JavaScript and AJAX
2nd Edition

Tutorial 11

Exploring Object-Based Programming

Objectives

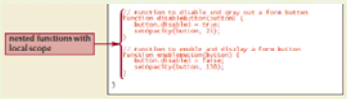
- Explore nested functions
- Use the base object
- Create a custom object
- Define object properties and methods
- Explore associative arrays
- Define an object class
- Define an object from a customized class

Objectives (cont'd)

- Work with object prototypes
- Explore prototypal inheritance
- Work with the apply() and call() methods
- Explore the function object
- Test for valid function arguments
- Use the arguments variable

Working with Nested Functions

- Use nested functions
  - To write code that controls the action and appearance of buttons
  - To limit a function to a local scope
    - Makes it invisible to any code outside of the containing function



Types of Executable Code Supported by JavaScript

Global code	• Lies outside of a function • Automatically executed when encountered by the browser • Has global scope
Function code	• Any code placed within a function • Must be called to be executed • Can be either local or global in scope, depending on whether the function is nested within another function
Eval code	• Any code passed to the browser using the eval() function • Scope is limited within the eval() function itself • Syntax: eval(*string*) • Used when an application needs to create executable code during run time

Introducing Custom Objects

- Three kinds of JavaScript objects:
  - **Native objects**
  - **Host objects**
  - **Custom objects (user-defined objects)**
- **Object constructor** or **constructor:** Function that defines every object in JavaScript
- **Object class:** The definition itself
- **Object instance** or **instance:** A specific case of an object class
- **Instantiating** an object: Creating an object from an object class

Introducing Custom Objects

- All JavaScript objects are derived from a single fundamental **base object**
- Properties and methods of a base object:

Property or Method		Description
Property	*object*.constructor	Returns a reference to the constructor function of *object*
Method	*object*.hasOwnProperty(*prop*)	Returns a Boolean value indicating whether *object* supports the property *prop*
	object.isPrototypeOf(*object2*)	Returns a Boolean value indicating whether *object2* is an instance of *object*
	object.propertyIsEnumerable(*prop*)	Returns a Boolean value indicating whether the *prop* property of *object* is enumerable and can be used in a for...in loop
	object.toString()	Returns the type of *object* as the text string [object *Class*] where *Class* is the name of the object's constructor function
	object.valueOf()	Returns the value of *object* either as a text string, number, Boolean value, undefined, or null

Introducing Custom Objects

- Defining an object property
  - To apply a property to an instance of a custom object:
    object.property = *value*;
- Defining an object method
  - To create a custom method, associate the method with a function:
    object.method = *function*

Understanding Objects and Associative Arrays

- To access an object property or method:
  - Use the *object.property* and *object.method*() syntax,
    - or -
  - Treat any object name as an array and the name of a property or method as a value within that array

Understanding Objects and Associative Arrays

- **Associative array**
  - Contains a collection of keys, each associated with a value or set of values (vs. **index arrays,** in which array values are identified by their index number)
  - Provides compact way to define an object using an **object literal**
- **Encapsulation**
  - Ensures that functions defined for a custom object will not conflict with functions defined elsewhere in the application because scope of the function is local to object constructor

Understanding Objects and Associative Arrays

- Associative arrays contain items that are not indexed; you cannot loop through contents of an array using a counter variable; instead, use the for ... in structure:

```
for (key in array) {
commands
}
```


Understanding Objects and Associative Arrays

- To define a custom object drawn from the base object:

```
var newObject = new Object() {
this.property = value;
this.method = function;
...
}
```

- To define a custom object as an object literal:

```
var newObject = {
property : value,
method : function,
...
}
```

Creating an Object Class

- To define a class of objects, enter constructor function:

```
function object() {
this.prop1 = value1;
this.prop2 = value2;
...
this.method1 = function1;
this.method2 = function2;
...
}
```

- To instantiate an object from an object class:

```
var newObject = new object();
```


Working with Object Prototypes

- The **prototype** property stores an object that acts as a template for all new object instances created by the constructor
- To reference a prototype:

```
object.prototype
```

- To apply a property to an object prototype:

```
object.prototype.property = value;
```

- To apply a method to an object prototype:

```
object.prototype.method = function;
```


Working with Object Prototypes

- The prototype property
  - Can be used with native JavaScript objects (Array, Date, and String)
  - Allows you to extend JavaScript objects by creating customized properties and methods for them

Working with Object Prototypes

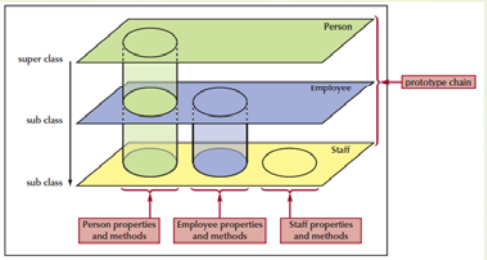
Public method	• Publically available • Can be made at any time using object's prototype
Private method	• Accessible only within object itself and not outside of that object • Can be made only within constructor function itself
Privileged method	• Able to access private variables and methods, but is itself accessible to the public • Relies on the value returned by calling the private getFilename() function • Can be made only within constructor function itself

Working with Object Prototypes

- Creating **prototypal inheritance**
  - All native JavaScript objects are derived from a single base object; any object can act as a base for new object classes through the use of prototypes
  - To create a **prototype chain:**
    - Specify each object prototype as an instance of the object above it in the class hierarchy
    - Define the relationship between the object classes (order is important; start at the top of the hierarchy and move down to the lower sub classes)

Working with Object Prototypes

- Creating prototypal inheritance



Adding a Property to a Prototype

- A custom property can store a document element using the expression:

  object.property = document.createElement-(*elem*)

The Changing Context of the `this` Keyword

- Common source of error when working with custom methods and nested functions is failure to keep track of the changing context of the `this` keyword
- The `this` keyword always refers to the current object, usually the object that initiated the function or method
- Limit use of the `this` keyword for non-nested functions or for situations where its context is completely clear

Developing More Custom Properties and Methods

- Applying and calling a function
  - To apply a function or method to an object, use the apply() method:

    function.apply(*thisObj*, *argArray*)
  - To call a function or method for use with an object, run:

    function.call(*thisObj*, *arg1*, *arg2*, *arg3*, ...)

Exploring the Function Object

- Supports its own collection of properties and methods
- Use properties of the Function object to return information about constructors

Properties and Methods		Description
Property	*function*.name	Returns the name of the function, *function* (not currently supported by Internet Explorer or Opera)
	function.caller	Returns the function that called *function* (not currently supported by Opera)
	function.length	Returns the number of arguments expected by *function*
Method	*function*.apply(*thisObj*, *thisArray*)	Applies *function* to *thisObj* using argument values stored in the array, *thisArray*
	function.call(*thisObj*, *arg1*, *arg2*, ...)	Applies *function* to *thisObj* using arguments in the list *arg1*, *arg2*, ...
	function.toString()	Returns the code of *function* as a text string

Exploring the Function Object

- Function object also includes an arguments variable that:
  - Returns detailed information about the parameter values passed to the function
  - Is similar to an array, although its contents cannot be modified or added to
  - Is only accessible within the function body, not outside of it
  - Properties of the arguments variable

Property	Description
arguments.length	Returns number of arguments passed into the function
arguments.callee	Returns a reference to the current function
arguments.caller	Returns a reference to the function that called the current function

Exploring the Function Object

- Testing for errors
  - Use the arguments variable to verify that the correct number of parameter values have been passed to a function
    - If the number of values does not match the expected length, user can be alerted
  - Use the arguments variable to test the data type of each value passed to a function against a required data type
    - Data types can be tested in two ways: typeof() method and constructor property

Exploring the Function Object

- To return the data type of a variable as a text string:
  typeof(*variable*)
- To return the constructor of a variable:
  variable.constructor