COMP284 Scripting Languages
Lecture 17 - JavaScript (Part 4)
Handouts

Department of Computer
School of Electrical Engineering, Electronics, an
University of Liverpo

Contents

Window and Document objects

JavaScript provides two objects that are essential to the creation of dynamic web pages and interactive web applications:

window object

- a JavaScript object that represents a browser window or tab
- auto
  <fra
- allows
  ⇝ JavaScript provides methods that allow win
  created and manipulated
  Example: window.open('http://www.c
- whenever an object method or property is referenced in a script without an object name and dot prefix it is assumed by JavaScript to be a member of the window object

  Example: We can write `alert()` instead of `window.alert()`

Window object

- A window object represents an open window in a browser.
- If a document contain frames, then there is
  - one window object, `window`, for the HTML document
  - and one additional window object for each frame,
    acce
- A wind

`doc`	
`history`	history object for the windo
`location`	location object (current U
`navigator`	navigator (web browser) o
`opener`	reference to the window tha
`innerHeight`	inner height of a window's content area
`innerWidth`	inner width of a window's content area
`closed`	boolean value indicating whether the window is (still) open

Navigator object

Properties of a navigator object include

navigator.appName	the web brower's name
navigator.appVersion	the web browers version

Example: Load different style sheets depending on browser

```
<html><he
<script type
if (navigato
  document.writeln('<link rel=stylesheet type="text/css" '+
                   href="Netsc
} else if (navigator.appName == 'Opera') {
  document.writeln('<link rel=stylesheet type="text/cs
                   href="Oper
} else {
  document.writeln('<link rel=stylesheet type="text/css" '+
                   href="Others.css">')
}
</script></head>
```

Window object

Methods provided by a window object include

- `open(url, name [, features])`
  - opens a new browser window/tab
  - returns a reference to a window object
  - *url*
  - *nam*
  - *fea*

The standard sequence for the creation of a new windo


```
// new instance of 'Window' class
var newWin = new Window(...)
newWin.document.write('<html>...</html>')
```

instead it is

```
// new window created by using 'open' with an existing one
var newWin = window.open(...)
newWin.document.write('<html>...</html>')
```

Window object

Methods provided by a window object include

- `close()`
  - closes a browser window/tab
- `focus()`
  - give f
- `blur`
  - rem
- `print()`
  - prints (sends to a printer) the contents of the current wi

Window object: Example

```
<html><head><title>Window handling</title>
<script type="text/javascript">
function Help() {
  var OutputWindow = window.open('','Help','resizable=1')
    with (OutputWindow.document) {
      open()
      wri
      </h
      mes
      pag
      close()
    }
}
</script></head><body>
<form name="ButtonForm" id="ButtonForm" action="">
<p>
  <input type="button" value="Click for Help"
          onclick="Help();">
</p>
</form></body></html>
```

Window object: Dialog boxes

- Often we only want to open a new window in order to
  - display a message
  - ask for confirmation of an action
  - request an input

- For the pre-d (windows for simple dialogs):
  - `null alert(message_string)`
  - `bool confirm(message_string)`
  - `string prompt(message_string, default)`

Window object: Dialog boxes

- `null alert(message_string)`
  - creates a message box displaying *message_string*
  - the box contains an 'OK' button that the user will have to click (alternatively, the message box can be closed)
    for the execution of the remaining code to proceed


```
alert(
```

Window object: Dialog boxes

- `bool confirm(message_string)`
  - creates a message box displaying *message_string*
  - the box contains two buttons 'Cancel' and 'OK'
  - the function returns `true` if the user selects 'OK', `false` otherwise

Exam

```
var answe = c
```

Window object: Dialog boxes

- `string prompt(message_string, default)`
  - creates a dialog box displaying *message_string* and an input field
  - if a sec
    is giv
    sho
  - the b
    'Cancel' and 'OK'
  - if the user selects 'OK' then the current value entered in the input field is returned as a string, otherwise `null` is returned

Example:

```
var userName =
  prompt("What is your name?",
```

Window object: Dialog boxes

- `prompt()` always returns a string, even if the user enters a number
- To convert a string to number the following functions can be used:
  - `number parseInt(string [, base])`
    - converts *string* to an integer number wrt numeral system *base*
    - onl
    - if the s `NaN`
  - `nu`
    - converts *string* to a floating-point number
    - only converts up to the first invalid character in
    - if the first non-whitespace character in `NaN`
  - `number Number(string)`
    - returns `NaN` if *string* contains an invalid character

Dialog boxes: Example

```
<html>
 <head><title>Interaction example</title></head>
<body>
<script type="text/javascript">
do {
  string   = prompt("How many items do you want to buy?")
  quanti
} while (isNaN
do {
  string = pr
  price  = parseFloat(string)
} while (isNaN(price) || price <= 0)
buy = confirm("You will have to pa"+
              (price*quantity).toFixed(2)+
              "\nDo you want to proceed?")
if (buy) alert("Purchase made")
</script>
</body></html>
```


http://cgi.csc.liv.ac.uk/~ullrich/COMP284/examples/jsPrompt.html

User input validation

- A common use of JavaScript is the validation of user input in a HTML form before it is processed:
  - check that required fields have not been left empty
  - check that fields only contain allowed characters or com
  - che


```
<form method=
      on
  <label>User name:     <input type="text" name="user"></label>
  <label>Email address: <input type="text" name="email"></label>
  <input type="submit" name="submit">
</form>
<script>
function validate(form) {
  fail  = validateUser(form.user.value)
  fail += validateEmail(form.email.value)
  if (fail == "") return true
  else { alert(fail); return false } }
</script>
```

User input validation

```
1  function validateUser(field) {
2    if (field == "") return "No username entered\n"
3    else if (field.length < 5)
4      return "Username too short\n"
5    else if (/[^a-zA-Z0-9_-]/.test(field))
6      r
7    else r
8  }
9
10 function validateEmail(field) {
11   if (field == "") return "No email entered\n"
12   else if (!((field.indexOf(".") > 0) &&
13             (field.indexOf("@") > 0)) ||
14            /[^a-zA-Z0-9.@_-]/.test(field))
15     return "Invalid character in email\n"
16   else return ""
17 }
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP284/examples/jsValidate.html

Window and Document objects

JavaScript provides two objects that are essential to the creation of dynamic web pages and interactive web applications:

document object

- an object-oriented representation of a web page (HTML document) that is displ
- allows i

Exam

Document Object Model

A platform- and language-neutral interface that all scripts to dynamically access and update the content, structure and style of HTML, XHTML and XML documents

Document Object Model

Example:

The HTML table below is parsed into the following DOM

```
<table>
  <tbody>
    <tr>
      <td>Shady Grove</td>
      <td
    </tr>
    <tr>
      <td
      <td>Dorian</td>
    </tr>
  </tbody>
</table>
```


Arnaud Le Hors, et al, editors: Document Object Model (DOM) Level 3 Core Specification, Version 1.0, W3C Recommendation 07 April 2004. World Wide Web Consortium, 2004. https://www.w3.org/TR/DOM-Level-3-Core/ [accessed 9 January 2017]

Accessing HTML elements: Object methods

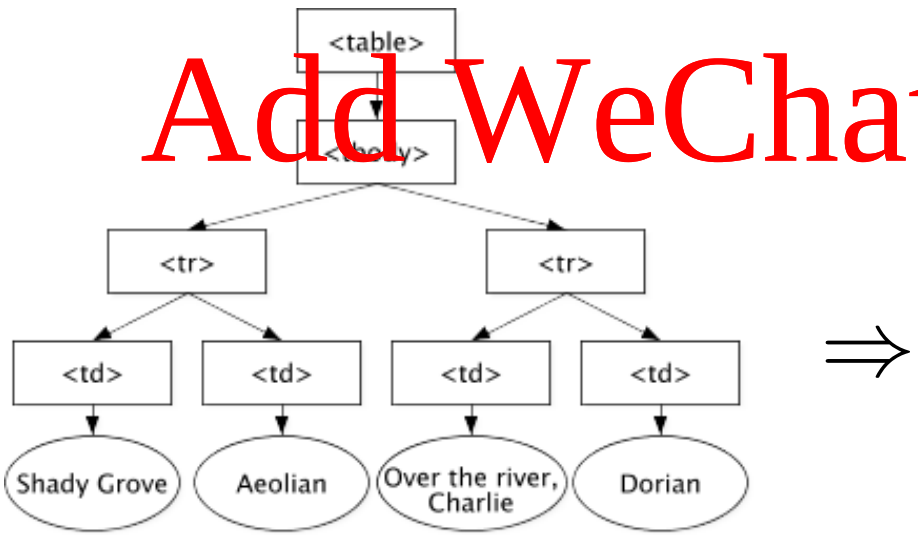
Example:

```
// access the tbody element from the table element
var myTbodyElement = myTableElement.firstChild;

// access its second tr element; the list of children starts at 0 (not 1).
var mySecondTrElement = myTbodyElement.childNodes[1];

// remove its first td el
mySecondTrEl

// change the text con
mySecondTrElement.firstChild.firstChild.data = "Peter";
```

⇒

Accessing HTML elements: Names (1)

Instead of using methods such as `firstChild` and `childNodes[n]`, it is possible to assign names to denote the children of a HTML element

Example:

```
<form name="form1" action="">
<label>Temperature in Fahrenheit:</label>
<input type="
<label>Tem
<input type='
</form>
```


Then – `document.form1`
Refers to the whole form

- `document.form1.celsius`
  Refers to the text field named `celsius` in `document.form1`
- `document.form1.celsius.value`
  Refers to the attribute `value` in the text field named `celsius` in `document.form1`

Accessing HTML elements: Names (2)

Accessing HTML elements by giving them names and using paths within the Document Object Model tree structure is still problematic

- If that tree structure changes, then those paths no longer work.

Example:

Changin

```
<form name="f
<div clas="f
<label>Tem
<input type="text" name ="fahrenheit" size=10 value="0" />
</div>
<div clas="field" name="cdiv">
<label>Temperature in Celsius:</label>
<input type="text" name="celsius"      size="10" value="" />
</div>
</form>
```


means that `document.form1.celsius` no longer works as there is now a `div` element between form and text field, we would now need to use `document.form1.cdiv.celsius`

Accessing HTML elements: IDs

A more reliable way is to give each HTML element an ID (using the `id` attribute) and to use `getElementById` to retrieve a HTML element by its ID

Example:

```
<form id="for
<label>Tem
<input type="
<label>Tem
<input type="
</form>
```


Then

- `document.getElementById('celsius`
  Refers to the HTML element with ID `celsius` `document`
- `document.getElementById('celsius').value`
  Refers to the attribute `value` in the HTML element with ID `celsius` in `document`

Manipulating HTML elements

It is not only possible to access HTML elements, but also possible to change them on-the-fly

```
<html><head><title>Manipulating HTML elements</title>
<style>
  td.RedBG { background: #f00; }
</style>
<script>
function chang
  document
  document
}
function changeBackground2(id) {
  document.getElementById(id).cell.className = "RedBG";
  document.getElementById(id).cell.innerHTML = "red";
}
</script></head><body>
<table border="1"><tr>
 <td id="0" onclick="changeBackground1('0');">white</td>
 <td id="1" onclick="changeBackground2('1');">white</td>
</tr></table></body></html>
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP284/examples/jsBG.html

Event-driven JavaScript Programs

- The JavaScript programs we have seen so far were all executed sequentially
  - programs have a particular starting point
  - programs are executed step-by-step, invo
  - pro

Event-Driven JavaScript Programs

- Web applications are event-driven
  ⇝ they react to events such as mouse clicks and key strokes

nickywalters: What is Event Driven Programming?
SlideShare, 7 September 2014.
https://tinyurl.com/ya58xbs9 [accessed 5/11/2017]

- With JavaScript,
  – we can define event handler functions for a wide variety of events
  – event handler functions can manipulate the `document` object (changing the web page in situ)

Event Handlers and HTML Elements

- HTML events are things, mostly user actions, that happen to HTML elements
- Event handlers are JavaScript functions that process events
- Event handlers must be associated with HTML elements for specific event
- This ca

```
<input ty
```

- Alternatively, a JavaScript function can be used to HTML element

```
// All good browsers
window.addEventListener("load", Hello)
// MS IE browser
window.attachEvent("onload", Hello)
```

More than one event handler can be added this way to the same element for the same event

Event Handlers and HTML Elements

- As our scripts should work with as many browsers as possible, we need to detect which method works:

```
if (window.addEventListener) {
    window.addEventListener("load", Hello)
} else {
    wi
}
```


- Event h


```
if (window.removeEventListener) {
    window.removeEventListener("load"  Hello)
} else {
    window.detachEvent("onload", Hello)
}
```

Events: Load

- An (on)load event occurs when an object has been loaded
- Typically, event handlers for onload events are associated with the window object or the body element of an HTML document


```
<html>
  <head>
    <ti
    <sc

    </script>
  </head>
  <body onload="Hello()">
    <p>Content of the web page</p>
  </body>
</html>
```


http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/jsOnload.html

Events: Focus / Change

- A focus event occurs when a form field receives input focus by tabbing with the keyboard or clicking with the mouse
  - ⇝ onFocus attribute
- A change event occurs when a select, text, or textarea field loses focus and its v
  - ⇝ on

Example


```
<form name="form1" method="post" action="process.php">
  <select name="select" required
          onChange="document.form1.submit();">
    <option value="">Select a name</option>
    <option value="200812345">Tom Beck</option>
    <option value="200867890">Jim Kent</option>
  </select>
</form>
```

Events: Focus / Change

- A focus event occurs when a form field receives input focus by tabbing with the keyboard or clicking with the mouse
  ⇝ onFocus attribute
- A change event occurs when a select, text, or textarea field loses focus and its value has been modified
  ⇝ on


```
<form>
<label>Temperature in Fahrenheit:</label>
<input type="text" id="fahrenheit" size="10" value="0"
 onchange="document.getElementById('celsius').valu
 FahrenheitToCelsius(parseFloat(
  document.getElementById('fahrenheit').value)).t
 ><br>
<label>Temperature in Celsius:</label>
<input type="text" id="celsius"
 size="10" value="" onfocus="blur();"></form>
```

http://cgi.csc.liv.ac.uk/~ullrich/COMP519/examples/jsOnchange.html

Events: Blur / Click

- A blur event occurs when an HTML element loses focus
  ⇝ onBlur attribute
- A click event occurs when an object on a form is clicked
  ⇝ onClick attribute

Example

```
<html><he
<form name="
  Enter a num
  <input type="text" size="12" id="number" value="3.1">
  <br><br>
  <input type="button" value="Double"
    onclick="document.getElementById('number').v
    parseFloat(document.getElementById('number').value)
    * 2;">
</form></body></html>
```


http://cgi.csc.liv.ac.uk/~ullrich/COMP284/examples/jsOnclick.html

Events: MouseOver / Select / Submit

- A keydown event occurs when the user presses a key
  ⇝ `onkeydown` attribute
- A mouseOver event occurs once each time the mouse pointer moves over an HTML element from outside that element
  ⇝ `on`
- A selec
  or text
  ⇝ `onSelect` attribute
- A submit event occurs when a user submits a form
  ⇝ `onSubmit` attribute

Events and DOM

- When an event occurs, an event object is created
  ⇝ an event object has attributes and methods
  ⇝ event objects can be created by your code independent of an event occurring
- In most
  as an arg
- In most
  can onl


```
<html><body onKeyDown="processKey(event)">
  <script>
    function processKey(e) {
      e = e || window.event
      document.getElementById("key").innerHTML =
       String.fromCharCode(e.keyCode)+' has been pressed'}
  </script>
  <!-- key code will appear in the paragraph below -->
  <p id="key"></p>
</body></html>
```

Revision

Read

- Chapter 17: JavaScript and PHP Validation and Error Handling
- Chapter 18: Using Ajax

of

R. Nixon:
Learnin
O'Reilly

- Mozilla Developer Network and individual co
  Document Object Model (DOM), 18 March 2
  `https://developer.mozilla.org`
  [accessed 18 March 2014].
- W3Schools: JavaScript and HTML DOM Reference,
  18 March 2014. `http://www.w3schools.com/jsref/`
  [accessed 18 March 2014].