Creating Dynamic Documents with JavaScript

Objectives

- Develop dynamic HTML documents
- Using CSS-P for controlling element position
- Dynamically changing element visibility, color, fonts, or content
- Using the zIndex to control element stacking
- Handling mouse events
- Implementing drag and drop functionality

Introduction

A ***dynamic HTML document*** is one whose tag attributes, tag contents, or element style properties can be changed after the document has been and is still being displayed by a browser

For example, a dynamic document may change the color, font, or position of an HTML element after a mouse click.

Controlling Position

Positioning Elements

Changing the position of an HTML element was made easier by positioning extensions to CSS (CSS-P)

The extension was released by W3C in 1997 and is now supported by all modern browsers

CSS-P allowed the position of any element to be specified by the three style properties: **`position`**, **`left`**, and **`top`**

The positioning property decides how the elements will be laid out. The three possible values of position are **`absolute`**, **`relative`**, and **`static`**

The left and top properties control the placement position depending on the position property.

Absolute Positioning

Absolute positioning specifies placement of elements relative to the enclosing element

The ***enclosing element*** is the element in which the given one is nested. This could be a , a <p>, or some other tag, or could even be the whole document.

To state the position of the element, set the left and top properties to needed pixel values, e.g.:

```
<p style = "position: absolute;
            left: 50px; top: 100px;">
```

Relative Positioning

Relative positioning places HTML elements relative to other elements

If `top` and `left` properties are given, they are offsets from where the element would have placed without the `position` property being specified

If no `top` and `left` properties are specified, the element is placed exactly where it would have been placed if no `position` property were given

- **But it can be moved later!**

Static Positioning

Static positioning is the default value of position if `position` is not specified

A statically placed element **cannot be dynamically moved** from its position

So to move elements, set the `position` to either `absolute` or `relative`. The element can be moved after it is displayed by changing the `top` and `left` property values using JavaScript

Slow Movement of Elements

We can animate an element by changing its left and top properties by small amounts, many times, in rapid succession.

JavaScript has two ways to do this, but we cover just one: using the `setTimeout` method

The **`setTimeout`** method sets a timer that triggers a call to the specified function after a specified number of milliseconds has passed, e.g.:

```
setTimeout("makeChange()", 5);
```

calls the function `makeChange()` after 5 ms.

Slow Movement of Elements (cont.)

We can hence use `setTimeout` to call a function which will make tiny changes to position

Example

To move a text element from its initial position (100, 100) to a new position (300, 300):

- Use the `onload` attribute of the `body` element to initialize the position of the element and call a *move function*
- Use a *move function* to change the `top` and `left` attributes by one pixel in the direction of the destination
- Before ending the move function, call `setTimeout` to repeat the *move function* again in 1 ms

One problem: **coordinate properties are stored as strings**, which include the units (`"150px"`)

Examples

absPos.html [link]

absPos2.html [link]

relPos.html [link]

mover.html [link]

moveText.html [link]

Controlling Visibility, Colors, Fonts, and Content

Element Visibility

Another important aspect we can control within a script is **element visibility**

This can be done by setting the **`visibility`** property. Its two values are **`visible`** and **`hidden`**.

For example, we can have code that toggles the visibility after some event occurs:

```
if (dom.visibility == "visible")
   dom.visibility = "hidden";
else
   dom.visibility = "visible";
```

Changing Colors

We also change the element's background or foreground color, e.g.:

```
document.body.style.backgroundColor =
    newColor;
```

Note that in JavaScript, foreground color property is just **`color`**, but background color is **`backgroundColor`**, not `background-color` as it is in CSS.

In general, JavaScript property names follow these rules:

- For CSS attributes w/o hyphens – same name
- For CSS attributes w/hyphens – **delete hyphen and capitalize the next letter** – `font-size` -> `fontSize`

Changing Fonts

Here is another dynamic page example:

We can change the font properties of any element that contains text by using the **mouseover** and **mouseout** events to trigger a script that makes the changes, e.g.:

```
onmouseover = "this.style.color = 'blue';
  this.style.font = 'italic 16pt Times';"

onmouseout = "this.style.color = 'black';
  this.style.font = 'normal 16pt Times';"
```

Dynamic Content

The content of an HTML element is addressed with the **`value`** property of its associated JavaScript object

This is useful for getting the text data from a textbox

Example: a help box for a form

Examples

showHide.html

dynColors.html

dynFont.html

dynValue.html

Element Stacking

Stacking Elements

The CSS **`z-index`** attribute determines which element is in front and which are covered by the front element

The JavaScript property associated with the `z-index` attribute is `zIndex`, which can be changed dynamically

To change stacking order, the handler function must change the `zIndex` property value of the element

Higher `zIndex` values will make the elements go on top

Examples

`stacking.html`

Mouse Cursor and Events

Locating the Mouse Cursor

If we want to locate the mouse cursor when the mouse button is clicked, we can use the `click` event

The coordinates of the element that caused an event (e.g. mouse click) are available in the **`clientX`** and **`clientY`** properties of the `event` object

- These are relative to upper left corner of the browser display window

There exist also **`screenX`** and **`screenY`** properties, which are relative to the upper left corner of the whole client screen

Note that a mouse click can be used to trigger an action, no matter where the mouse cursor is in the display

Examples

`where.html`

`anywhere.html`

Implementing Drag and Drop

Dragging and Dropping an Element

We can use **`mousedown`**, **`mousemove`**, and **`mouseup`** events to grab, drag, and drop

We know how to move an element - just change its `left` and `top` properties

So to implement drag and drop, we can use the DOM 2 event model to add an event handler for `mousemove` whenever a `mousedown` event occurs and remove it whenever a `mouseup` event occurs afterwards

We will know which element to move by accessing the `Event` object and its property, `currentTarget`

Drag and Drop

So here is the process:

- When the `mousedown` event occurs, get a reference of the element to be moved when the mouse button is pressed down (using `currentTarget`) and register events for `mousemove` and `mouseup`

- When the `mousemove` event occurs, move the element by changing its top and left properties of the element as the mouse cursor is moved
  - Compute the distance of each move as the difference between the current position (the `left` and `top` values) and the mouse click position (`clientX` and `clientY`)

- When the `mouseup` event occurs, drop the element by removing the event handler for `mousemove` and `mouseup`

Examples

dragNDrop.html

Summary

- A dynamic HTML document is one whose tag attributes, tag contents, or element style properties can be changed after the document has been and is still being displayed by a browser
- CSS-P allows the position of any element to be specified by the three style properties: position, left, and top
- The style property of an HTML element can be changed within JavaScript to dynamically control color, fonts, and other aspects of the element's presentation
- The zIndex is a property that controls the order in which elements are drawn to the screen
- Mouse coordinates can be accessed through the mouse event object using either the clientX and clientY, or screenX and screenY properties
- Drag and drop functionality can be implemented by dynamically adding and removing event handlers using the DOM 2 event model