



JavaScript Basics & HTML DOM

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- Acknowledgments
 - > The contents of this presentation was created from JavaScript tutorial from www.w3cschools.com

Topics

- What is and Why JavaScript?
- How and Where do you place JavaScript code?
- JavaScript language
- JavaScript functions
- JavaScript events
- JavaScript objects
- JavaScript HTML DOM objects
- Closure (need to be added)

What is and Why JavaScript?

What is JavaScript?

- Was designed to add interactivity to HTML pages
- Is a scripting language (a scripting language is a lightweight programming language)
- JavaScript code is usually embedded directly into HTML pages
- JavaScript is an interpreted language (means that scripts execute without preliminary compilation)

What can a JavaScript do?

- JavaScript gives HTML designers a programming tool
- JavaScript can put dynamic text into an HTML page
- JavaScript can react to events
- JavaScript can read and write HTML elements
- JavaScript can be used to validate input data
- JavaScript can be used to detect the visitor's browser
- JavaScript can be used to create cookies

How and Where Do You Place JavaScript Code?

How to put a JavaScript code into an HTML page?

- Use the `<script>` tag (also use the `type` attribute to define the scripting language)

```
<html>
<head>
<script type="text/javascript">
...
</script>
</head>
<body>
<script type="text/javascript">
...
</script>
</body>
</html>
```

Where Do You Place Scripts?

- Scripts can be in the either `<head>` section or `<body>` section
- Convention is to place it in the `<head>` section

```
<html>  
<head>  
  <script type="text/javascript">  
  ....  
</script>  
</head>
```

Referencing External JavaScript File

- Scripts can be provided locally or remotely accessible JavaScript file using *src* attribute

```
<html>
<head>
<script language="JavaScript"
        type="text/javascript"
        src="http://somesite/myOwnJavaScript.js">
</script>
<script language="JavaScript"
        type="text/javascript"
        src="myOwnSubdirectory/myOwn2ndJavaScript.js">
</script>
```

JavaScript Language

JavaScript Variable

- You create a variable with or without the **var** statement

```
var strname = some value
```

```
strname = some value
```

- When you declare a variable within a function, the variable can only be accessed within that function
- If you declare a variable outside a function, all the functions on your page can access it
- The lifetime of these variables starts when they are declared, and ends when the page is closed

JavaScript Popup Boxes

- Alert box
 - > User will have to click "OK" to proceed
 - > `alert("sometext")`
- Confirm box
 - > User will have to click either "OK" or "Cancel" to proceed
 - > `confirm("sometext")`
- Prompt box
 - > User will have to click either "OK" or "Cancel" to proceed after entering an input value
 - > `prompt("sometext","defaultvalue")`

JavaScript Language

- Conditional statement
 - > if, if.. else, switch
- Loop
 - > for loop, while loop
- try...catch
- throw

JavaScript Functions (which behave like Java methods)

**More on Functions
in other Presentation**

JavaScript Functions

- A JavaScript function contains some code that will be executed only by an event or by a call to that function
 - > To keep the browser from executing a script as soon as the page is loaded, you can write your script as a function
- You may call a function from anywhere within the page (or even from other pages if the function is embedded in an external .js file).
- Functions can be defined either `<head>` or `<body>` section
 - > As a convention, they are typically defined in the `<head>` section

Example: JavaScript Function

```
<html>
<head>
<script type="text/javascript">
  // If alert("Hello world!!") below had not been written within a
  // function, it would have been executed as soon as the page gets loaded.
  function displaymessage() {
    alert("Hello World!")
  }
</script>
</head>

<body>
<form>
<input type="button" value="Click me!"
onclick="displaymessage()" >
</form>
</body>
</html>
```

JavaScript Events

Events & Event Handlers

- Every element on a web page has certain events which can trigger invocation of event handlers
- Attributes are inserted into HTML tags to define events and event handlers
- Examples of events
 - > A mouse click
 - > A web page or an image loading
 - > Mousing over a hot spot on the web page
 - > Selecting an input box in an HTML form
 - > Submitting an HTML form
 - > A keystroke

Events

- onabort - Loading of an image is interrupted
- **onblur** - An element loses focus
- onchange - The content of a field changes
- **onclick** - Mouse clicks an object
- ondblclick - Mouse double-clicks an object
- onerror - An error occurs when loading a document or an image
- onfocus - An element gets focus
- onkeydown - A keyboard key is pressed

Events

- onkeypress - A keyboard key is pressed or held down
- onkeyup - A keyboard key is released
- onload - A page or an image is finished loading
- onmousedown - A mouse button is pressed
- onmousemove - The mouse is moved
- onmouseout - The mouse is moved off an element
- onmouseover - The mouse is moved over an element
- onmouseup - A mouse button is released

Events

- onreset - The reset button is clicked
- onresize - A window or frame is resized
- onselect - Text is selected
- **onsubmit** - The submit button is clicked
- onunload - The user exits the page

onload & onUnload Events

- The *onload* and *onUnload* events are triggered when the user enters or leaves the page
- The *onload* event is often used to check the visitor's browser type and browser version, and load the proper version of the web page based on the information
- Both the *onload* and *onUnload* events are also often used to deal with cookies that should be set when a user enters or leaves a page.

onFocus, onBlur and onChange

- The onFocus, onBlur and onChange events are often used in combination with validation of form fields.
- Example: The *checkEmail()* function will be called whenever the user changes the content of the field:

```
<input type="text" size="30"  
id="email" onchange="checkEmail()">
```

Example & Demo: onblur

```
<html>
<head>
<script type="text/javascript">
  function upperCase() {
    var x=document.getElementById("fname").value
    document.getElementById("fname").value=x.toUpperCase()
  }
</script>
</head>

<body>

Enter your name:
<input type="text" id="fname" onblur="upperCase()">

</body>
</html>
```

onSubmit

- The *onSubmit* event is used to validate all form fields before submitting it.
- Example: The *checkForm()* function will be called when the user clicks the submit button in the form. If the field values are not accepted, the submit should be canceled. The function *checkForm()* returns either *true* or *false*. If it returns true the form will be submitted, otherwise the submit will be cancelled:

```
<form method="post" action="xxx.html"  
onsubmit="return checkForm()">
```

Example & Demo: onSubmit

```

<html>
<head>
<script type="text/javascript">
    function validate() {
        // return true or false based on validation logic
    }
</script>
</head>

<body>
    <form action="tryjs_submitpage.htm" onSubmit="return validate()">
        Name (max 10 characters): <input type="text" id="fname" size="20"><br />
        Age (from 1 to 100): <input type="text" id="age" size="20"><br />
        E-mail: <input type="text" id="email" size="20"><br />
        <br />
        <input type="submit" value="Submit">
    </form>
</body>
</html>

```

onMouseOver and onMouseOut

- onMouseOver and onMouseOut are often used to create "animated" buttons.
- Below is an example of an onMouseOver event. An alert box appears when an onMouseOver event is detected:

```
<a href="http://www.w3schools.com"  
onmouseover="alert('An onMouseOver event');return false">  
  
</a>
```

JavaScript Objects

JavaScript Object

- JavaScript is an Object Oriented Programming (OOP) language
- A JavaScript object has properties and methods
 - > Example: *String* JavaScript object has *length* property and *toUpperCase()* method

```
<script type="text/javascript">
```

```
var txt="Hello World!"  
document.write(txt.length)  
document.write(txt.toUpperCase())
```

```
</script>
```

JavaScript Built-in Objects

- String
- Date
- Array
- Boolean
- Math

JavaScript Object vs. Java Object

- Similarities
 - > Both has properties and methods
- Differences
 - > JavaScript object can be dynamically typed while Java object is statically typed
 - > In JavaScript, properties and methods are dynamically added

JavaScript Objects; 3 Different Ways of Creating JavaScript Objects

Creating Your Own JavaScript Objects

- 3 different ways
 - > Create a direct instance of an object by using built-in constructor for the *Object* class
 - > Create a template (Constructor) first and then create an instance of an object from it
 - > Create object instance as Hash Literal

Option 1: Creating a Direct Instance of a JavaScript Object

- By invoking the built-in constructor for the Object class

```
personObj=new Object(); // Initially empty with no properties or methods
```

- Add properties to it

```
personObj.firstname="John";  
personObj.age=50;
```

- Add an anonymous function to the *personObj*

```
personObj.tellYourage=function(){  
    alert("This age is " + this.age);  
}
```

```
// You can call then tellYourage function as following  
personObj.tellYourage();
```

Option 1: Creating a Direct Instance of a JavaScript Object

- Add a pre-defined function

```
function tellYourage(){  
    alert("The age is" + this.age);  
}  
personObj.tellYourage=tellYourage;
```

- Note that the following two lines of code are doing completely different things

```
// Set property with a function  
personObj.tellYourage=tellYourage;  
// Set property with returned value of the function  
personObj.tellYourage=tellYourage();
```

Option 2: Creating a template of a JavaScript Object

- The template defines the structure of a JavaScript object in the form of a function
- You can think of the template as a constructor

```
function Person(firstname,lastname,age,eyecolor) {  
    this.firstname=firstname;  
    this.lastname=lastname;  
    this.age=age;  
    this.tellYourage=function(){  
        alert("This age is " + this.age);  
    }  
}
```

Option 2: Creating a template of a JavaScript Object

- Once you have the template, you can create new instances of the object

```
myFather=new Person("John","Doe",50,"blue");
myMother=new Person("Sally","Rally",48,"green");
```
- You can add new properties and functions to new objects

```
myFather.newField = "some data";
myFather.myfunction = function() {
alert(this["fullName"] + " is " + this.age);
}
```

Option 3: Creating JavaScript Object as a Hash Literal

- Create *personObj* JavaScript object

```
var personObj = {  
    firstname: "John",  
    lastname: "Doe",  
    age: 50,  
    tellYourage: function () {  
        alert("The age is " + this.age );  
    }  
    tellSomething: function(something) {  
        alert(something);  
    }  
}
```

```
personObj.tellYourage();
```

```
personObj.tellSomething("Life is good!");
```

JavaScript Objects: Hash (**Associative Array**)

JavaScript Object is an Associative Array (Hash)

- A JavaScript object is essentially an associative array (hash) with fields and methods, which are keyed by name

```
{
  firstname: "John",
  lastname: "Doe",
  age: 50,
  tellYourage: function () {
    alert("The age is " + this.age );
  },
  tellSomething: function(something) {
    alert(something);
  }
}
```

- The following two lines of code are semantically equivalent

```
myObject.myfield = "something";
myObject['myfield'] = "something";
```

JavaScript Objects: Classes, Objects, Inheritance

JavaScript has No built-in concept of Inheritance

- JavaScript has a concept of objects and classes (like in Java) but no built-in concept of inheritance (unlike in Java)
 - > Every JavaScript object is really an instance of the same base class, a class that is capable of binding member fields and functions to itself at runtime

JavaScript Objects: **prototype**

prototype

- A prototype is a property of every JavaScript object
- Functions and properties can be associated with a constructor's property
- When a function is invoked with *new* keyword, all properties and methods of the prototype for the function are attached to the resulting object

prototype

```
// Constructor of the MyObject
function MyObject(name, size){
    this.name=name;
    this.size=size;
}
// Add a function to the prototype
MyObject.prototype.tellSize=function{
    alert("size of " + this.name+" is " + this.size);
}

// Create an instance of the object. The new object has tellSize() method.
var myObj=new MyObject("Sang", "30 inches");
myObj.tellSize();
```

JavaScript Objects: Functions Again

A function is a first-class JavaScript Object

- Functions are a bit like Java methods
 - > They have arguments and return values
- A function is a first-class object in JavaScript (unlike in Java)
 - > Can be considered as a descendant of Object
 - > Can do everything a regular JavaScript object can do such as storing properties by name
 - > Function objects can have other function objects as methods

A function can take Variable arguments

- You can call *myfunction()* or *myfunction(20)*

```
function myfunction(value){  
    if (value){  
        this.area=value;  
    }  
    return this.area;  
}
```

JavaScript Objects: **Context**

HTML DOM Objects

HTML DOM

- The HTML DOM defines a standard set of objects for HTML, and a standard way to access and manipulate HTML documents
- All HTML elements, along with their containing text and attributes, can be accessed through the DOM.
 - > The contents can be modified or deleted, and new elements can be created.
- The HTML DOM is platform and language independent
 - > It can be used by any programming language like Java, JavaScript, and VBScript

HTML DOM Objects

- Anchor object
- Document object
- Event object
- Form and Form Input object
- Frame, Frameset, and IFrame objects
- Image object
- Location object
- Navigator object

HTML DOM Objects

- Option and Select objects
- Screen object
- Table, TableHeader, TableRow, TableData objects
- Window object

Document Object

Document Object: Write text to the output

```
<html>
```

```
<body>
```

```
<script type="text/javascript">
```

```
document.write("Hello World!")
```

```
</script>
```

```
</body>
```

```
</html>
```

Document Object: Write text with Formatting to the output

```
<html>
```

```
<body>
```

```
<script type="text/javascript">
```

```
    document.write("<h1>Hello World!</h1>")
```

```
</script>
```

```
</body>
```

```
</html>
```

Document Object: Use getElementById()

```
<html>
```

```
<head>
```

```
<script type="text/javascript">
```

```
  function getElement() {
```

```
    var x=document.getElementById("myHeader")
```

```
    alert("I am a " + x.tagName + " element")
```

```
  }
```

```
</script>
```

```
</head>
```

```
<body>
```

```
<h1 id="myHeader" onclick="getElement()">Click to see what element I am!</h1>
```

```
</body>
```

```
</html>
```

Document Object: Use getElementsByTagName()

```
<html>
<head>
<script type="text/javascript">
  function getElements() {
    var x=document.getElementsByTagName("myInput")
    alert(x.length + " elements!")
  }
</script>
</head>
```

```
<body>
<input name="myInput" type="text" size="20"><br />
<input name="myInput" type="text" size="20"><br />
<input name="myInput" type="text" size="20"><br />
<br />
<input type="button" onclick="getElements()" value="How many elements named
  'myInput'?">
</body>
</html>
```

Document Object: Return the innerHTML of the first anchor in a document

```
<html>
<body>

<a name="first">First anchor</a><br />
<a name="second">Second anchor</a><br />
<a name="third">Third anchor</a><br />
<br />
```

InnerHTML of the first anchor in this document:

```
<script type="text/javascript">
  document.write(document.anchors\[0\].innerHTML)
</script>

</body>

</html>
```

Document Object: Access an item in a collection

```
<html>
<body>
<form id="Form1" name="Form1">
Your name: <input type="text">
</form>
<form id="Form2" name="Form2">
Your car: <input type="text">
</form>
```

```
<p>
To access an item in a collection you can either use the number or the name of the item:
</p>
```

```
<script type="text/javascript">
document.write("<p>The first form's name is: " + document.forms[0].name + "</p>")
document.write("<p>The first form's name is: " + document.getElementById("Form1").name
+ "</p>")
</script>
```

```
</body>
</html>
```

Event Object

Event Object: What are the coordinates of the cursor?

```
<html>
<head>
<script type="text/javascript">
  function show_coords(event) {
    x=event.clientX
    y=event.clientY
    alert("X coords: " + x + ", Y coords: " + y)
  }
</script>
</head>
```

```
<body onmousedown="show_coords(event)">
<p>Click in the document. An alert box will alert the x and y coordinates of the
  cursor.</p>
</body>

</html>
```

Event Object: What is the unicode of the key pressed?

```
<html>
<head>
<script type="text/javascript">
  function whichButton(event) {
    alert(event.keyCode)
  }
```

```
</script>
</head>
```

```
<body onkeyup="whichButton(event)">
<p><b>Note:</b> Make sure the right frame has focus when trying this example!</p>
<p>Press a key on your keyboard. An alert box will alert the unicode of the key
  pressed.</p>
</body>
```

```
</html>
```

Event Object: Which element was clicked?

```
<html>
<head>
<script type="text/javascript">
function whichElement(e) {
    var targ
    if (!e) var e = window.event
    if (e.target) targ = e.target
        else if (e.srcElement) targ = e.srcElement
    if (targ.nodeType == 3) // defeat Safari bug
        targ = targ.parentNode
    var tname
    tname=targ.tagName
    alert("You clicked on a " + tname + " element.")
}
</script>
</head>
```

```
<body onmousedown="whichElement(event)">
<p>Click somewhere in the document. An alert box will alert the tag name of the element you clicked on.</p>
```

```
<h3>This is a header</h3>
<p>This is a paragraph</p>

</body>
```

```
</html>
```

Event Object: Which event type occurred?

```
<html>  
<head>
```

```
<script type="text/javascript">  
  function whichType(event) {  
    alert(event.type)  
  }  
</script>  
</head>
```

```
<body onmousedown="whichType(event)">
```

```
<p>  
Click on the document. An alert box will alert which type of event occurred.  
</p>
```

```
</body>  
</html>
```

JavaScript Basics

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