

Objects

Oliver W. Layton

CS151: Computational Thinking: Visual Media

Lecture 10, Fall 2020

Wednesday September 16

Objects

- New type of data (other than string, float, int, boolean).
- Two key ideas
 1. Objects help us organize heterogenous data/information related to a "thing" we care about. **Objects "know stuff"**.
 2. Objects allow you to perform operations (actions) and manipulate the stored data. **Objects can "do stuff"**.

1) Objects group data (1/2)

Maintaining information about cars:

```
car1_color = 'blue'  
car1_tankSize = 11  
car2_color = 'silver'  
car2_tankSize = 15  
car3_color = 'black'  
car3_tankSize = 9
```

The data are not *really* associated with car1, car2, and car3...they are just names we came up with.

1) Objects group data (2/2)

```
car1_color = 'blue'  
car1_tankSize = 11  
car2_color = 'silver'  
car2_tankSize = 15  
car3_color = 'black'  
car3_tankSize = 9
```

Objects *actually* group together data related to an **instance** of a **common** thing.

Common thing here: Cars.

3 cars → 3 unique Car objects ("3 instances of a car"): Car 1, Car 2, Car 3 — each only stores data relevant to **itself**. Let's draw unique symbol tables.

2) We perform actions on objects to change their data

Example: Car 1 gets painted gray. How do we tell the object that its existing color (blue) needs to change?

We call a function on it, passing in the new color (blue):

```
car1.setColor( 'gray' )
```

- How do find out what Car 1 and Car 2's colors currently are? We call another function on each object that returns the current color string:

```
color1 = car1.getColor()  
color2 = car2.getColor()  
print(color1)    # gray  
print(color2)    # silver
```

Summary of new ideas

- Each object holds and groups together info that makes that object **unique**.
- Call functions on the objects to do actions like set and get their unique data (`car1.getColor()` vs `car2.getColor()`).
- Functions called on objects (`object.function()`) called **methods**.
- The unique object GOES BEFORE THE DOT (`car1.function()` vs. `car2.function()`).

`turtle` with objects

Enables us to do cool things that weren't possible before!

Two "things" / types of objects we will work with:

1. `Turtle`: You can now create more than one turtle that draws on the screen! Each is an **object** and has unique properties (color, shape, position on canvas, pen width, etc.)
2. `Screen`: represents the canvas (pop-up window in which turtle draws stuff). Controls canvas size, background color, etc.

How do we create objects in the first place?

- Call a special method called the **constructor**. It returns a new object.
- Convention: constructor starts with a capital letter.
- To create two `Turtle` objects to draw stuff (later):

```
turt1 = turtle.Turtle()
```

```
turt2 = turtle.Turtle()
```

- The two objects are **independent**: changing `turt1`'s color will not affect `turt2`.

Let's write some turtle code with
Turtle and Screen objects