

Execution Control with *If/Else* and Boolean Questions

Example: Multiple Conditions

Alice



The Zeus world revisited

Zeus-V1.a2w



- 🌐 Testing this world, we find two significant problems
 - ⚡ Anything the user clicks on is zapped by Zeus' bolt – not just philosophers!
 - ⚡ Philosophers could be zapped with lightning more than once!



Problem

🌍 What we need in the Zeus world is conditional execution

🎥 Check conditions:

💡 Is the selected object a philosopher?

💡 If so, has the philosopher already been zapped by lightning?

🎥 Conditional execution:

💡 lightning bolt will be shot or not



Multiple Conditions

- First, we'll tackle the problem of restricting Zeus to shoot thunderbolts only at philosophers.
- This is different from previous examples in that **four possible conditions must be checked** – the user could click on any one of the four philosophers.

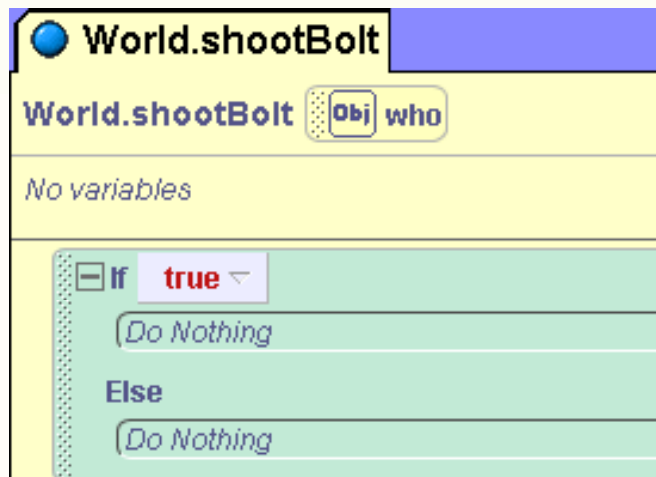


Demo

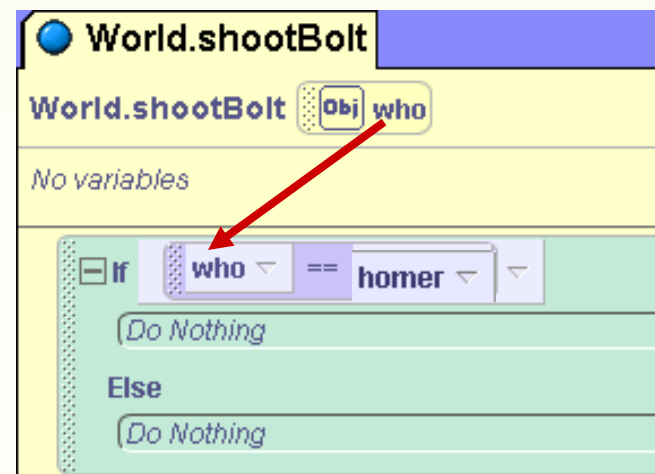
Zeus-V2

Concept illustrated:

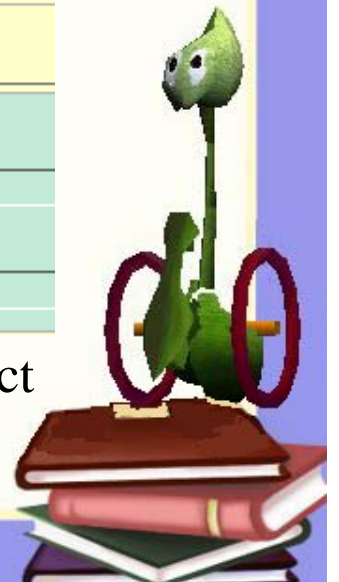
- ▶ Begin with just one object – we chose homer, but any one philosopher would do.



Start with a blank *If* statement...



drag in the *who* tile, then select == and homer

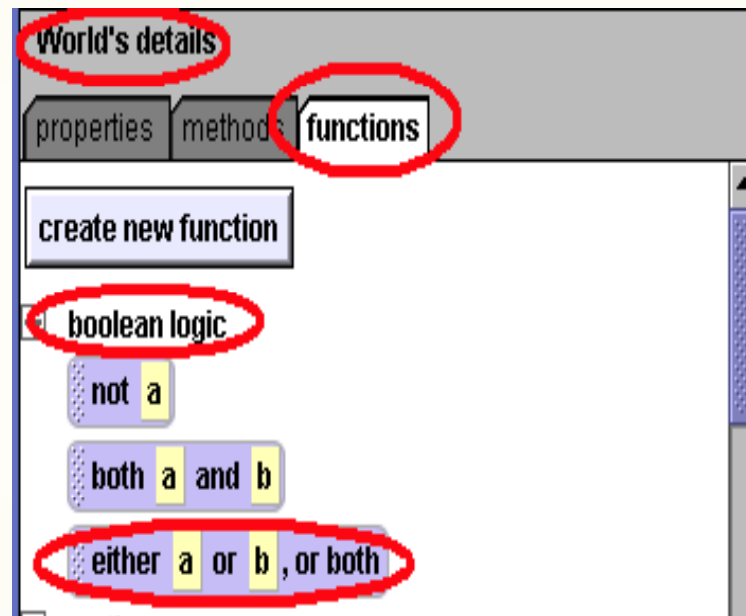


Demo

Zeus-V3

Concept illustrated

- Boolean logic operators are used to build an expression composed of multiple conditions



Abstraction

- Multiple conditions, as in this example,
 - become complex
 - are difficult to read
 - are difficult to debug
- A better solution is to write our own Boolean question that checks the conditions.
- This is another example of abstraction – allowing you to think on a higher plane.



Demo

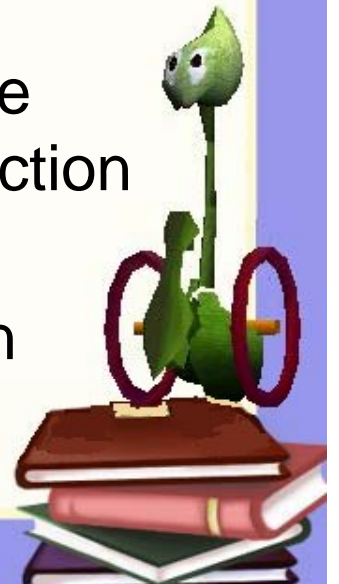
🌐 Zeus-V4

🌐 Concepts illustrated in this example

🎥 Multiple conditions can be checked using nested *If* statements to check each possible condition.

💡 If one of the conditions is found to be *true*, the function immediately returns *true* and the function is all over!

💡 If none of the conditions are *true*, the function returns *false*.



Completing the Zeus world

- 🌍 Now, we are ready to prevent lightning striking the same philosopher more than once.
- 🌍 How do we know if a philosopher has already been struck by lightning?
 - 👤 When a lightning bolt strikes, the philosopher “is zapped” and the his *color* property is set to black.
 - 👤 Checking color is a convenient way to check for a previous lightning strike.

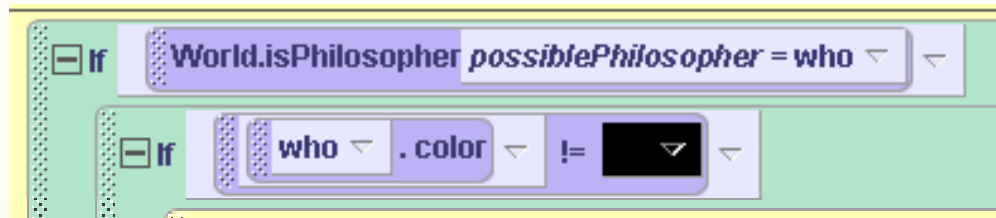


Demo

Zeus-V5

Concept illustrated in this example

- ▶ We only need to check for a possible duplicate-strike if we already know that a philosopher is clicked
- ▶ the way to handle this is to nest a second *If* statement inside the first.



Problem

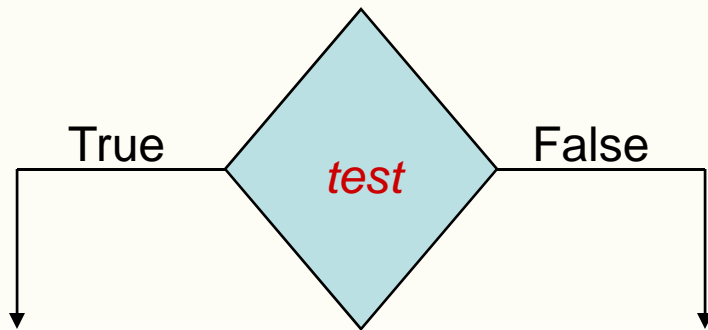
Create a flowchart to determine the price for a customer to an amusement park that has the following ticket prices:

	All Day	Evening
Adult	20	15
Child	10	7.5
Senior	12	9



Flowchart Symbols

A reminder



Conditional Branch

`if (test)`

...

`else`

...

Statement

assignment, method,
etc.



Flowchart to code

Take the ticket price flowchart you have built, and convert it to code (actually pseudocode, because you should not worry about the details of syntax and grammar)



More complicated loops

- It is also possible to place a loop statement within another loop statement
- This is called **nested loops**



An example of nested loops



The whole Ferris wheel will rotate clockwise, while the two inner wheels will rotate counterclockwise. The inner wheels should perform 2 revolutions for each outer loop revolution.



Demo

🌐 FerrisWheel

🌐 Concept illustrated in this example

- 🎥 The inner loop runs completely each time the outer loop runs once.
- 🎥 An outer loop that executes 2 times and an inner loop that executes 5 times will actually execute the inner loop 10 times.



Picking the corn

It is time for a farmer to harvest his crops (corn). His field is nicely planted, with 6 rows of corn, and 10 cornstalks per row.

Create a flowchart that will illustrate a solution to this problem

Convert the flowchart to pseudocode.



Picking the corn v2

The farmer goes to the next field (of the same dimensions as the first) to harvest his corn. But the scarecrow has not done its job, and the crows have helped themselves to a lot of the corn.

Each stalk of corn may or may not have an ear of corn to be picked

Create a flowchart and that will illustrate a solution to this problem and convert the flowchart to pseudocode.



Assignment

- Read Chapter 6 Section 2, Execution control with *If/Else and Boolean functions*
- Read Chapter 7 Section 1, Loops

