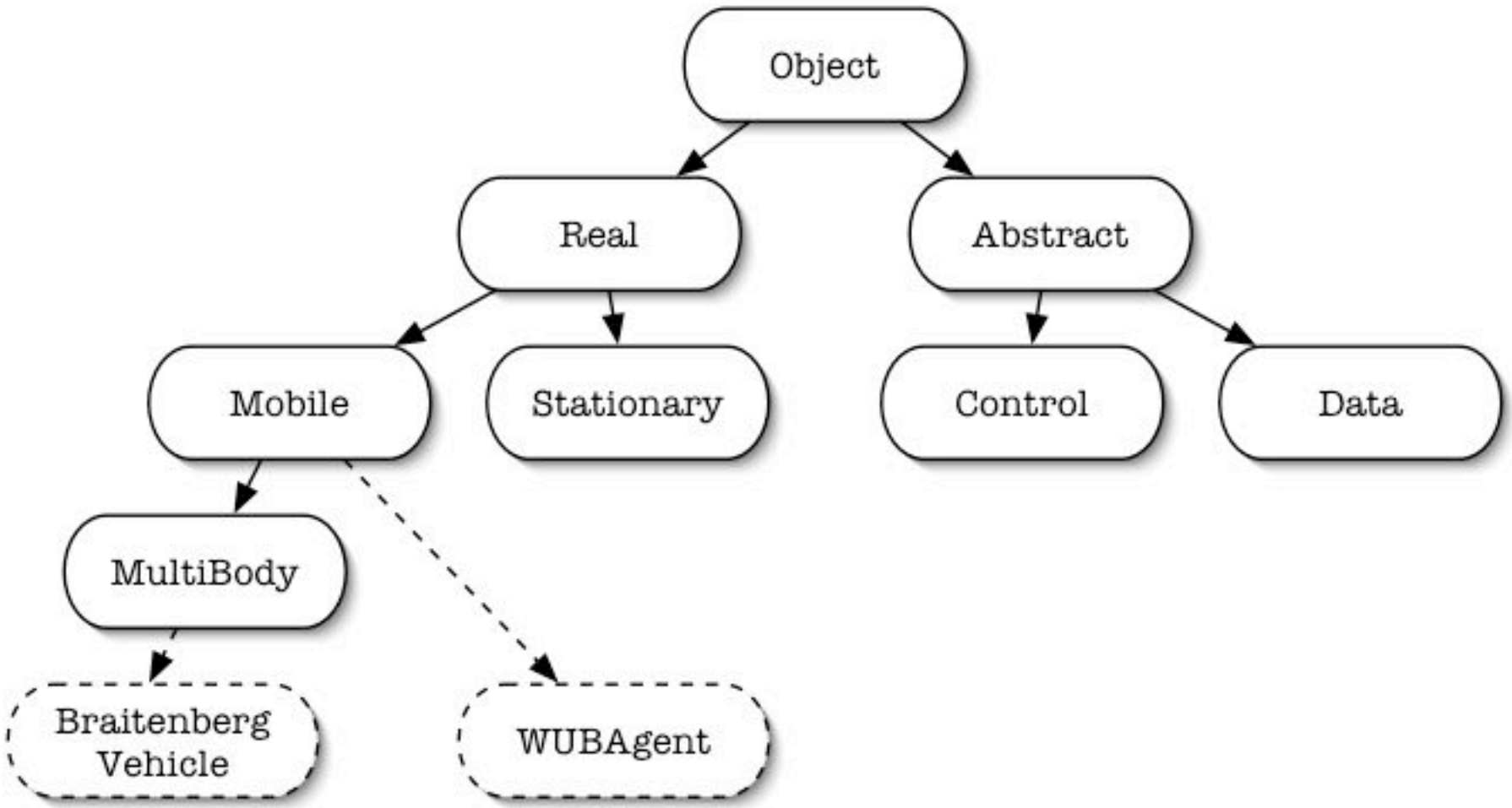
programming in breve

CS263: Artificial Intelligence in 3D Virtual Worlds

Object-orientation

- We program with *objects*
- Objects do computations and hold data
- A *class* is a specific type of object
- We create *instances* of these classes
- Classes inherit behaviors from their parent classes
- An agent in the simulated world is an instance of the class "Real"
- Instances of the "Abstract" class do not appear in the world

breve Class Hierarchy



The “Controller”

- Must be a subclass of “Control”
- Created automatically when the simulation starts
- Provides services to agents
- Coordinates communication between agents and the simulation software

Implementing objects

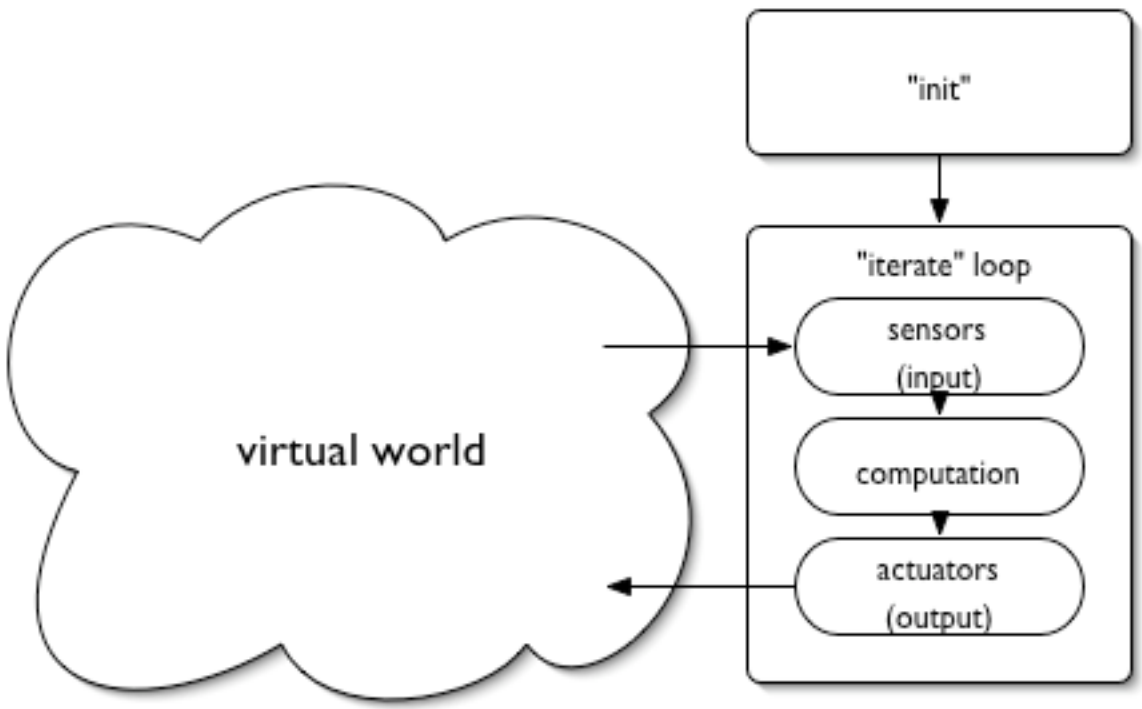
- Methods (code)
- Data (variables)

```
ParentClass : ClassName {
        + variables:
            ...

        + to init:
            ...

        + to ...:
            ...
}
```

an "agent" in breve



init & iterate

- `init`: code run when object is created
- `iterate`: code run at every iteration

```
+ to init:
    ...

+ to iterate:
    ...
    super iterate.
```

`print-statement`

- prints expressions to the output log
- `print` *`expression`*`.`
- `print` *`expression`*`, ` *`expression`*`, ...`

Examples:

```
print 4 + 5.

print “the answer is”, x.

print “the object is $self”.
```

Creating an instance

- Uses an object definition to create an *instance* of that object
- Also called "instantiating" an object
- `new` *`ObjectName`*`.`

  Examples:

```
new BraitenbergVehicle.

10 new BraitenbergLights.
```

Summary so far...

- We create agent objects and specify their behaviors (using the `init` and `iterate` methods)
- We create a controller object to setup the simulation and make instances of other objects (from its `init` method)
- We can print expressions using `print` and created new instances using `new`

WUBWorld...

- "Connect to Server" (command-K) from Finder
- Find server "Urza"
- Login as cs263, password cs263
- Select "Course Storage"
- Open cs263/Handouts
- Drag "WUBWorld" to desktop

Exercise

- Start from the myWUBWorldTemplate.tz file
- Create an Agent subclass
- Add `init` & `iterate` methods
- make the Agent's `init` method print out "Hello, world!"
- Instantiate your Agent using the controller

What you'll need...

`+ to` *`methodname`*`:` declare a method

`new:` instantiate an object

`print:` print a message

Calling instance methods

- "tell" an instance to preform an action
- can pass in and return data
- *`instance method [ keywords and values ].`*

  Examples:

```
leftSensor link to rightWheel.

self set-color to (1, 0, 0).

self do-stuff with-x 100 with-y 200.

time = (controller get-time).
```

Built-in instance variables

- `self`, the object itself
- `controller`, the controller object
- `super`, the parent object (of the class "superclass")
  - `super iterate:` says to also use the iterate behavior of the parent class

“WUBWorldControl”

- subclass of Control
- the parent class for our simulation controller
- useful methods:
  - `get-time`
  - `watch item` *`cameraTarget`*
  - `aim-camera at` *`cameraLocation`*

“Agent”

- the parent class for our Agents
- subclass of Mobile
- Useful methods:
  - `turn-left`
  - `turn-right`
  - `set-speed to` *`floatValue`*
  - `get-angle to` *`vectorValue`*
  - `get-closest-food`
  - `detect-edge`

`if`-statement

- Tests whether an expression is true
- `if` *`expression`*`: { ... }`
  `else { ... }`

  Examples:

```
if (self get-angle to (0, 0, 0)) < 0: {
     self turn-left.
} else {
     self turn-right.
}

if x == 1: print “yippee!!!”.
```

Summary

- We call methods to tell agents to do things
- We make use of behaviors inherited from parent classes (Mobile, WUBAgent, Control, etc.)
- We can use "if" statements to make decisions on how to behave

Things to try...

- Make the Agent follow a specific pattern (circle, figure-8, etc.)
- Make the Agent find the food
- Make the Agent follow the edges
- Create a second agent and play “tag”