CompSci 94
Inheritance and Writing Functions
September 27, 2018

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Class Today

- Last time we used functions, this time we will write functions
- Continue to make decisions with IF statement
- Use logic instead of nested IFs
- Inheritance – how it relates to Alice
- making a character more functional, then saving it to put in other Alice worlds
Review 1

• What is the difference between a function and a procedure?
Review 1

• What is the difference between a function and a procedure?
  – Procedure is something to do – turn, move, dance
  – Function is a calculated value – a number, an object, a direction
  – A function by itself is not very useful, a function has to be used in some way based on the type of value it calculates
Review 2

• What happens if the diningTable has width 1.7 and depth 1.0?
Review 2

• What happens if the diningTable has width 1.7 and depth 1.0?
  – Say hello and the table is resized larger by 1.2
Logic Operators

• A and B – true if both are true
• A or B – true if one or both are true
• Not A – True if A was false
Logic Truth Table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>not A</th>
<th>A and B</th>
<th>A or B</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
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</tbody>
</table>
Logic Truth Table

A AND B is **true** only if both A and B are **true**

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<thead>
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</thead>
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</table>
Logic Truth Table

A OR B is **false** only if both A and B are **false**

<table>
<thead>
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<th></th>
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<th>A and B</th>
<th>A or B</th>
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Consider this code – Nested IFs
Rewrite Code - one IF with AND
What we want to do today

1. Teach a dog to jump over two creatures at once (write a function to determine how high the dog must jump?)

2. Have the taller of two creatures spin around and say I’m taller (write a function to determine the taller object)

3. Learn about inheritance

4. Use the jumping dog in another Alice world
Characters in Lecture World today

• Note Different types:
  – Bipeds: Alice, ChesireCat, Alien
  – Quadruped: Dalmatian
  – Flyer: Flamingo
Last time, Built-in functions

• You can use a built-in function anywhere that matches the type of value it calculates
• Move up 2.0
• Drag over getHeight (value is a decimal number), and now moves up the dalmatian’s height
Can write your own functions

Function for Scene  OR  Function for character

Use scene function if it involves multiple objects
1) Write Scene function tallerHeight

- Inputs: two objects
- Output: the height (decimal number) of the taller object
Start Scene function tallerHeight

• The start of the function

• Note bottom of page – must return value
Add two parameters – what type should we choose?
Best choice, why?

- First level that includes all our objects
Function tallerHeight – add parameters

- Added parameters of type SJointedModel: object1 and object2.
- Object1 has its own procedures and functions
How to start function tallerHeight

• We need to calculate which object is taller and then return the height of the taller object
• How do we calculate the taller value?
Problem Solve

Write out what you want to do!

```python
if object1 is taller than object 2
    return object1’s height
else
    return object2’s height
```

Then convert to code!
Translate to Code – need number place holders

• Must put in with four numbers first

• Then replace numbers with getHeight calls
Drag parameters to code carefully!

• Make sure you choose the correct object too!
• Object1 versus Object2
To use tallerHeight, first we wrote a Dalmatian jump Proc

```
declare procedure jump with parameters: DecimalNumber = height, DecimalNumber = howFar

do in order
  - this move UP, height, duration = 0.5, add detail
  - this move FORWARD, howFar, duration = 0.5, add detail
  - this move DOWN, height, add detail
```

Procedures Functions

Dalmatian's Editable Procedures (1)

edit this jump height: ???, howFar: ???
Using tallerHeight

• Want the dalmatian to jump over Alice and the CheshireCat. Needs to know the height of the taller one to know how high to jump.

declare procedure myFirstMethod

do in order

[Diagram showing the procedure with inputs and outputs, including 'this.dalmatian', 'turnToFace', 'this.cheshireCat', 'this.dalmatian', 'jump', 'height: 2.0', 'howFar: 4.0']

temporary place holder
Using tallerHeight

• Replace the number 2.0 with the tallerHeight function, it’s a number!

• Run the world, what happens?
• Make Alice or CheshireCat taller and run again? What happens?
2) Write Scene function tallerObject

- Inputs: two objects
- Output: the taller object

return value? Parameters?
2) Write Scene function tallerObject

- Inputs: two objects
- Output: the taller object
Resulting code for tallerObject

• This returns the object who is taller
How do you use tallerObject?

• Want the taller of Alice or Cheshire cat to say they are taller, then spin around once, and then shrink

• Must first put each command for an object, say Alice, then replace it with the function

![Diagram showing the use of tallerObject function]
What does this code do?
3) Inheritance

• There is a hierarchical structure

• Alice and Alien are bipeds

• Flamingo and Alien are SJointedModels and everything above that: Smodel, STurnable, etc
3) Inheritance

• Inheritance appears in Object Oriented languages
• It allows you to share code
• If you write a biped method, all objects that are bipeds can use it
• If you write a SjointedModel procedure, then both bipeds and quadrupeds can use it
4) Inheritance - Save jumping Dalmation and put in another Alice world

• Our Dalmation knows how to jump. Since we wrote the jump method as a Dalmatian method, we can save the Dalmatian out as a DalmatianJumper, a smarter dog who inherits all the functionality of a Dalmatian but also knows how to jump
To save the Dalmation as a class, an .a3c file

• Click on *Save to Class File*

• I saved him in the folder *My Classes*
• I named him *DalmatianJumper*
Now you can put the Dalmatian in another world with the jumping procedure

- Start a new Alice world on the moon
- Add in a regular Dalmatian
- Note the dog doesn’t know how to jump
Now add in a jumping Dalmatian

- Look in my Classes

- Find the DalmatianJumper and add it
You will be asked if you want the extra procedures, yes you do!
Now both all Dalmatians know how to jump

- Including the one you already added
This lecture covered

- Using Logic in place of nested Ifs
- Writing your own function. A function needs input (parameters) and has a single output of a specified type
- Inheritance – the hierarchical structure of the Alice objects
- Saving an object with functionality and using it in another Alice world