

Lecture 11: Turtle memory Symbol table

Line 20

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

← line 21

```
1  '''lecture_11_turtle_object_symbol_table.py
2  Create 2 Turtle objects and a Screen object. Change a few properties of each object.
3  Oliver W. Layton
4  CS 151: Computational Thinking: Visual Media
5  Fall 2020
6  '''
7  import turtle
8
9
10 def goto(turt, x, y):
11     turt.goto(x, y)
12
13
14 def make_turtle(shape='turtle', penColor='white'):
15     turt = turtle.Turtle(shape=shape)
16     turt.color(penColor)
17     return turt
18
19
20 w = 1000
21 h = 800
22 screen = turtle.Screen()
23 screen.setup(width=w, height=h)
24
25 t1 = make_turtle()
26 t2 = make_turtle(shape='arrow', penColor='black')
27 t1.color('red')
28
29 goto(t1, 10, 10)
30
31 screen.exitonclick()
32
```

Line 22

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

Object

Screen

<u>Name</u>	<u>Value</u>	<u>type</u>
exitonclick	→	fun

Steps:

1) Screen object Symbol table Created.

2) Add entry in main table as arrow to Object table

line 23

mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int
Screen		object

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

Setup()

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int

Steps:

- 1) Create function symbol table Setup()
- 2) w/h ints from mem copied to Setup()
- 3) Setup() copies width/height values to object.
- 4) Setup() table goes away.

Time 25

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen Object

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

make_turtle

<u>Name</u>	<u>Value</u>	<u>type</u>
shape	'turtle'	Str
pen color	'white'	Str

Steps:

- 1) Create table for make_turtles.
- 2) make entries based on default parameter values

Ime 15

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

Object

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

make_turtle

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	Str
pen color	'white'	Str
turt		Object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	Str
Color	→	fun
goto	→	fun

Steps:

- 1) Create table for turtle object
- 2) Copy parameter (Shape)
- 3) make entry / connection in make_turtle

main

Name	Value	type
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

Object

Screen Object

Name	Value	type
width	1000	int
height	800	int
exitonclick	→	fun

make_turtle

Name	Value	type
Shape	'turtle'	str
pen_color	'white'	str
turt		object

Turtle object

Name	Value	type
Shape	'turtle'	str
color	'white'	str
color	→	fun
goto	→	fun

turt.color()

copy

Name	Value	type
color	'white'	str

Steps:

- 1) Create color() table
- 2) Copy parameters: pen_color → color
- 3) color copies value to object.
- 4) color() table goes away

me 17

main

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

Object

+1

Object

Turtle object a

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	str
Color	'white'	str
Color	→	fun
goto	→	fun

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
Width	1000	int
height	800	int
exitonclick	→	fun

make_turtle

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	str
pen color	'white'	str
turt		Object

Steps:

- 1) make_turtle returns reference to turtle object (arrow)
- 2) main adds entry called +1, gets returned connection to object

3) make_turtle table goes away

line 26 → line 17 [skipping steps until before return statement]

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

+1

Object

Object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	str
color	'white'	str
color	→	fun
goto	→	fun

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

make_turtle

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	str
pencolor	'black'	str
turt		object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	str
color	'black'	str
color	→	fun
goto	→	fun

main

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

+1
+2

object
object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	str
Color	'white'	str
Color	→	fun
goto	→	fun

Steps:

- 1) make_turtle sends arrow to the turtle object it made.
- 2) main adds entry for +2 in table.
- 3) make_turtle table goes away

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	str
Color	'black'	str
Color	→	fun
goto	→	fun

line 27

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

+1
+2

Object
Object

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

tl.Color()

<u>Name</u>	<u>Value</u>	<u>type</u>
Color	'red'	Str

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	Str
color	'white' 'red'	Str

copy

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	Str
color	'black'	Str
color	→	fun
goto	→	fun

Steps:

- 1) Make color() table
- 2) Color copies parameter value to object tl's table, replaces value for color.
- 3) color() table goes away

line 29 → 11

[Skip to 1st line of goto]

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

Screen

+1
+2

object
object

goto()

<u>Name</u>	<u>Value</u>	<u>type</u>
turt		Object
x	10	int
y	10	int

Turtle object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	Str
color	'red'	Str
color	→	fun
goto	→	fun

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	Str
color	'black'	Str

t1.goto()

<u>Name</u>	<u>Value</u>	<u>type</u>
x	10	int
y	10	int

Steps:

- 1) Create table for goto()
- 2) Set `twr` to reference of `tl`'s table, `x, y` int values
Copied Over
- 3) Create `twr.goto()` table by looking up `tl → goto`,
Copy `x, y` values to its table.

After line 11 executes, `tl.goto` table goes away,
we return to main code (line 29), `goto()` table
goes away. we are left with:

Mem

<u>Name</u>	<u>Value</u>	<u>type</u>
turtle	→	module
goto	→	fun
make_turtle	→	fun
w	1000	int
h	800	int

Screen

+1

+2

object

object

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'turtle'	str
color	'red'	str
color	→	fun
goto	→	fun

Screen Object

<u>Name</u>	<u>Value</u>	<u>type</u>
width	1000	int
height	800	int
exitonclick	→	fun

Turtle object

<u>Name</u>	<u>Value</u>	<u>type</u>
Shape	'arrow'	str
color	'black'	str