CSc 110, Spring 2017

Lecture 38: Critters

Adapted from slides by Marty Stepp and Stuart Reges

Calling overridden methods

- Subclasses can call overridden methods with `super`

```
super(ClassName, self).method(parameters)
```

  - Example:

```
class Rabbit(Critter):
    def __init__(self):
        super(Rabbit,self).__init__()
        self.__moves = 0
        self.__hungry = False
```

What class is `Rabbit` inheriting from? _____

What method did `Rabbit` override above? _____

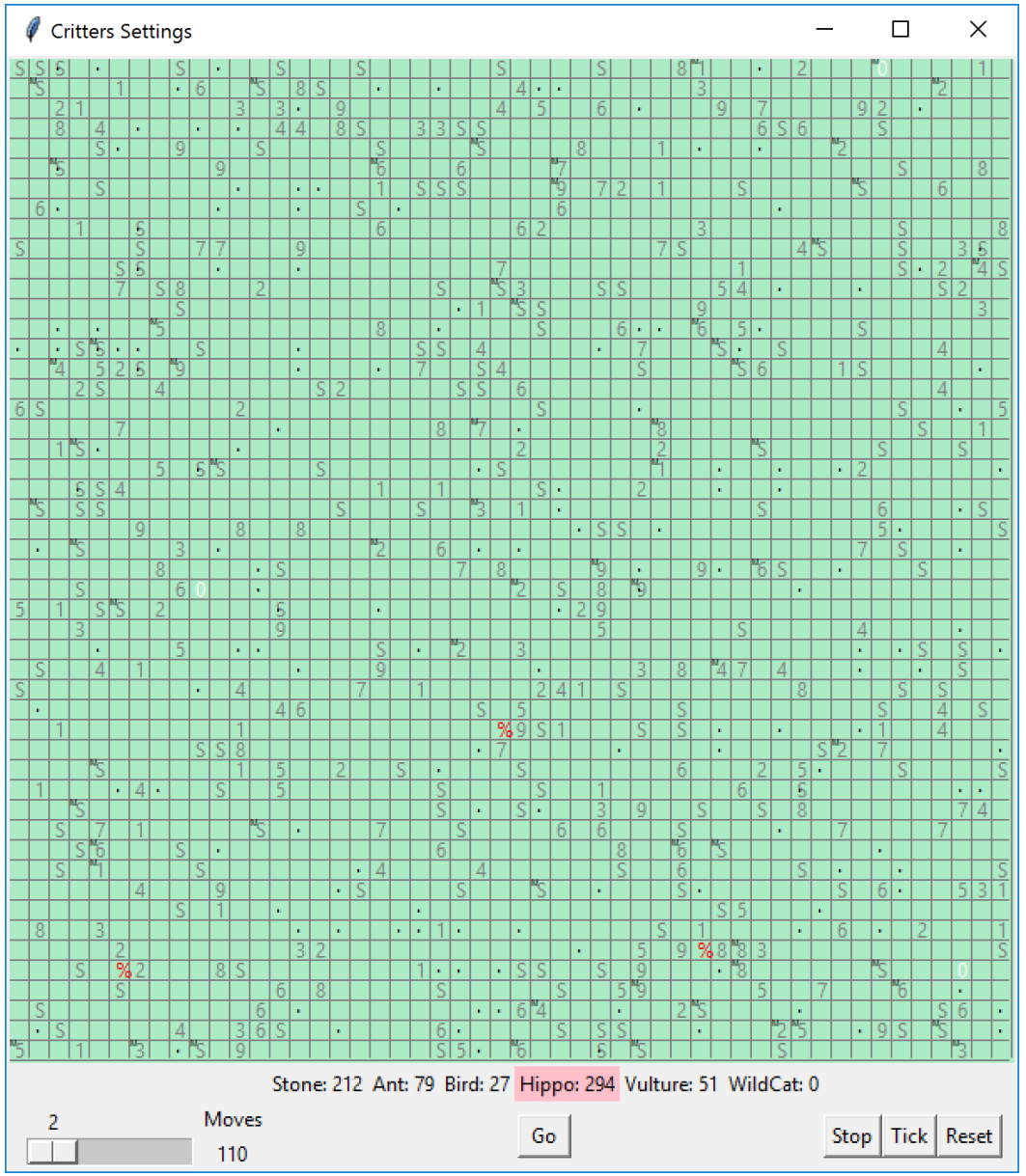
What code creates an *instance* of the class `Rabbit`? _____

What code would cause the `__str__` method of a class to be called? _____

CSc 110 Critters

- `Ant`
- `Bird`
- `Hippo`
- `Vulture`
- `WildCat` (creative)

- behavior:
  - `eat` eating food
  - `fight` animal fighting
  - `get_color` color to display
  - `get_move` movement
  - `__str__` a single character to display



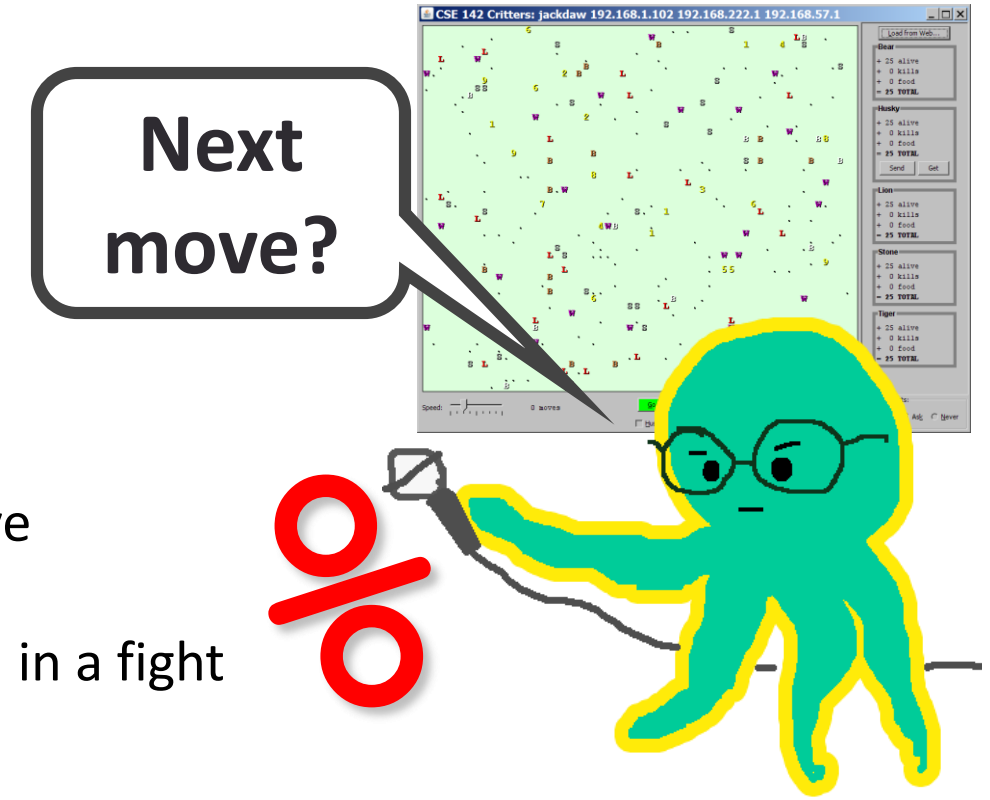
Inherit from the `Critter` class

- Syntax: `class` **name(Critter):**

```
class NewAnimal(Critter):
    def eat()
        # returns True or False
    def fight(opponent)
        # ROAR, POUNCE, SCRATCH
    def get_color()
        # returns a string for the color, e.g., "blue"
    def get_move()
        # returns NORTH, SOUTH, EAST, WEST, CENTER
    def __str__()
```

How the simulator works

- "Go" → loop:
  - move each animal (`get_move`)
  - if they collide, `fight`
  - if they find food, `eat`



- The simulator keeps score based on:
  - How many animals of that kind are still alive
  - How much food they have eaten
  - How many other animals they have beaten in a fight

- Simulator is in control!
  - `get_move` is <u>one move</u> at a time
    - (*no loops*)
  - Keep <u>state</u> (attributes)
    - to remember for future moves

Development Strategy

- Simulator helps you debug
  - smaller width/height
  - fewer animals
  - **"Tick"** instead of "Go"

- Write your own main
  - call your animal's methods and print what they return

The `Critter` class

```
class Critter():
    def eat(self):
        return False

    def fight(self, opponent):
        return ATTACK_FORFEIT

    def get_color(self):
        return "grey"

    def get_move(self):
        return DIRECTION_CENTER

    def __str__(self):
        return "?"
```

The `Critter` class constants

```
# Constants for attacks, directions
ATTACK_POUNCE    = 0
ATTACK_ROAR      = 1
ATTACK_SCRATCH   = 2
ATTACK_FORFEIT   = 3
DIRECTION_NORTH  = 0
DIRECTION_SOUTH  = 1
DIRECTION_EAST   = 2
DIRECTION_WEST   = 3
DIRECTION_CENTER = 4
```

Critter exercise: `Cougar`

- Write a critter class `Cougar`:

Method	Behavior
`__init__`	
`eat`	Always eats.
`fight`	Always pounces.
`get_color`	Blue if the `Cougar` has never fought; red if he has.
`get_move`	Walks west until he finds food; then walks east until he finds food; then goes west and repeats.
`__str__`	`"C"`

Critter exercise: `Cougar`

- We need to know two things about its state:
  - Has it ever fought?
  - How much food it has eaten? Needed in order to return the correct direction. (West/Eat/East/Eat/West/Eat/East, and so on)
  - Two instance variables

    `fought` (of type `bool`)

    `eaten` (of type `int`)

  - Method `eat`: increment `eaten` every time eat is called
  - Method `get_move`: Walks west until he finds food; then walks east until he finds food; then goes west until west and repeats.

    if `eaten` is even, walk west else walk east

The Cougar class

```
from Critter import *

class Cougar(Critter):
    # returns a Cougar
    def __init__(self):
        super(Cougar,self).__init__()    # call the superclass constructor
        self.__fought = False
        self.__eaten = 0

    # returns "C" as a representation of the cougar
    def __str__(self):
        return "C"

    # returns that the critter does want to eat
    def eat(self):
        self.__eaten += 1
        return True
```

The Cougar class- cont.

```
# returns the pounce attack
   def fight(self, opponent):
       self.__fought = True
       return ATTACK_POUNCE

   # returns west until the critter eats, returns east until it
   # eats again and then repeats
   def get_move(self):
       if(self.__eaten % 2 == 0):
           return DIRECTION_WEST
       else:
           return DIRECTION_EAST

   # returns blue if the critter has never fought and red if it has
    def get_color(self):
       if(not self.__fought):
           return "blue"
       else:
           return "red"
```

Debugging: `Cougar`

- Start small. Run the Cougar class.
  - In idle, create a Cougar object
  - Call the methods to verify the behavior

Debugging Cougar

```
>>> c = Cougar()
>>> c.get_color()
'blue'
>>> c.get_move()
3
>>> c.eat()
True
>>> c.get_move()
2
>>> c.fight()
Traceback (most recent call last):
  File "<pyshell#5>", line 1, in <module>
    c.fight()
TypeError: fight() missing 1 required positional argument:
 'opponent'
>>>
```

Debugging: `Cougar`

- Add Stone and Cougar to the list of methods Critters.py
- Use a small grid size, few animals
- Go tick by tick
- Simulator actions on each tick for each animal:
  - Move the animal (call `get_move`) in a random order
  - If moved to occupied square, call both animials `fight` methods
  - If moved onto food, call the animal's `eat` method.

- What the scores mean:
  - How many animals of the class are alive
  - How much food they have eaten
  - How many other animals they have destroyed in a fight

Ideas for state

- You must not only have the right state, but update that state properly when relevant actions occur.

- Counting is helpful:
  - How many total moves has this animal made?
  - How many times has it eaten? Fought?

- Remembering recent actions in attributes is helpful:
  - Which direction did the animal move last?
    - How many times has it moved that way?
  - Did the animal eat the last time it was asked?
  - How many steps has the animal taken since last eating?
  - How many fights has the animal been in since last eating?

Critter exercise: `Aardvark`

- Write a critter class `Aardvark`:

Method	Behavior
`__init__`	
`eat`	Eats 3 pieces of food and then stops
`fight`	randomly chooses between pouncing and roaring
`get_color`	pink if hungry and red if full
`get_move`	walks up two and then down two
`__str__`	`"a"` if hungry `"A"` otherwise

Critter exercise: `Aardvark`

- We need to know two things about its state:
  - How much food has it eaten?
  - How many moves has it taken?
  - Instance variables:

    `eaten` (of type `int`)

    `moves` (of type `int`)

  - Method `eat`: increment `eaten` every time eat is called, return False after 3
  - Method `get_move`: Walks up two and then down two

    `N N S S N N S S N N S S`

    `1 2 3 4 1 2 3 4 1 2 3 4` ← use logic as in Rabbit