CSE3026: Web Application Development Events

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11.1: Event-Handling

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JavaScript events

abort	blur	change	click	dblclick	error	focus
keydown	keypress	keyup	load	mousedown	mousemove	mouseout
mouseover	mouseup	reset	resize	select	submit	unload

- the `click` event (`onclick`) is just one of many events that can be handled
- **problem**: events are tricky and have incompatibilities across browsers
  - reasons: fuzzy W3C event specs; IE disobeying web standards; etc.
- **solution**: Prototype includes many event-related features and fixes

Attaching event handlers the Prototype way

```
~~element.onevent = function~~;
element.observe("event", function);
```

```
// call the playNewGame function when the Play button is clicked
$("play").observe("click", playNewGame);
```

- to use Prototype's event features, you must attach the handler using the DOM element object's `observe` method (added by Prototype)
- pass the **event name** as a string, and the **function name** to call
- handlers *must* be attached this way for Prototype's event features to work

`observe` substitutes for `addEventListener` (not supported by IE)

The `event` object

```
function name(event) {
    // an event handler function ...
}
```

- Event handlers can accept an optional parameter to represent the event that is occurring. Event objects have the following properties / methods:

method / property name	description
`type`	what kind of event, such as `"click"` or `"mousedown"`
`element()` *	the element on which the event occurred
`stop()` **	cancels an event
`stopObserving()`	removes an event handler

It's not standard

* replaces non-standard `srcElement` and `which` properties
** replaces non-standard `return false;`, `stopPropagation`, etc.

Mouse events

down -> move -> up -> click 순으로 실행 된다.

`click`	user presses/releases mouse button on the element
`dblclick`	user presses/releases mouse button twice on the element
`mousedown`	user presses down mouse button on the element
`mouseup`	user releases mouse button on the element

clicking

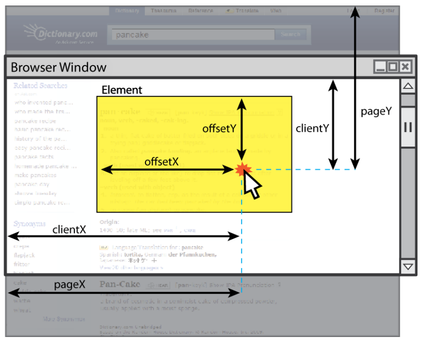
`mouseover`	mouse cursor enters the element's box
`mouseout`	mouse cursor exits the element's box
`mousemove`	mouse cursor moves around within the element's box

movement

Mouse event objects

The `event` passed to a mouse handler has these properties:

property/method	description
`clientX`, `clientY`	coordinates in *browser window*
`screenX`, `screenY`	coordinates in *screen*
`offsetX`, `offsetY`	coordinates in *element* (non-standard)
`pointerX()`, `pointerY()` *	coordinates in *entire web page*
`isLeftClick()` **	`true` if left button was pressed



* replaces non-standard properties `pageX` and `pageY`
** replaces non-standard properties `button` and `which`

Mouse event example

```
<pre id="target">Move the mouse over me!</pre>
```

```
window.onload = function() {
    $("target").observe("mousemove", showCoords);
};

function showCoords(event) {
    $("target").innerHTML =
          "pointer: (" + event.pointerX() + ", " + event.pointerY() + ")\n"
        + "screen : (" + event.screenX + ", " + event.screenY + ")\n"
        + "client : (" + event.clientX + ", " + event.clientY + ")";
}
```

```
Move the mouse over me!
```

The keyword `this`

```
this.fieldName                        // access field
this.fieldName = value;               // modify field

this.methodName(parameters);          // call method
```

- all JavaScript code actually runs inside of an object
- by default, code runs in the global `window` object (so `this === window`)
  - all global variables and functions you declare become part of `window`
- the `this` keyword refers to the current object

Event handler binding

```
window.onload = function() {
    $("textbox").observe("mouseout", booyah);   // bound to text box here
    $("submit").observe("click", booyah);       // bound to submit button here
};

function booyah() {           // booyah knows what object it was called on
    this.value = "booyah";
}
```

- event handlers attached unobtrusively are **bound** to the element
- inside the handler, that element becomes `this` (rather than the `window`)

Fixing redundant code with `this`

```
<fieldset>
    <label><input type="radio" name="ducks" value="Huey"  /> Huey</label>
    <label><input type="radio" name="ducks" value="Dewey" /> Dewey</label>
    <label><input type="radio" name="ducks" value="Louie" /> Louie</label>
</fieldset>
```

```
function processDucks() {
~~    if ($("huey").checked) {~~
~~        alert("Huey is checked!");~~
~~    } else if ($("dewey").checked) {~~
~~        alert("Dewey is checked!");~~
~~    } else {~~
~~        alert("Louie is checked!");~~
~~    }~~
    alert(this.value + " is checked!");
}
```

- if the same function is assigned to multiple elements, each gets its own bound copy

Page/window events

name	description
`load`, `unload`	the browser loads/exits the page
`resize`	the browser window is resized
`error`	an error occurs when loading a document or an image
`contextmenu`	the user right-clicks to pop up a context menu

- The above can be handled on the `window` object. An alternative to `window.onload`:

```
~~window.onload = function() { ... };~~
document.observe("dom:loaded", function() {
    // attach event handlers, etc.
});
```

Keyboard/text events

name	description
`keydown`	user presses a key while this element has keyboard focus
`keyup`	user releases a key while this element has keyboard focus
`keypress`	user presses and releases a key while this element has keyboard focus
`focus`	this element gains keyboard focus
`blur`	this element loses keyboard focus
`select`	this element's text is selected or deselected)

- **focus**: the attention of the user's keyboard (given to one element at a time)

Key event objects

property name	description
`keyCode`	ASCII integer value of key that was pressed (convert to char with `String.fromCharCode`)
`altKey`, `ctrlKey`, `shiftKey`	`true` if Alt/Ctrl/Shift key is being held

`Event.KEY_BACKSPACE`	`Event.KEY_DELETE`	`Event.KEY_DOWN`	`Event.KEY_END`
`Event.KEY_ESC`	`Event.KEY_HOME`	`Event.KEY_LEFT`	`Event.KEY_PAGEDOWN`
`Event.KEY_PAGEUP`	`Event.KEY_RETURN`	`Event.KEY_RIGHT`	`Event.KEY_TAB`
`Event.KEY_UP`			

Prototype's key code constants

- issue: if the event you attach your listener to doesn't have the focus, you won't hear the event
  - possible solution: attach key listener to entire page body, outer element, etc.

Form events

event name	description
`submit`	form is being submitted
`reset`	form is being reset
`change`	the text or state of a form control has changed

- Prototype adds the following methods to form controls' DOM objects:

`activate`	`clear`	`disable`	`enable`
`focus`	`getValue`	`present`	`select`

Stopping an event

```
<form id="exampleform" action="http://foo.com/foo.php">...</form>
```

```
window.onload = function() {
    $("exampleform").observe("submit", checkData);
};

function checkData(event) {
    if ($F("city") == "" || $F("state").length != 2) {
        alert("Error, invalid city/state.");  // show error message
        event.stop();
        return false;
    }
}
```

- to abort a form submit or other event, call Prototype's `stop` method on the event

Timer events

method	description
`setTimeout(`*function*`,` *delayMS*`);`	arranges to call given function after given delay in ms
`setInterval(`*function*`,` *delayMS*`);`	arranges to call function repeatedly every *delayMS* ms
`clearTimeout(`*timerID*`);` `clearInterval(`*timerID*`);`	stops the given timer so it will not call its function

- both `setTimeout` and `setInterval` return an ID representing the timer
  - this ID can be passed to `clearTimeout/Interval` later to stop the timer

`setTimeout` example

```html
<button onclick="delayMsg();">Click me!</button>
<span id="output"></span>
```

```javascript
function delayMsg() {
    setTimeout(booyah, 5000);
    document.getElementById("output").innerHTML = "Wait for it...";
}

function booyah() {    // called when the timer goes off
    document.getElementById("output").innerHTML = "BOOYAH!";
}
```

`setInterval` example

```
var timer = null;  // stores ID of interval timer

function delayMsg2() {
    if (timer == null) {
        timer = setInterval(rudy, 1000);
    } else {
        clearInterval(timer);
        timer = null;
    }
}

function rudy() {   // called each time the timer goes off
    document.getElementById("output").innerHTML += " Rudy!";
}
```

Click me!

Passing parameters to timers

```
function delayedMultiply() {
    // 6 and 7 are passed to multiply when timer goes off
    setTimeout(multiply, 2000, 6, 7);
}
function multiply(a, b) {
    alert(a * b);
}
```

Click me

- any parameters after the delay are eventually passed to the timer function
  - doesn't work in IE6; must create an intermediate function to pass the parameters
- why not just write this?

```
setTimeout(multiply(6 * 7), 2000);
```

Common timer errors

- many students mistakenly write `()` when passing the function

```
~~setTimeout(booyah(), 2000);~~
setTimeout(booyah, 2000);

~~setTimeout(multiply(num1 * num2), 2000);~~
setTimeout(multiply, 2000, num1, num2);
```

  - what does it actually do if you have the `()` ?
  - it calls the function immediately, rather than waiting the 2000ms!