

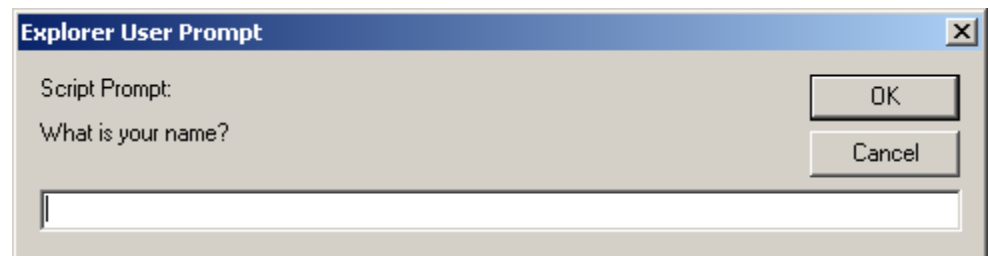
COMP 4021
Internet Computing

JavaScript 2

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Input

- You have already experienced `prompt()` as a method to get input from the user - also `confirm()`
- Both are very inflexible methods of input
- To have great flexibility for user input we need an understanding of events and event handling in JavaScript



Events

- Examples of events
 - The user presses a key on the keyboard
 - The user moves the mouse
 - The user clicks on the mouse button
- Whenever an event occurs you can tell the browser to run some JavaScript code to do something appropriate

Events - onLoad

- Here's an example:

```
<body onload="new_game () ">
```

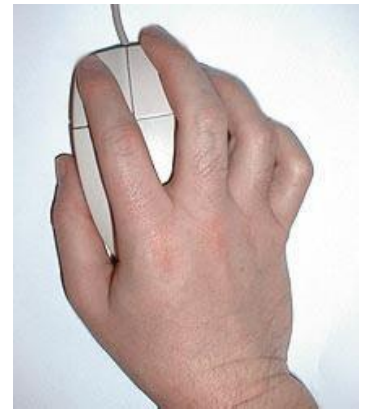
```
. . .
```

```
</body>
```

- The *body* object is loaded when the web page is loaded: therefore the result of the above code is that when the web page is loaded the function `new_game()` is executed

Mouse Events

- The most commonly used mouse events:
 - onclick – when the user clicks on an object
onclick = onmousedown followed by onmouseup
 - onmousedown – when the user presses down the button on the mouse (but hasn't let go yet)
 - onmouseup – when the user lets go of the mouse button



Mouse Events – onclick

```
<html>
<head>
<script language= "JavaScript">
<!--
function greet_the_user() {
    var user_name;
    user_name=prompt("What is your name?", "" );
    alert("Welcome to my page " + user_name + "!!");
}
//-->
</script>
</head>
<body onclick="greet_the_user()" >
<h1>Please click on this page!!</h1>

</body>
</html>
```

onclick event handler: When the mouse button is clicked execute the function `greet_the_user()`

Mouse Events - onmousedown

- We could change

```
<body onclick="greet_the_user()">
```

into

```
<body onmousedown="greet_the_user()">
```

- Then the code will be executed as soon as the mouse button is pressed down
(no need to also release the button)

Mouse Events - onmousedown

```
<html>
<head>
<script language= "JavaScript">
<!--
function greet_the_user() {
    var user_name;
    user_name=prompt("What is your name?", "" );
    alert("Welcome to my web page " + user_name +
        "!");
}
//-->
</script>
</head>
<body onmousedown="greet_the_user()" >

<h1>Please click on this page!!</h1>

</body>
</html>
```

onmousedown event: when the mouse button is pressed down execute greet_the_user()

Mouse Events

- Remember we can handle events when they happen to *any* object
- For example, on the following page the JavaScript function will be executed when the user clicks on the image

Mouse Events - onclick

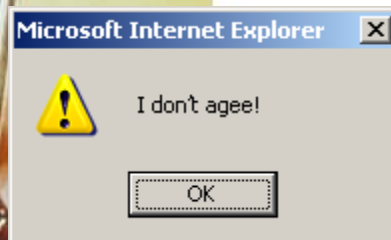
```
<html>
<head>
<script language="JavaScript">
<!--
function good_choice() {
    alert("That's a good choice!");
}
function bad_choice() {
    alert("I don't agree!");
}
//-->
</script>
</head>
<body>
<h1>Click on the best action actor...</h1>




</body>
</html>
```

The user sees a different message
depending on which image he/she clicks on

Click on the best action actor...



More Mouse Events

- `ondblclick` – when the user double clicks on an object
(it is more sensible to use `onclick`)
- `onmouseover` – when the user moves the mouse over an object
(almost the same: `onmouseenter`)
- `onmouseout` – when the user moves the mouse away from an object
(almost the same: `onmouseleave`)
- `oncontextmenu` – when the user clicks on the right mouse button

onmouseover/ onmouseout

```
<html>
<head>
<script language= "JavaScript">
function change_colour( new_colour ) {
    document.getElementById("pretty_layer").style.background=new_colour;
}
</script>
</head>
```

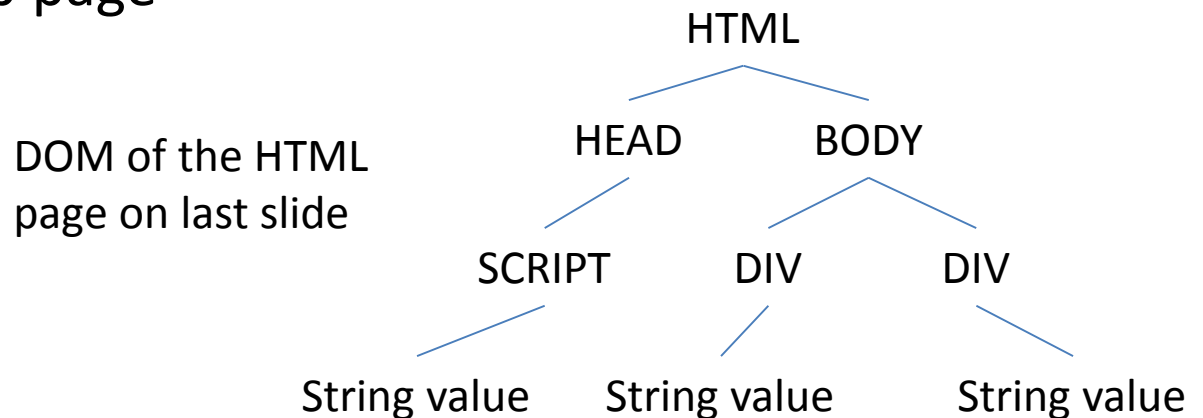
- **document.getElementById** finds the “pretty_layer” element
- Then, change the background colour

```
<body>
<div id="pretty_layer"
    style=" position:absolute;
    background:yellow;
    left:300; top:100; width:100;
    font-size:22pt"
    onmouseover="change_colour('red');"
    onmouseout="change_colour('yellow');">
    Move mouse in and out this layer...
</div>
<div id="ugly_layer" ... ..> ... .. </div>
</body>
</html>
```

- Mouse over/out triggers the JavaScript function
- Color changes accordingly
- But there are 2 div's (2 display areas) ...

Document Object Model (DOM)

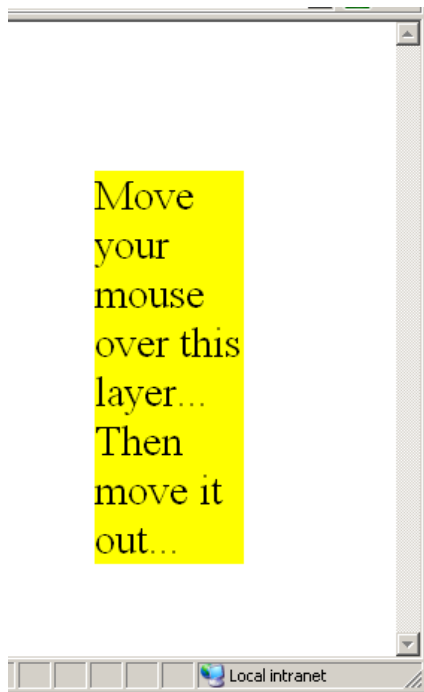
- When a web page is loaded by the browser it stores the page in the DOM structure, which is a tree representing the nested structure of the elements (html tags)
- JavaScript code can access and change any of the things stored in memory
- When DOM is updated, the user will immediately see the change in the web page



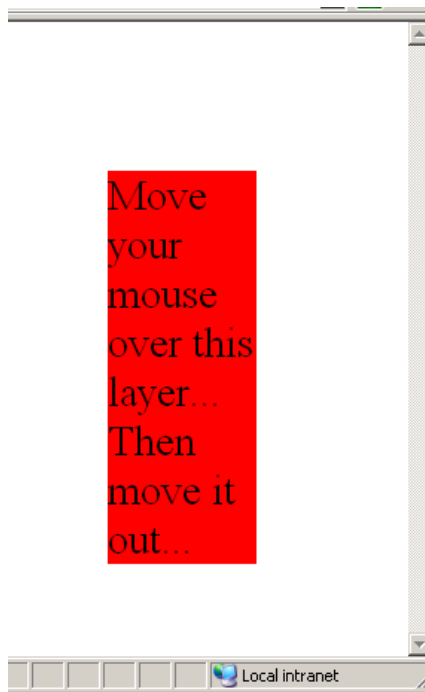
Finding - getElementById

- `getElementById("fun_thing")` means 'find the object in the DOM structure which is called *fun_thing*'
- The object which you are searching for could be anything – i.e. a paragraph, a layer, a title, a list item, an image ...
- After you find something you can change it/ delete it/ copy it

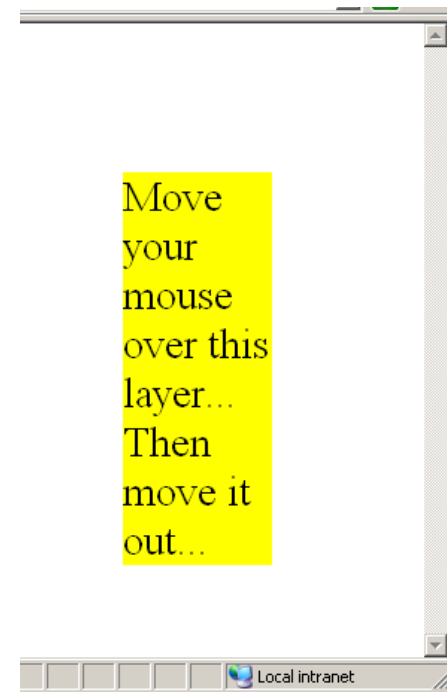
onmouseover/ onmouseout



- Move mouse over the div



- Move mouse away from the div



Other Methods of Access

- There are some special ‘shortcut’ methods for accessing some particular types of data:
- `document.images[]` – all images in the document
- `document.applets[]` – all applets in the document
- `document.links[]` – all links in the document
- ... *others* ...
- i.e. `document.images[0]` refers to the first image in the web page

Timers

- Timers are very useful for dynamic web page behaviour, i.e.

```
var the_timer;  
the_timer = setTimeout("do_something()", 1000);
```

- This tells the browser to run the function `do_something()` 1 second later
- The value '1000' is in milliseconds, so $1000=1$ sec

Example of a Timer

```
<html>
<head>
<script language="JavaScript">
function set_things_up() {
    setTimeout("show_failure()", 3000 );
}
function show_failure() {
    alert("Too slow!!!");
}
</script>
</head>
<body onload="set_things_up()">

<h1>Warning!! You have 3 seconds to
    go to another page ...</h1>
</body>
</html>
```

Another Example

- Here's another example
- This one is a kind of 'alarm clock'

Example of a Timer

```
<html>
<head>
<script language="JavaScript">
var wait_duration;

function set_things_up() {
    wait_duration=prompt("How long would you like to sleep?", "");
    setTimeout("show_wake_up_message()", wait_duration );
}
function show_wake_up_message() {
    alert("WAKE UP! WAKE UP! WAKE UP!!");
}
</script>
</head>

<body onload="set_things_up()">
<h1>Alarm clock example</h1>
</body>
</html>
```

For this example the user will enter a number in milliseconds i.e. 1000 means 1 second

Using a Timer to Move an Image

- Many games use moving images
- To make a moving image using HTML and JavaScript, the image must first be put in a layer:

```
<div id="image_layer" style="position:absolute">  
    
</div>
```

As discussed before, this part tells the browser that this layer can be positioned anywhere on the web page by the client side code

Using a Timer to Move an Image

- Then in order to move the image you have to move the layer
- Because the image is inside the layer, you will see the image move
- In the following example a timer is used to move the layer slowly from left to right across the screen

Moving an Image

```
<html>
<head>
<script language="JavaScript">
```

```
var the_timer; var x_position=0; var the_layer;
```

```
function set_timer()←{
```

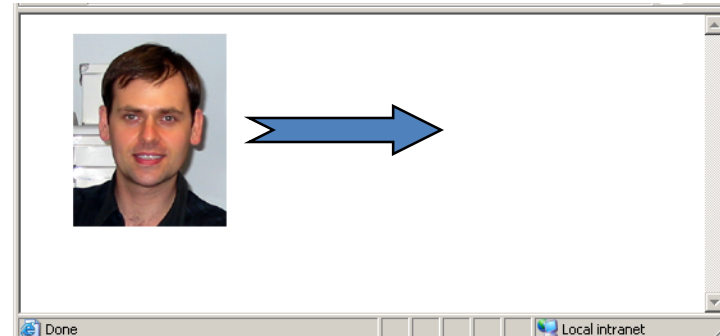
```
the_layer=document.getElementById("image_layer"); // Find the layer
x_position=x_position+1;                          // Move the position to the right
the_layer.style.left=x_position;                   // Now put the div at that x position
```

```
// Now start the timer again so this function will run again.
// It will run every 0.1 second. (100 milliseconds = 0.1 second).
the_timer=setTimeout("set_timer()", 100 );
}
```

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

```
<body onload=" set_timer() ">
<div id="image_layer" style="position:absolute;
    
</div>
</body>
</html>
```

The same function will be run again in 0.1 second



Randomly Moving an Image

```
<html>
<head>
<script language="JavaScript">
<!--
var the_timer;  var x_position;  var the_layer;

function set_timer() {
x_position=Math.floor( Math.random() * 400 ); // Random position from 0 to 400

the_layer=document.getElementById("image_layer"); // Find the layer

the_layer.style.left=x_position; // Now set the x position of the layer

// Now start the timer again so this function will run again.
// It will run between 0 and 1 second later. (1000 milliseconds = 1 second).
the_timer=setTimeout( "set_timer()", Math.floor( Math.random() * 1000) );
}
//-->
</script>
</head>
<body onload=" set_timer() ">

<div id="the_layer" style="position:absolute;">
  
</div>
</body>
</html>
```

The same function will be run again a bit later (a random time between 0 and 1 second)

Stopping the Timer

- What if you want to stop the timer before it finishes?
- Use: `clearTimeout(the_timer);`
where 'the_timer' is the variable which was used to start the timer
- Here's a reminder of how a timer gets started:
`the_timer=setTimeout('set_timer()', 1000);`

Example: clearTimeout

```
<html>
<head>
<script language="JavaScript">
var the_timer;
function set_timer() {
    the_timer=setTimeout("show_message()", 500 ); }

function reset_timer() {
    clearTimeout(the_timer); }

function show_message() {
    alert("Too slow! Are you a snail?"); }
</script>
</head>

<body onload="set_timer()" onclick="reset_timer()">
<h1>Click on this page within 0.5 seconds!</h1>
</body>
</html>
```

Intervals

- An alternative to `setTimeout` is `setInterval`
- `setTimeout` is for something that happens once
- `setInterval` is for something that happens repeatedly
- As before, the time value is in thousandths of a second
- For example: `setInterval("update_display()", 3000)`
- The function *update_display()* will be executed every 3 seconds
- This will continue until the web page is unloaded, or until the interval is cleared using *clearInterval()*

Including Other JavaScript Files

- You can use 'script' to load multiple JavaScript files
- For example, you could split your code into different files, then in your main file have this:

```
...  
<script language="JavaScript"  
        src="audio_functions.js"  
        type="text/javascript">  
</script>  
<script language="JavaScript"  
        src="layer_functions.js"  
        type="text/javascript">  
</script>  
<script language="JavaScript"  
        src="form_functions.js"  
        type="text/javascript">  
</script>  
...
```

Take Home Message

- JavaScript runs on browser to interact with users via:
 - Input and output via dialog box, text box, etc.
 - Detect and respond to mouse and keyboard events
- JavaScript manipulates the DOM structure of a web page, including reading and modifying existing DOM nodes, inserting new and deleting old DOM nodes
- We learnt event handling, including mouse events, keyboard events, page events, and timers