

COMP 431/531: Web Development

Lecture 5: Scope and Events

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<https://www.clear.rice.edu/comp431>



Announcements & Reminders

- Homework #2 (Dynamic Page) is due **today** at 11:59pm
hw2 repo: <https://classroom.github.com/a/NeQeDxJk>
- Quiz #1 (JavaScript) is due Thursday, Sept. 18th at 11:59pm
- Homework #3 (JavaScript Game) is due Sept. 25th at 11:59pm
hw3 repo: <https://classroom.github.com/a/wZT10Yqv>



JavaScript Functions

```
var namedFunction = function aName() {  
    // This is a comment  
    return 9;  
}  
  
var unnamedFunction = function () {  
    return 7;  
}  
  
function globalFunction() {  
    return 33;  
}
```

```
> namedFunction  
< function aName()  
> namedFunction.name  
< "aName"  
> unnamedFunction  
< function unnamedFunction()  
> unnamedFunction.name  
< ""  
> globalFunction  
< function globalFunction()  
> globalFunction.name  
< "globalFunction"
```



Java Scope

```
private void go() {  
    Random r = new Random();  
    int sum = 0;  
    int value = 1;  
    int prevValue = 1;  
    for (int ii = 0; ii < 100; ++ii) {  
        value = r.nextInt(10);  
        int product = value * prevValue;  
        prevValue = value;  
        sum += product;  
    }  
    System.out.println("The product was " + product);  
    System.out.println("The sum is " + sum);  
}
```



Java Scope

```
private void go() {  
    Random r = new Random();  
    int sum = 0;  
ScopeExample.java:18: error: cannot find symbol  
        System.out.println("The product was " + product);  
                      ^  
symbol:   variable product  
location: class ScopeExample  
1 error
```

```
        prevValue = value;  
        sum += product;  
    }  
    System.out.println("The product was " + product);  
    System.out.println("The sum is " + sum);  
}
```



JavaScript has Function Scope

```
function go() {  
    var sum = 0;  
    var value = 0;  
    var prevValue = 1;  
    for (var ii = 0; ii < 100; ++ii) {  
        value = Math.floor(Math.random()*10);  
        var product = value * prevValue;  
        prevValue = value;  
        sum += product;  
    }  
    console.log('The product was ' + product)  
    console.log('The sum is ' + sum)  
}
```

The product was 7

The sum is 2482



Function Scope

Changing outer scope

Declared in global scope

```
> outer3  
< "Bar"
```

```
function innerOuter() {  
    var outer1 = "In Outer Scope"  
    var outer2 = "Also in Outer Scope"  
  
    var internal = function() {  
        var inner = "In Inner Scope"  
        outer1 = "Foo"  
        var outer2 = "Redeclared"  
        outer3 = "Bar"  
        console.log([inner, outer1, outer2, outer3])  
    }  
    internal()  
    console.log([outer1, outer2, outer3])  
    console.log(inner)  
}
```

["In Inner Scope", "Foo", "Redeclared", "Bar"]

["Foo", "Also in Outer Scope", "Bar"]

✖ ▼ **Uncaught ReferenceError: inner is not defined**

```
innerOuter          @ scope.js:30  
(anonymous function) @ scope.js:33
```



Block Scope with Let

```
function innerOuterBlock() {
    var outer1 = "In Outer Scope"
    var outer2 = "Also in Outer Scope"

    var internal = function() {

        // block scope with let
        {
            let inner = "In Inner Scope"
            outer1 = "Foo"
        }
        //console.log("let does not hoist: " + outer2)
        let outer2 = "Redeclared"
        var outer3 = "Bar" // no auto-global scope
        console.log([inner, outer1, outer2, outer3])
    }
    internal()
}
```

Uncaught ReferenceError: inner is not defined



Variable Hoisting

```
function go() {
    var sum = 0;
    var value = 0;
    var prevValue = 1;
    for (var ii = 0; ii < 100;
        value = Math.floor(Math.random()*10);
        var product = value *
        prevvalue = value;
        sum += product;
    }
    console.log('The product was ' + product)
    console.log('The sum is ' + sum)
}
```

```
function go() {
    var product, ii
    var sum = 0;
    var value = 0;
    var prevValue = 1;
    for (ii = 0; ii < 100; ++ii) {
        value = Math.floor(Math.random()*10);
        product = value * prevValue;
        prevValue = value;
        sum += product;
    }
    console.log('The product was ' + product)
    console.log('The sum is ' + sum)
```



Variable Hoisting

```
hoist()  
function hoist() {  
  console.log("Inside hoist()", a)  
  var a = "Hoist Me!"  
}  
hoist()
```

```
hoist2()  
var hoist2 = function() {  
  hoist()  
}
```

Inside hoist() undefined

Inside hoist() undefined

► Uncaught TypeError: hoist2 is not a function



Variable Hoisting

```
hoist()  
function hoist() {  
  console.log("Inside hoist()", a)  
  var a = "Hoist Me!"  
}  
hoist()  
  
hoist2() ←  
var hoist2 = function() {  
  hoist()  
}  
  
Inside hoist() undefined  
Inside hoist() undefined  
▶ Uncaught TypeError: hoist2 is not a function
```

a is hoisted, but has no value

hoist2 is hoisted, but has no value and therefore is not a function yet



Global Scope

```
2
3
4 console.log('What is this?', this)
5 console.log('this is window', this === window)
6
7 function myFunction() {
8     noVar = 'abc'
9     var varred = '123'
10    console.log(`in myFunction noVar=${noVar} varred=${varred}`)
11
12    console.log('myFunction this is window', this === window)
13}
14
15 myFunction()
16 console.log(`after myFunction call noVar=${noVar}`)
17 console.log('What is window.noVar?', window.noVar)
18
```

```
What is this?  
Window {speechSynthesis: SpeechSynthesis,  
► LocalStorage: Storage, sessionStorage: Storage,  
DeprecatedStorageInfo...}  
this is window true  
in myFunction noVar=abc varred=123  
myFunction this is window true  
after myFunction call noVar=abc  
What is window.noVar? abc
```



Global Scope

```
2 'use strict' // run with and without!
3
4 console.log('What is this?', this)
5 console.log('this is window', this === window)
6
7 function myFunction() {
8     noVar = 'abc'
9
10    What is this?
11    Window {speechSynthesis: SpeechSynthesis, caches: CacheStorage,
12    ► localStorage: Storage, sessionStorage: Storage, webkitStorageInfo:
13    DeprecatedStorageInfo...}
14
15    this is window true
16    ► Uncaught ReferenceError: noVar is not
17    defined
18
```

What is this?

Window {*speechSynthesis*: SpeechSynthesis, *localStorage*: Storage, *sessionStorage*: Storage, *webkitStorageInfo*: DeprecatedStorageInfo...}

this is window true

in myFunction noVar=abc varred=123

myFunction this is window true

after myFunction call noVar=abc

What is window.noVar? abc

[javascript-scope.html:4](#)

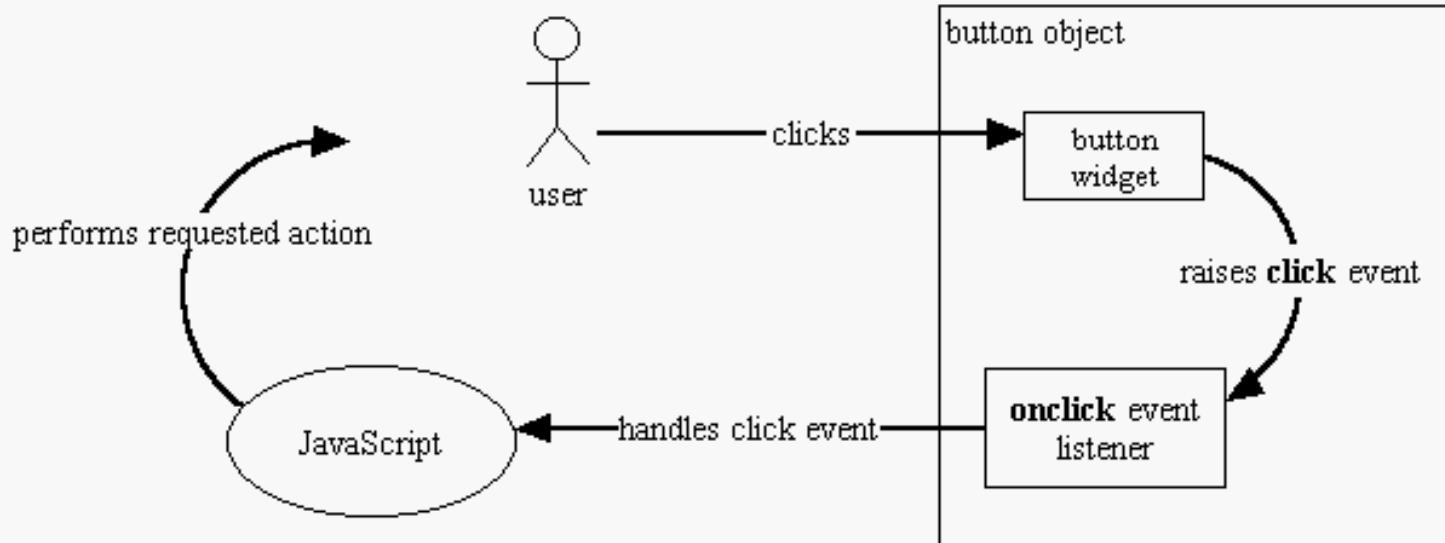
[javascript-scope.html:5](#)

[javascript-scope.html:8](#)



Events

```
<button value="Click Me" onclick="alert('Thank you') " />
```



DOM Level 1 Event Types: on<type>

- blur / focus (element loses / receives focus)
- change (form field value changes)
- click (mouse down and mouse up on one element)
- contextmenu (right-click)
- keydown / keyup (depress / release a key, repeats)
- keypress (character key id depressed, repeats)
- mousedown / mouseup (depress / release mouse button)
- mousemove (mouse in motion)
- mouseover / out (mouse enters / leaves an element)
- reset, copy, paste, submit, ...

```
<!DOCTYPE html>
<html>
<body>

<p>Write something in the text field to trigger a function.</p>

<input type="text" id="myInput" oninput="myFunction()">

<p id="demo"></p>

<script>
function myFunction() {
  var x = document.getElementById("myInput").value;
  document.getElementById("demo").innerHTML = "You wrote: " + x;
}
</script>

</body>
</html>
```

https://www.w3schools.com/jsref/event_oninput.asp

<http://www.quirksmode.org/dom/events>



DOM Level 2 Event

- Allows for multiple registration of handlers
 - level 1 only has one handler
- Allows for handler removal

useCapture

true = execute during the *capture phase*

false = (default) execute during the *bubble phase*

```
// add level 2 handlers
var l2p = document.getElementById("level2p")

l2p.addEventListener("click", l2pResponse, false);
l2p.addEventListener("click", l2pColorFn, false);
l2p.addEventListener("click", l2pBgColorFn, false);
l2p.removeEventListener('click', l2pBgColorFn)
```

- Allows event listeners on the *document* (e.g. key pressed)

<https://www.clear.rice.edu/comp431/sample/hello-events.html>



Event Objects

Events with listeners return Event objects

- MouseEvent (e.g. click, mouseover)
- KeyboardEvent (e.g. keyup) has *key* field
 - e.key returns “Shift” for keyup when Shift key is released
- InputEvent (e.g. input)
- ...there are others

```
1  'use strict';
2
3  /**
4   * setup the event listener
5   */
6  function setup() {
7      document.getElementById("myBtn").addEventListener("click", handleClickedButton);
8  }
9
10 /**
11  * Handle the button click event
12  * @param e The mouse event
13  */
14 function handleClickedButton(e) {
15     let btnText = document.getElementById("myBtn");
16
17     alert("Event " + e + " just happened for mouse click on " + btnText.innerText +
18 }
```

