Alice

Mathematical Expressions, Conditional Statements, Control Structures

Coverage

• Arithmetic Expressions
• Built-in Functions
• Conditional Execution
  – If/Then Statements
• Control Structures
  – Loops
Functions

• Alice provides a set of built-in **functions**
  – Similar to methods but like a mathematical function
  – Takes some input and computes some output
    • E.g. SquareRoot(25)
    • We say the function **returns** the value 5 and has an **input parameter** of 25
  – Built-in functions give us information about properties of objects and relationship to other objects (e.g. distance, position in world, width)

Functions

• Click on the functions tab after selecting an object
Arithmetic Function Example

• Make the alien on wheels move to another object
• If we use are not careful it will move right through the object
• We can experiment to find a good number
• More generally, we could change the distance it moves to the function that computes the distance between the two objects
  – Drag the distance function over the “1 meter” box

Arithmetic Function Example

• Now the alien moves to the middle of the object; how to fix this?
Arithmetic Function Example

• Should move a distance:
  
  \[(\text{distance to object}) - (\text{Object width})/2 - (\text{alien width})/2\]

We can perform the math by clicking on the down arrow.

If-Then

To create, drag "If/Else" from bottom to the code window.

Single Path If Statement
If-Then-Else

If / Else Statement

If-Then-Else Example

- If the alien is smaller than the object
  - Move around it
- Else
  - Move right through it

- Can resize the object to check both cases
Relational Operators

- Relational operators are functions of the **world** object
  - $A == B$: $A$ is equal to $B$
  - $A != B$: $A$ is not equal to $B$
  - $A > B$: $A$ greater than $B$
  - $A < B$: $A$ less than $B$
  - $A >= B$: $A$ gte $B$
  - $A <= B$: $A$ lte $B$

If/Else Example

- If the alien’s height $< 2$ then
  - Move around it
- Else
  - Move right through it

- Change the number 2 to test both cases
Repetition

• Sometimes you want to repeat some code multiple times
• Example: Make a flying cow
  – Should wiggle front legs together as it flies, like a dolphin kick
  – Remember how to do this?

Flying Cow

• Problem: We would like the cow to wiggle her legs a total of 5 times, but it is a pain to copy the turn code 4 more times
Repetition

• We can use a loop to repeat any block as many times as we like
• Use LOOP to repeat something some known number of times
• Use WHILE to repeat something while some condition is true
  – Once the condition becomes false, the loop will stop

Version 1

Off a bit, why? Consider that we want the legs to move together like a dolphin kick, not running
Version 2

• The leg turning is done at the same time; requires another “Do Together” block

To try: Change Number of times to Infinity

Flying Cow

Reminder: Can also move camera around in the scene
While Loop

Is Condition True?

Do This Action

True

False

While Loop Example

• Make the alien try to randomly get close to the object
  – While (alien’s distance to the object > some value)
    • Turn some random amount
    • Go forward 1 meter
  – Say “Found it!”
Random Roll

• While Loop code
  – Many other versions possible

More Complex Loop

• If we click on the “Complex” loop then it shows additional loop options
• Most notably there is a loop “index”
  – This is a variable that holds a number for the current iteration of the loop
  – Sometimes we may want to do processing based on the index

  Loop index from NUM1 to NUM2
  Loop body
More Complex Loop Example

• The opacity property sets how transparent an object is
  – 0 = invisible
  – 1 = fully solid

• Use the complicated loop to make the cow
  – Fade from invisible to visible
  – Fade from visible to invisible

Class Exercise

• Make a kangaroo jump onto a crate. The legs should make a hopping motion. Use the height/width of the objects to guide the forward and upward movements.
Class Exercise 2

• Create a new event
  – Let the mouse move any object

• Create a loop so the kangaroo turns toward the crate and moves toward it ½ meter until it is close to the crate, then it stops and says “GOT IT”
  – Use the mouse to move the crate around; the kangaroo should chase it

| White | crate | distance to | kangaroo | | | | |
|-------|-------|-------------|----------|---|---|---|
| kangaroo | turn to face | crate | duration = 0.25 seconds | more... |
| kangaroo | move forward | 0.5 meters | duration = 0.25 seconds | more... |
| kangaroo | say | GOT IT | more... |