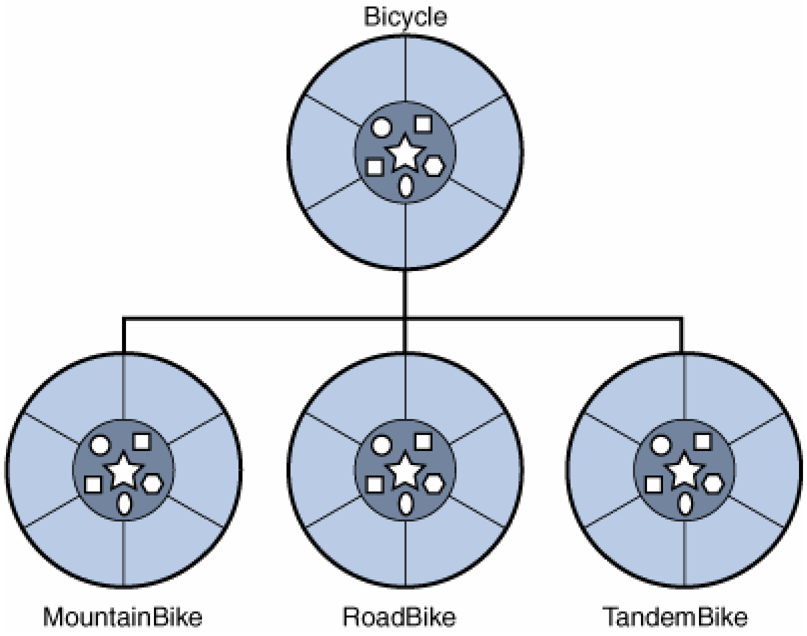
```
class Bicycle {

   int cadence = 0;
   int speed = 0;
   int gear = 1;

   void changeCadence(int newValue) {
      cadence = newValue;
   }

   void changeGear(int newValue) {
      gear = newValue;
   }
```

```
void speedUp(int increment) {
      speed = speed + increment;
   }

   void applyBrakes(int decrement) {
      speed = speed - decrement;
   }

   void printStates() {
      System.out.println("cadence:"+cadence+"
speed:"+speed+" gear:"+gear);
   }
```

Inheritance in Java (1)

- Different kinds of objects often have a certain amount in common with each other.
- Object-oriented programming allows classes to inherit commonly used state and behavior from other classes.
- In the Java programming language, each class is allowed to have one direct superclass, and each superclass has the potential for an unlimited number of subclasses

Inheritance in Java (2)



```
class MountainBike extends Bicycle
{
            // new fields and methods defining a mountain bike would go here
}
```

Interfaces in Java

- An **interface** is a group of related methods with empty bodies. Methods form the object's *interface* with the outside world.

```
interface Bicycle {
        void changeCadence(int newValue);
        void changeGear(int newValue);
        void speedUp(int increment);
        void applyBrakes(int decrement);
}
```

```
class ACMEBicycle implements Bicycle {

        // remainder of this class implemented as before
}
```

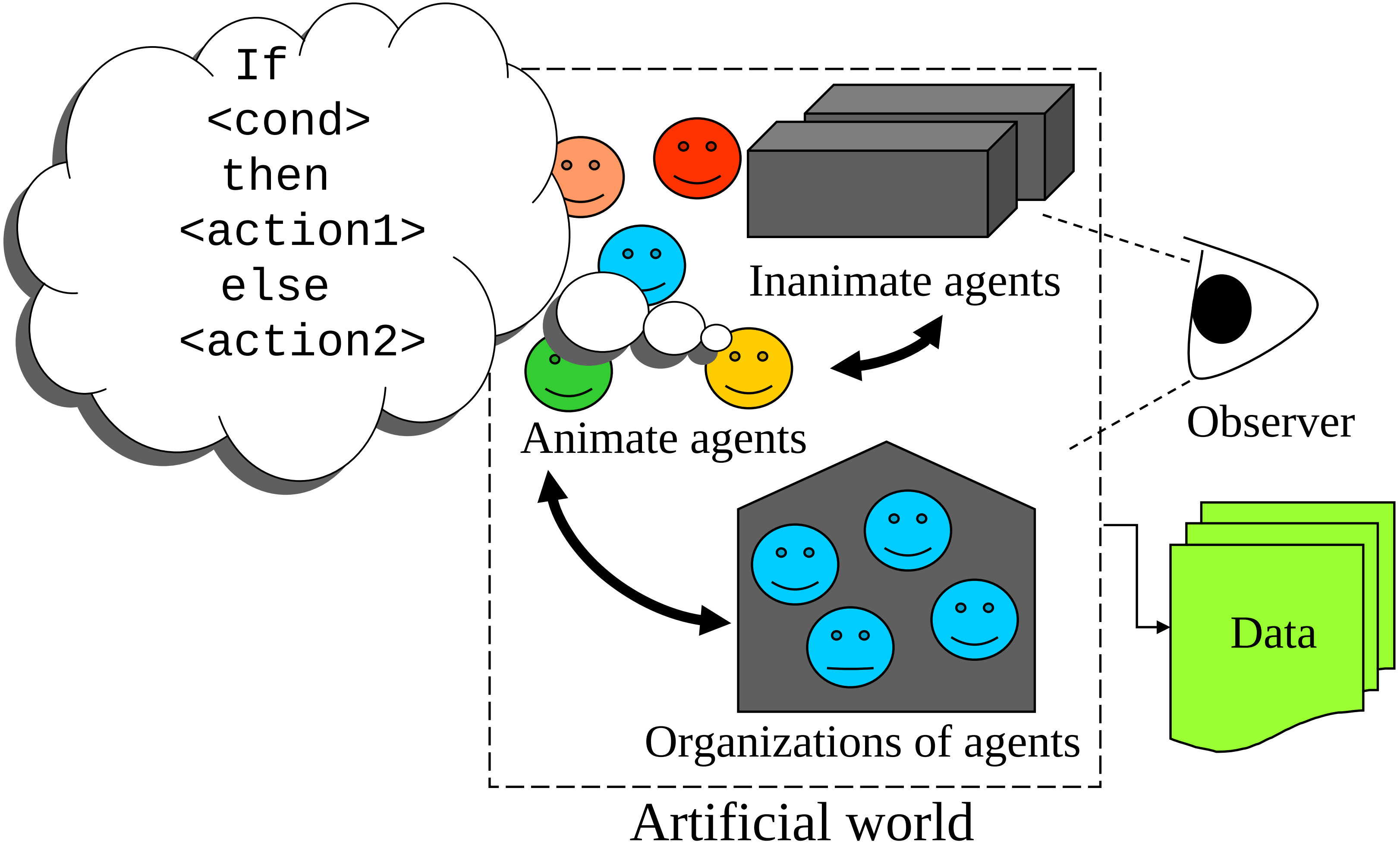
Simple OOP program (1)

```
public class Bicycle {
        // the Bicycle class has three fields
        public int cadence;
        public int gear;
        public int speed;
        // the Bicycle class has one constructor
        public Bicycle(int startCadence, int startSpeed, int startGear) {
                gear = startGear;
                cadence = startCadence;
                speed = startSpeed; }
        // the Bicycle class has four methods
        public void setCadence(int newValue) {
                cadence = newValue; }
        public void setGear(int newValue) {
                gear = newValue; }
        public void applyBrake(int decrement) {
                speed -= decrement; }
        public void speedUp(int increment) {
                 speed += increment; }
}
```

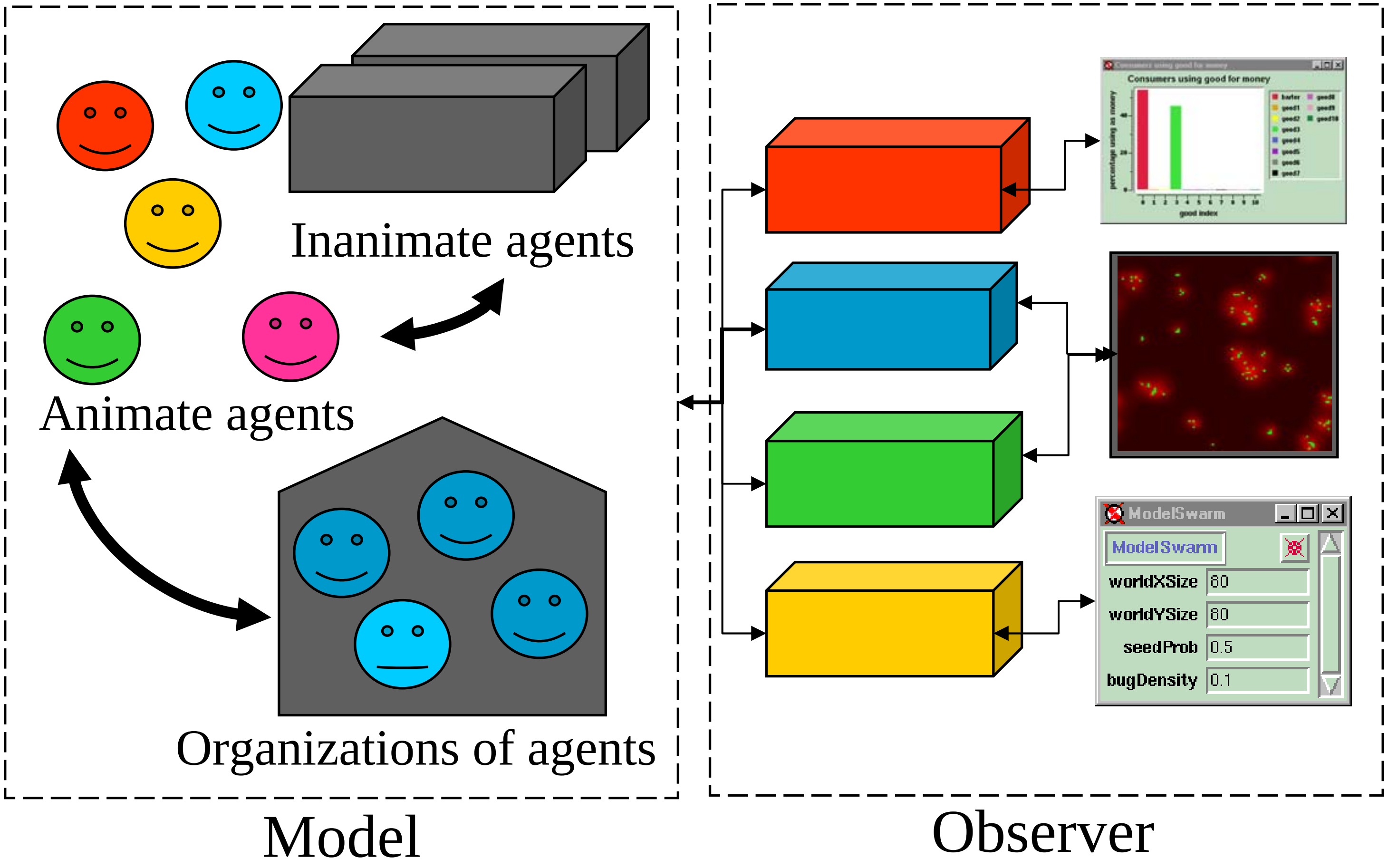
Simple OOP program (2)

```
public class MountainBike extends Bicycle {

        // the MountainBike subclass has one field
        public int seatHeight;

        // the MountainBike subclass has one constructor
        public MountainBike(int startHeight, int startCadence, int startSpeed,
        int startGear) {
                super(startCadence, startSpeed, startGear);
                seatHeight = startHeight; }

        // the MountainBike subclass has one method
        public void setHeight(int newValue) {
                seatHeight = newValue; }
}
```

Objects in an Agent-Based Model (1)



Objects in an Agent-Based Model (2)



worldXSize 80
worldYSize 80
seedProb 0.5
bugDensity 0.1

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