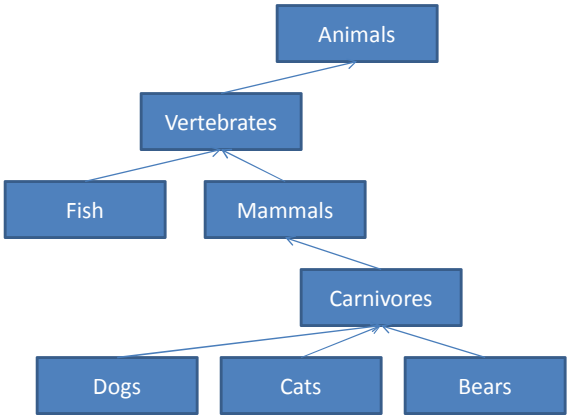
Alice

Inheritance and Event Handling

Inheritance Concept

- Consider this hierarchy; parents describe properties of children



Introduction to Inheritance

- *Inheritance* is one of the main techniques of object-oriented programming (OOP)
- Using this technique, a very general form of a class is first defined and compiled, and then more specialized versions of the class are defined by adding properties and methods
  - The specialized classes are said to *inherit* the methods and properties of the general class

Introduction to Inheritance

- Inheritance is the process by which a new class is created from another class
  - The new class is called a *derived class*
  - The original class is called the *base class*
- A derived class automatically has all the properties and methods that the base class has, and it can have additional methods and/or properties as well
- Inheritance is especially advantageous because it allows code to be *reused*, without having to copy it into the definitions of the derived classes

Derived Classes

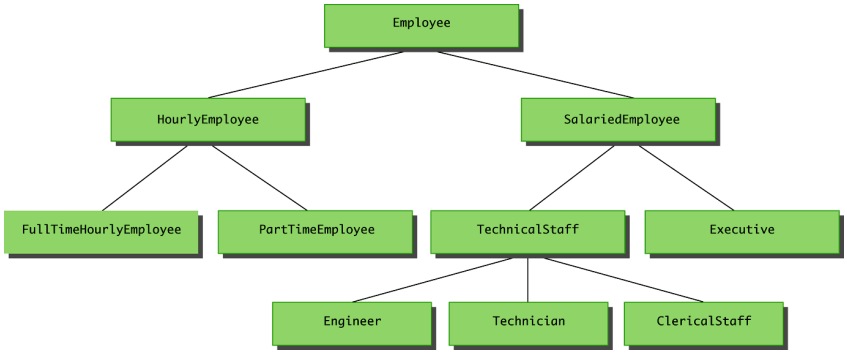
- When designing certain classes, there is often a natural hierarchy for grouping them
  - In a record-keeping program for the employees of a company, there are hourly employees and salaried employees
  - Hourly employees can be divided into full time and part time workers
  - Salaried employees can be divided into those on technical staff, and those on the executive staff

Derived Classes

- All employees share certain characteristics in common
  - All employees have a name and a hire date
  - The methods for setting and changing names and hire dates would be the same for all employees
- Some employees have specialized characteristics
  - Hourly employees are paid an hourly wage, while salaried employees are paid a fixed wage
  - The methods for calculating wages for these two different groups would be different

A Class Hierarchy

Display 7.1 **A Class Hierarchy**



Inheritance in Alice

- Alice supports a rather weak form of inheritance; a more powerful/complex version exists in most OOP languages like Java, C++, or C#
  - Add existing class to the project
  - Create new methods for the class
  - Save out as a new class using a different name
  - Can now Import the new class and it has the properties/methods of the parent along with the new methods
  - TO DO: Demonstrate creating and saving new class
- The process is more dynamic and seamless in other OOP languages

Guidelines for Class-Level Methods

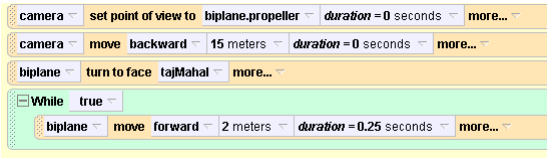
- Create many different class level methods and study methods already written for some objects (e.g. see animal classes)
- Play a sound in a class level method only if the sound has been imported for the object, instead of the world
  - Not loaded if imported into another world
- Do not call world level methods from class level methods
- Do not use instructions for other objects from within a class level method
  - Possible exceptions include camera, world objects

Interaction: Events and Event Handling

- To date, most of our programs have been movie-centric
- Many programs are user-centric, requiring user input
- One way to get user input is through events
- An **event** is when something happens, like a particular condition is met, the user clicks the mouse, hits a key, or some other action is performed
  - We can write methods that react to events, such methods are called **event handlers**

Event Example

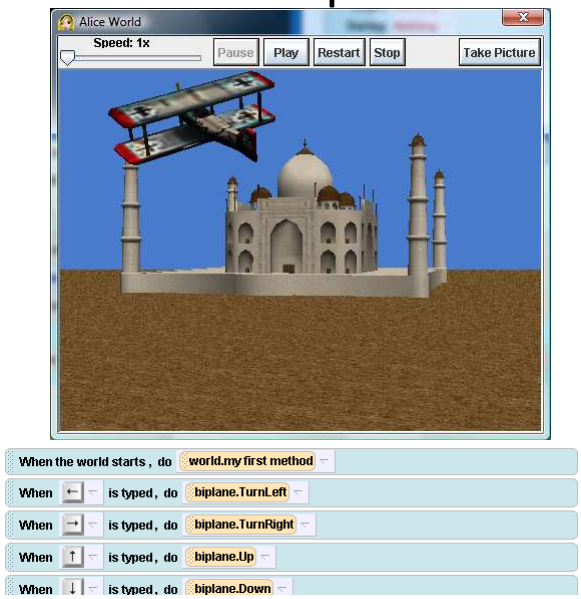
- Create keyboard control for a biplane
  - Up turns backward, down turns forward, left turns left, right turns right
  - Loop for always moving forward



Create Methods and Events

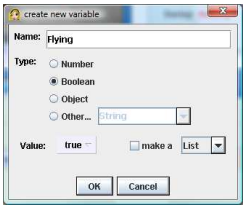
- Create separate methods for turning left, right, up, and down
- Click create new event to create an event and pick the method and key that will activate the method
- Complete the events to control the biplane
  - Can experiment with rolling

Example



To Do:

- Add another event that completes a barrel roll when the spacebar is pressed
- Simulate a plane crash into the building
  - Create a new Biplane variable under its Properties named “Flying” and set to True
  - While true, the plane is flying, if false, it has crashed



Plane Crash

- In the world method, the plane should only go forward if it is flying

- Make a new biplane method, Crashed, that moves the plane to the ground and sets flying to false

Plane Crash

- Add event : while some condition, do event handler. In this case, crash if the plane is close enough to the building

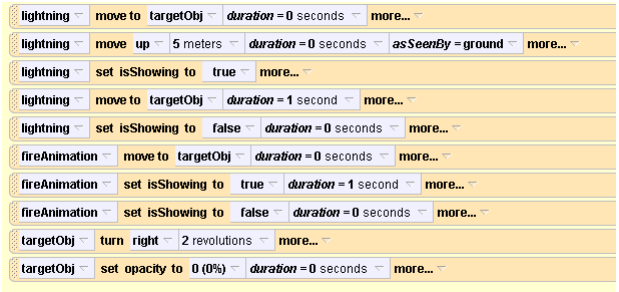
Events and Parameters

- Event handlers can also take parameters, just like any other method
- For example, we can create a method that takes an Object parameter, then the object to send in can be specified in the Event
- Example: Zap Euripides and Socrates with lightning when clicked
  - Add Euripides, Socrates, Lightning, Animated Fire but set lightning and fire's visible property to false

Lightning

- Create a world method, LightningZap
  - Should take a parameter, the object to zap
  - Position the lightning above the object
  - Make the lightning visible
  - Move the lightning to the object
  - Make the lightning not visible
  - Move the fire to the object
  - Make the fire visible
  - Make the fire invisible
  - Make the object spin and disappear

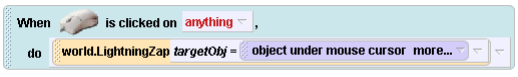
LightningZap Method



Can test by invoking it from the Main method

Using LightningZap in a Click Event

- Create a new click event for whatever the mouse is under
- Send in the object clicked as the parameter for LightningZap



Class Exercise

- Penguin Slide
  - Create a world with a lake scene and three penguins. Allow the user to click on a penguin and make it slide down the slope into the water then disappear. Add a parameter to control how many times the penguin spins as it slides.
  - Hint: Use an invisible object as the target