Introduction to Web Technology

Dynamic Documents with Javascript, Animation

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Objectives:

- use JavaScript to build website with dynamic content;

- use JavaScript to generate animation on your web site.

REVIEW: Change content by JavaScript

○ **Step 1:** give the HTML element that we want to change an **ID**

○ **Step 2:** use the function
```
var e = document.getElementById("the-id");
```
to get the HTML element that we want to change

○ **Step 3:** change the content of the HTML element

```
for span, div, etc.:
e.innerHTML = "the-new-content";

for input text field:
e.value = "the-new-value";

for image:
e.src = "the-new-image-src";
```

Useful tags for dynamic content:

- The `<div>` tag defines a generic section container

- The `<span>` tag defines a generic inline container

Say Hi 1

The web page displays **2 text fields**: *first name* and *last name*, and **a button** *"Say Hi"*. If the user enters John in the first name text field and Smith in the last name text field, and clicks the "Say Hi" button, then a greeting message is displayed on the page: *"Hi John Smith!"*.

First name: John
Last name: Smith
Say Hi
Hi John Smith!

Say Hi 1

```
First name: <input type="text" id="firstname" /> <br />

Last name: <input type="text" id="lastname" /> <br />

<button onClick="sayHi()">Say Hi</button> <br />

<span id="greeting"></span>
```

First name: John
Last name: Smith
Say Hi
Hi John Smith!

Say Hi 1

```
function sayHi(){

  // get the first name


  // get the last name


  // construct the greeting message


  // display the greeting message
}
```

Say Hi 1

```
// get the first name

var firstnameInput = document.getElementById("firstname");

var firstname = firstnameInput.value;
```

```
<input type="text" id="firstname" />
```

First name: John

Last name: Smith

Say Hi

Hi John Smith!

Say Hi 1

```
// get the last name

var lastnameInput = document.getElementById("lastname");

var lastname = lastnameInput.value;
```

```
<input type="text" id="lastname" />
```

First name: John

Last name: Smith

Say Hi

Hi John Smith!

Say Hi 1

```
// get the first name

var firstnameInput = document.getElementById("firstname");

var firstname = firstnameInput.value;


// get the last name

var lastnameInput = document.getElementById("lastname");

var lastname = lastnameInput.value;


// construct the greeting message

var greetingMessage = "Hi " + firstname + " " + lastname + "!";
```

First name: John

Last name: Smith

Say Hi

Hi John Smith!

Say Hi 1

```
// construct the greeting message

var greetingMessage = "Hi " + firstname + " " + lastname + "!";


// display the greeting message

var greetingSpan = document.getElementById("greeting");

greetingSpan.innerHTML = greetingMessage;
```

First name: John

Last name: Smith

Say Hi

Hi John Smith!

```
<span id="greeting"></span>
```

Say Hi 2

Adding a button "Clear".

If the user clicks the "Clear" button then the texts in the input fields and the greeting message are removed.

First name: [   ]

Last name: [   ]

[Say Hi] [Clear]

Say Hi 2

```
First name: <input type="text" id="firstname" /> <br /><br />

Last name: <input type="text" id="lastname" /> <br /><br />

<button onClick="sayHi()">Say Hi</button>

<button onClick="clearPage()">Clear</button> <br /><br />

<span id="greeting"></span>
```

First name: [   ]

Last name: [   ]

[Say Hi] [Clear]

Say Hi 2

```
function clearPage(){

    // clear the firstname text field


    // clear the lastname text field


    // clear the greeting message

}
```

First name: [   ]

Last name: [   ]

[Say Hi] [Clear]

Say Hi 2

```javascript
// clear the firstname text field
var firstnameInput = document.getElementById("firstname");
firstnameInput.value = "";

// clear the lastname text field
var lastnameInput = document.getElementById("lastname");
lastnameInput.value = "";

// clear the greeting message
var greetingSpan = document.getElementById("greeting");
greetingSpan.innerHTML = "";
```

First name: [   ]

Last name: [   ]

[Say Hi] [Clear]

```html
<span id="greeting"></span>
```

Math Question

The user enters 2 numbers into the two text fields, then selects the operation (+, - , x) from the drop-down list, then clicks the "=" button, then answer will be generated.

| 3 | + ▼ | 5 | = | 8 | 16 |

Math Question

```
<input type="text" id="input1" />

<select id="operationSelect">
  <option value="add">+</option>
  <option value="subtract">-</option>
  <option value="multiply">x</option>
</select>

<input type="text" id="input2" />

<button onClick="answer()">
=
</button>

<input type="text" id="result" />
```

Math Question

```
function answer(){
    // get the 1st number
    // get the 2nd number
    // get the operation
    // calculate the result
    // display the result
}
```

| 3 | + ▼ | 5 | = | 8 | 18 |

Math Question

```javascript
// get the 1st number
var inputField1 = document.getElementById("input1");
var number1 = Number(inputField1.value);


// get the 2nd number
var inputField2 = document.getElementById("input2");
var number2 = Number(inputField2.value);


// get the operation
var operationSelect = document.getElementById("operationSelect");
var operation = operationSelect.value;
```

| 3 | + ▼ | 5 | = | 8 |

Math Question

```
// calculate the result
var result;
if(operation == "add"){
  result = number1 + number2;
}else if(operation == "subtract"){
  result = number1 - number2;
}else if(operation == "multiply"){
  result = number1 * number2;
}

// display the result
var resultField = document.getElementById("result");
resultField.value = result;
```

3	+ ▾	5	=	8

Change style

```
<button onClick="changeHelloWorldStyle();">

Click me to change the style of the text

</button>

<span id="hello">Hello world</span>

<script>

function changeHelloWorldStyle(){

  var helloSpan = document.getElementById("hello");

  helloSpan.style.color = "orange";

  helloSpan.style.fontSize = "30px";

  helloSpan.style.fontStyle = "italic";

}

</script>
```

Click me to change the style of the text | Hello world

Click me to change the style of the text | *Hello world*

Passing parameters to function

Sometimes, it is useful to pass **parameters** to the **function**

Cat & Dog 1

```
<button onClick="cat()">Cat</button>
<button onClick="dog()">Dog</button>
<br /> <br />
<span id="display"></span>
```

Old solution: using two functions

Cat Dog

Woof woof woof!

Cat & Dog 1B

```
<button onClick="showMessage('Meao meao meao!')">Cat</button>

<button onClick="showMessage('Woof woof woof!')">Dog</button>

<br /> <br />

<span id="display"></span>
```

Cat Dog

Woof woof woof!

Cat & Dog 1B

```
function showMessage(message){

  // get the span element

  var displaySpan = document.getElementById("display");

  // show the message

  displaySpan.innerHTML = message;

}
```
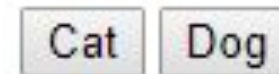
| Cat | Dog |

Woof woof woof!

i am for equality

whatever

Cat & Dog 2B

```html
<button onClick="showMessage('Meao meao meao!')">Cat</button>
<button onClick="showMessage('Woof woof woof!')">Dog</button>
<br /> <br />
<input type="text" id="display" />
```

```javascript
function showMessage(message){
  // get the text field element
  var displayField = document.getElementById("display");

  // show the message
  displayField.value = message;
}
```
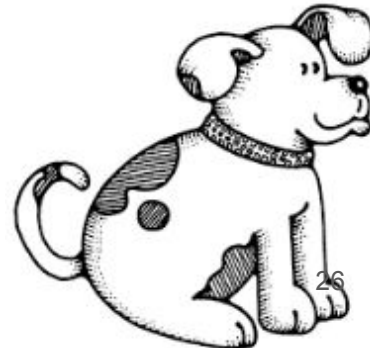
| Cat | Dog |

```
Woof woof woof!
```

Cat & Dog 3B

```
<button onClick="showImage('cat.png')">Cat</button>

<button onClick="showImage('dog.png')">Dog</button>

<br /> <br />

<img id="display" />


function showImage(imageFile){

  // get the image element

  var image = document.getElementById("display");


  // show the animal picture

  image.src = imageFile;

}
```

Random

To get a random (decimal) number from 0 (**inclusive**) to 1 (**exclusive**):

```
var x = Math.random();   // random decimal number 0 → 1
```

Random

Random decimal number from $0 \longrightarrow 1$

```
Math.random()
```

Random decimal number from $0 \longrightarrow 10$

```
Math.random() * 10
```

Random **integer** from $0 \longrightarrow 10$

```
Math.floor(Math.random() * 10)
```

```
//generate a random integer: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
var x = Math.floor(Math.random() * 10);
```

Random

Random decimal number from 0 ⟶ ~~1~~

```
Math.random()
```

Random decimal number from 0 ⟶ ~~10~~

```
Math.random() * 10
```

Random integer from 0 ⟶ ~~10~~

Math.floor`(Math.random() * 10)`

Random integer from 1 ⟶ ~~11~~
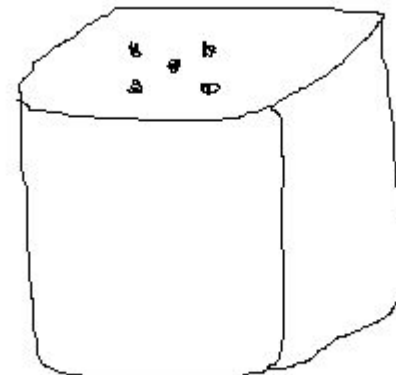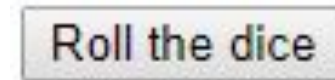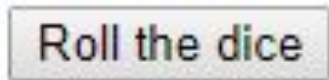
```
Math.floor(Math.random() * 10) + 1
```

```
//generate a random integer: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
var x = Math.floor(Math.random() * 10) + 1;
```

Dice 1

When the button is clicked, a random dice is displayed.

Generate a random integer from 1 to 6:
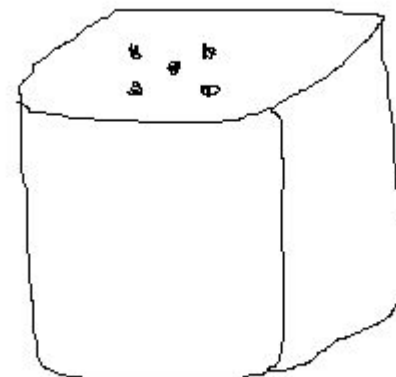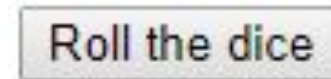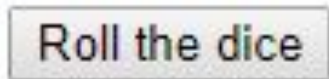
```
Math.floor(Math.random() * 6) + 1
```

Roll the dice

Roll the dice

Dice 1

```
<button onClick="rollDice()">
Roll the dice
</button>

<br />

<img id="dice" />
```

Dice 1

```
function rollDice(){
  // generate a random dice value from 1 to 6
  var diceValue = Math.floor(Math.random() * 6) + 1;

  // get image file name for this dice value
  var imageFile = "dice" + diceValue + ".png";

  // show the image
  var diceImage = document.getElementById("dice");
  diceImage.src = imageFile;
}
```

Roll the dice

dice5.png

Confirm box

A confirm box is often used if you want the user to verify or accept something.

When a confirm box pops up, the user will have to click either "OK" or "Cancel".

If the user clicks "OK", the box returns true.

If the user clicks "Cancel", the box returns false.

```
var ok = confirm("Do you want to proceed with the order?");
if(ok){
  alert("User clicked OK");
}else{
  alert("User clicked Cancel.");
}
```

Prompt box

When a prompt box pops up, the user will have to click either "OK" or "Cancel".

If the user clicks "OK" the box returns the input value.

If the user clicks "Cancel" the box returns null.

We can also specify the default text in the input box:

```
prompt("sometext","defaultText");
```

```
var name = prompt("Please enter your name", "cat in the hat");
if(name != null){
  alert("Hello " + name);
}
```

Add subject 1

When the button is clicked, a prompt box appears asking the user to enter a subject code. Then the subject is added to the page.

Click here to add subject

MATH 111

CSCI 230

Add subject 1

```html
<button onClick="addSubject()">
Click here to add subject
</button>

<div id="subjectList">
</div>
```

Click here to add subject

MATH 111

CSCI 230

Add subject 1

```javascript
function addSubject(){
  // ask user for a subject code
  var subject = prompt("Enter subject code");

  if(subject != null){
    // create a new paragraph holding the subject code
    var para = document.createElement("p");
    var subjectText = document.createTextNode(subject);
    para.appendChild(subjectText);

    // add the new paragraph element to the subject div
    var subjectDiv = document.getElementById("subjectList");
    subjectDiv.appendChild(para);
  }
}
```

```html
<div id="subjectList">
  <p>MATH 111</p>
</div>
```

Click here to add subject

MATH 111

CSCI 230

Add subject 2

When the button is clicked, a prompt box appears asking the user to enter a subject code. Then the subject is added to the page in an **unordered list**.

Click here to add subject

- MATH 111
- CSCI 230

Add subject 2

```html
<button onClick="addSubject()">
Click here to add subject
</button>

<ul id="subjectList">
</ul>
```


Click here to add subject

- MATH 111
- CSCI 230

Add subject 2

```javascript
function addSubject(){
  // ask user for a subject code
  var subject = prompt("Enter subject code");

  if(subject != null){
    // create a new list item holding the subject code
    var li = document.createElement("li");
    var subjectText = document.createTextNode(subject);
    li.appendChild(subjectText);

    // add the new list item element to the unordered list
    var subjectUL = document.getElementById("subjectList");
    subjectUL.appendChild(li);
  }
}
```

Click here to add subject

- MATH 111
- CSCI 230

Animation

Start an animation

```
var animationSchedule = setInterval(animationFunction, milisecs);
```

specify 2 things:

- ***what need to be done***: write a function to do the task

- ***how often***: how often this task need to be done

Stop the animation

```
clearInterval(animationSchedule);
```

Counter animation

When the "Start Counter" button is clicked, the counter animation displays a number increasing every 1 second.

When the "Stop Counter" button is clicked, the number is stop increasing.

```
initially counter = 0
start animation
  1000 milisec        showCounter()    counter = 1
  1000 milisec        showCounter()    counter = 2
  1000 milisec        showCounter()    counter = 3
  1000 milisec        showCounter()    counter = 4
  1000 milisec        showCounter()    counter = 5
  ......
```

Start counter   Stop counter

stop animation

13

Counter animation

```
<button onClick="startCounterAnimation()">
Start counter
</button>

<button onClick="stopCounterAnimation()">
Stop counter
</button>

<br /><br />

<font size="7">
<span id="counter"></span>
</font>
```
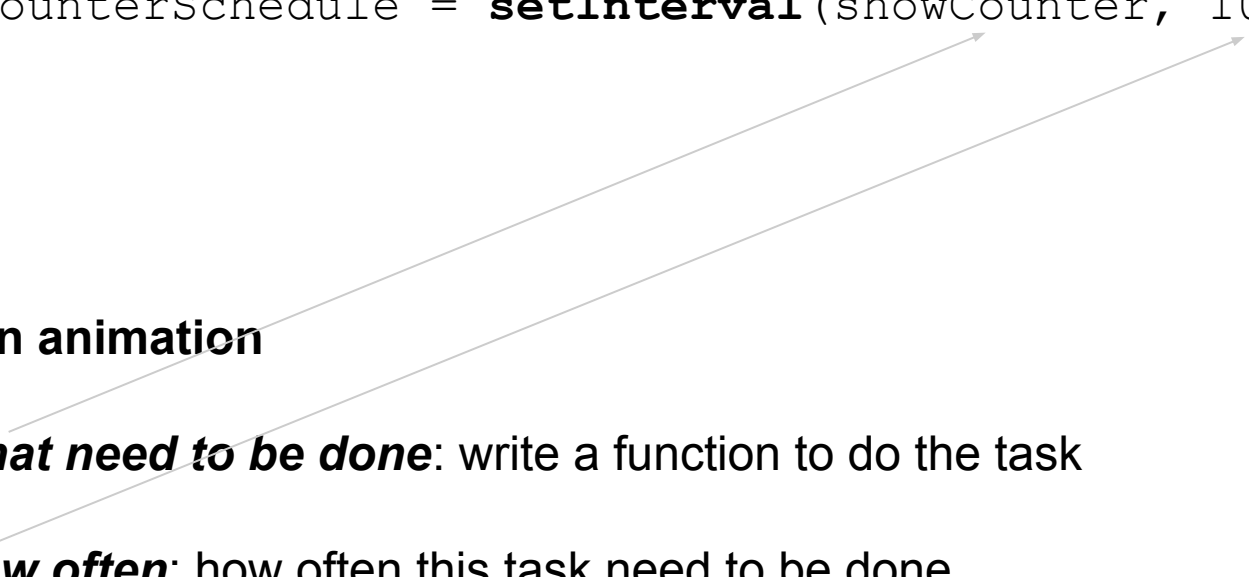
13

Counter animation

```
var counter = 0;

var counterSchedule;

function startCounterAnimation(){

   // start the counter animation
   counterSchedule = setInterval(showCounter, 1000);

}
```

Start an animation

- ***what need to be done***: write a function to do the task

- ***how often***: how often this task need to be done

Start counter | Stop counter

13

Counter animation

```
function showCounter(){

  // increase the counter by 1
  counter = counter + 1;

  // show the counter
  var counterSpan = document.getElementById("counter");
  counterSpan.innerHTML = counter;

}
```

Start counter | Stop counter

13

Counter animation

```
function stopCounterAnimation(){

    clearInterval(counterSchedule);

}
```

Start counter | Stop counter

13

Dice 2 - animation

When the button is clicked, within 1 second, a flash of 10 random dice images are displayed, and then it stops.

```
start animation                          counter = 0
 100 milisec     rollDice()     counter = 1
 100 milisec     rollDice()     counter = 2
 100 milisec     rollDice()     counter = 3
 100 milisec     rollDice()     counter = 4
 100 milisec     rollDice()     counter = 5
 100 milisec     rollDice()     counter = 6
 100 milisec     rollDice()     counter = 7
 100 milisec     rollDice()     counter = 8
 100 milisec     rollDice()     counter = 9
 100 milisec     rollDice()     counter = 10
stop animation
```

Roll the dice

Use a **counter variable** to know when to stop the animation
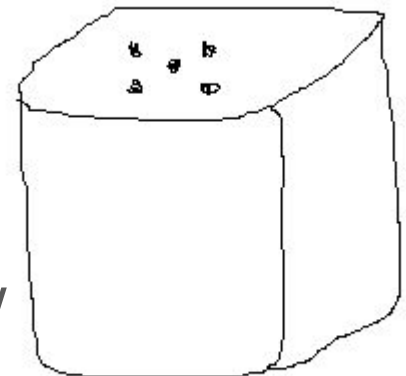
Dice 2 - animation

```
<button onClick="rollDiceAnimation()">
Roll the dice
</button>

<br />

<img id="dice" />
```

Dice 2 - animation

```
var rollDiceSchedule;
var rollDiceCounter;

function rollDiceAnimation(){
  // set the roll dice counter to 0
  rollDiceCounter = 0;

  // start the roll dice animation
  rollDiceSchedule = setInterval(rollDice, 100);
}
```

Roll the dice

Start an animation

- ***what need to be done***: write a function to do the task
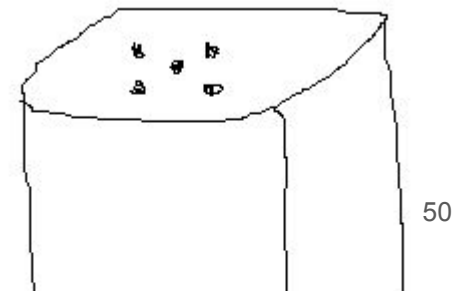
- ***how often***: how often this task need to be done

Dice 2 - animation

```
function rollDice(){
  // generate a random dice value from 1 to 6
  var diceValue = Math.floor(Math.random() * 6) + 1;

  // get image file name for this dice value
  var imageFile = "dice" + diceValue + ".png";

  // show the image
  var diceImage = document.getElementById("dice");
  diceImage.src = imageFile;

  // increase the roll dice counter
  rollDiceCounter = rollDiceCounter + 1;

  // if the roll dice counter reaches 10 then stop the animation
  if(rollDiceCounter == 10){
    clearInterval(rollDiceSchedule);
  }
}
```

References

- http://www.w3schools.com/js

- http://developer.mozilla.org/en-US/docs/Web/JavaScript