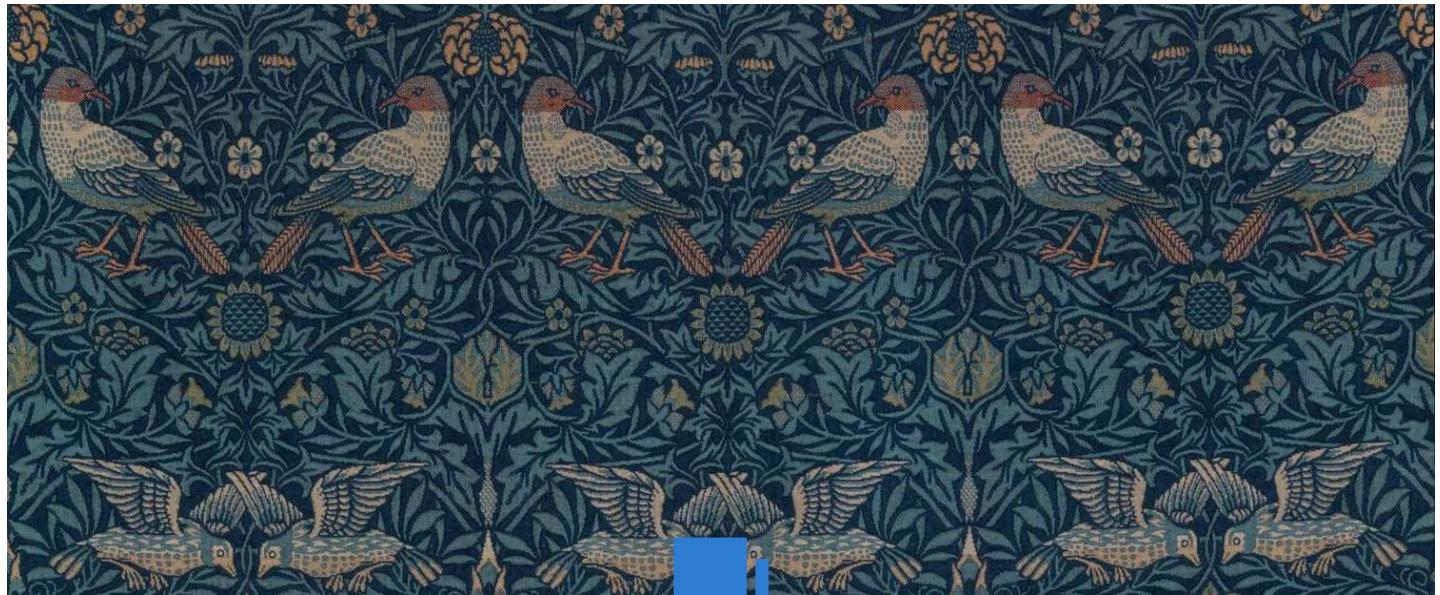


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## Week 3.5

### Document Object Model (Laisha)

In this session, Laisha delves into the [Document Object Model \(DOM\)](#), demystifying the core structure that transforms plain HTML pages into dynamic, interactive web encounters through JavaScript. She also sheds light on NodeList and HTMLCollection, the essential tools for effectively handling clusters of elements.

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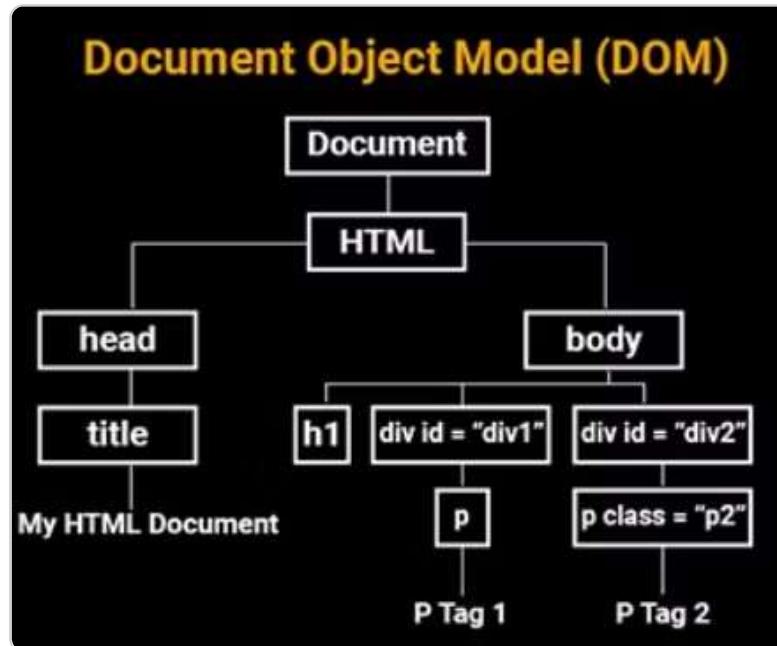
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**DUMI**

You know how a remote control brings a television to life by letting you change channels and do cool things? Well, in the web world, JavaScript is like that remote control for your HTML page, making it active and dynamic. And the secret sauce behind this magic is the DOM — the Document Object Model.



## What is DOM?

So, what's this DOM thing? DOM stands for Document Object Model. It's like the behind-the-scenes framework that JavaScript uses to talk to your browser. Imagine it as the language that JavaScript speaks with your web browser to make things happen on your HTML page.

## Communication with the Browser

JavaScript and the browser communicate through a set of tools in this magical interface known as the DOM. These tools include properties, methods, and events. It's like having a language to tell your browser what to do and when to do it.



## Possibilities of DOM

Now, let's talk about the possibilities the DOM opens up. With JavaScript and the DOM, you can:

- Change the content of your webpage dynamically.
- Update styles and layout on the fly.
- Respond to user interactions, like clicks or keyboard inputs.
- Add or remove elements, making your page super interactive.

## Independence and Consistency

DOM doesn't pick sides. It's independent of any particular programming language. This means whether you're using JavaScript, Python, or any other language, the DOM provides a consistent way to interact with your document. It's like a universal remote that works with any TV.

### In a Nutshell:

So, the DOM is your backstage pass to making HTML pages come alive with JavaScript. It's a set of rules and tools that allow you to control, change, and interact with your webpage dynamically. It's like giving your webpage a personality and making it respond to your JavaScript commands.

## DOM Tree

The DOM tree, or The Document Object Model tree, is a hierarchical representation of the structure of a web document in the context of web development. It's essentially a way to organize and navigate the elements of an HTML or XML document. Here's a breakdown:

- **Document Object:** At the top of the tree is the Document Object, representing the entire web document.
- **HTML Element:** The HTML element comes next, serving as the container for the entire document.
- **Head and Body Elements:** Within the HTML element, there are two main sections: the Head and the Body. The Head typically contains meta-information, styles, and links to external resources, while the Body holds the primary content visible on the webpage.
- **Further Nesting:** Each of these main sections may contain further nested elements. For instance, the Head



languages like JavaScript.

## Implementing innerHTML

The below implementation consists of an input field that allows users to enter their name. Accompanying this, a button is present, equipped with an `onclick` attribute that invokes the `displayGreeting` function. Within this function, the entered name is acquired by accessing the value of the input field through `document.getElementById("nameInput").value`. Subsequently, the function utilizes `innerHTML` to dynamically alter the content of the `<p>` element identified by the id "greetingMessage," facilitating the display of a personalized greeting message.



```
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Simple Name Greeting</title>
</head>
<body>

    <label for="nameInput">Enter Your Name:</label>
    <input type="text" id="nameInput">
    <button onclick="displayGreeting()">Submit</button>

    <p id="greetingMessage"></p>

    <script>
        function displayGreeting() {
            // Get the entered name from the input field
            var enteredName = document.getElementById("nameInput").value;

            // Render the greeting message on the DOM using innerHTML
            document.getElementById("greetingMessage").innerHTML = "Hello, " + enteredName;
        }
    </script>

</body>
</html>
```



## Difference Between HTMLCollection and NodeList:

Both HTMLCollections and NodeLists are collections of nodes in the Document Object Model (DOM) provided by JavaScript, but they have some key differences:

### HTMLCollection:



## 2. Accessing Elements:

- **By Index:** Elements in an HTMLCollection can be accessed using numerical indices, similar to an array.

## 3. Methods:

- **Limited Methods:** HTMLCollections have a more limited set of methods compared to NodeLists.

## 4. Specific to Elements:

- **Element-Specific:** HTMLCollections are typically used for collections of HTML elements, such as those returned by `getElementsByName` or `getElementsByClassName`.

# NodeList:

## 1. Live or Static:

- **Live or Static:** A NodeList can be live or static. If it's obtained using `querySelectorAll`, it's static and won't automatically update. If it's obtained by other means, like `childNodes`, it might be live.

## 2. Accessing Elements:

- **By Index or forEach:** Like HTMLCollection, you can access elements by index. Additionally, NodeList supports the `forEach` method for iteration.

## 3. Methods:

- **Richer Set of Methods:** NodeLists typically have a broader set of methods compared to HTMLCollections.

## 4. Not Limited to Elements:

- **Node-Oriented:** NodeLists can include various types of nodes, not just HTML elements. They might include text nodes, comment nodes, etc.

# Practical Considerations:

## • Common Methods:

- For general purpose, when using methods like `querySelectorAll`, you will get a NodeList.

## • Live vs. Static:

- If you need a live collection that automatically updates, an HTMLCollection might be suitable.
- If you want a static collection that won't change, or if you need a broader range of methods, a NodeList



- PROBLEMS ARE OFTEN THE RESULT OF MORE GENERIC METHODS LIKE `querySelectorAll` OR PROPERTIES LIKE `childNodes`.

In summary, the choice between `HTMLCollection` and `NodeList` depends on your specific needs, especially regarding the liveliness of the collection and the methods you require for manipulation.

## HTMLCollection

### Finding HTML Elements

#### By ID:

To find an HTML element by its ID, you can use the `getElementById` method.

```
var elementById = document.getElementById("yourElementId");
```



#### By Tag Name:

To find HTML elements by their tag name, you can use the `getElementsByName` method.

```
var elementsByName = document.getElementsByName("yourTagName");
```



#### By Class Name:

To find HTML elements by their class name, you can use the `getElementsByClassName` method.

```
var elementsByClassName = document.getElementsByClassName("yourClassName");
```





## By HTML Object Collections:

To find HTML elements using HTML collections, you can use methods like `getElementsByName` or `getElementsByTagName` in specific cases.

```
var elementsByName = document.getElementsByName("yourElementName");
```



These methods provide different ways to locate and interact with HTML elements in a document using JavaScript. Choose the appropriate method based on your specific needs and the structure of your HTML document.

## Changing HTML Elements

Changing HTML elements dynamically is a fundamental aspect of web development, and JavaScript provides several methods to achieve this. Here are some commonly used methods for changing HTML elements:

### 1. `innerHTML` :

- **Purpose:** Changes the HTML content (including tags) of an element.
- **Example:**

```
document.getElementById("myElement").innerHTML = "New content";
```

### 2. `textContent` :

- **Purpose:** Changes the text content of an element, excluding HTML tags.
- **Example:**

```
document.getElementById("myElement").textContent = "New text content";
```



DOCUMENT. GETELEMENTBYID (HTML ELEMENT) . SELECTOR SELECT , CLASS , ID , CSS SELECTOR

#### 4. **style :**

- **Purpose:** Modifies the inline styles of an element.
- **Example:**

```
document.getElementById("myElement").style.color = "blue";
```

#### 5. **classList :**

- **Purpose:** Provides methods to add, remove, or toggle CSS classes on an element.
- **Examples:**

```
document.getElementById("myElement").classList.add("newClass");
document.getElementById("myElement").classList.remove("oldClass");
```

#### 6. **appendChild :**

- **Purpose:** Adds a new child element to an existing element.
- **Example:**

```
var newElement = document.createElement("p");
newElement.textContent = "New paragraph";
document.getElementById("parentElement").appendChild(newElement);
```

#### 7. **removeChild :**

- **Purpose:** Removes a child element from its parent.
- **Example:**

```
var childToRemove = document.getElementById("childElement");
document.getElementById("parentElement").removeChild(childToRemove);
```



DOCUMENTS · ELEMENTS · DOM · INTERACTIVITY · SELECTORS · STYLING · NEW IMAGE · PHP · JS ·

These methods provide a diverse set of tools for us —developers to manipulate HTML elements dynamically, whether it's updating content, changing styles, or modifying attributes. The choice of method depends on the specific requirement and the nature of the change you want to apply.

## Example - using `setAttribute` to change an input field to a button:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Change Input to Button Example</title>
</head>
<body>

    <input type="text" id="myInput" value="Type Something">
    <button onclick="changeToButton()">Change to Button</button>

    <script>
        function changeToButton() {
            // Get the input element
            var inputElement = document.getElementById("myInput");

            // Create a new button element
            var buttonElement = document.createElement("button");

            // Set attributes for the new button
            buttonElement.setAttribute("type", "button");
            buttonElement.setAttribute("onclick", "alert('Button Clicked!')");
            buttonElement.innerHTML = "Click Me";

            // Replace the input with the new button
        }
    </script>

```



In this example, an input field with the id "myInput" is initially present, alongside a button labeled "Change to Button." Clicking this button triggers the **changeToButton** function, wherein a new button is dynamically created using **createElement**. Key attributes (type and onclick) are set via **setAttribute**, and the input field is promptly replaced by this newly fashioned button using **replaceChild**. The outcome is a dynamic transformation, demonstrating the capability to swap an input field for a button upon clicking "Change to Button," complete with an onclick attribute for interactive functionality.

## Adding HTML Elements:

### 1. **createElement** Method:

- **Purpose:** Creates a new HTML element.
- **Example:**

```
var newElement = document.createElement("div");
```

### 2. **appendChild** Method:

- **Purpose:** Appends a new child element to an existing element.
- **Example:**

```
var parentElement = document.getElementById("parent");
parentElement.appendChild(newElement);
```

### 3. **insertBefore** Method:

- **Purpose:** Inserts a new element before a specified existing element.
- **Example:**

```
var existingElement = document.getElementById("existing");
parentElement.insertBefore(newElement, existingElement);
```



```
parentElement.innerHTML = "<p>New content</p>";
```

##### 5. **insertAdjacentHTML** Method:

- **Purpose:** Inserts HTML into a specified position relative to the element.
- **Example:**

```
parentElement.insertAdjacentHTML("beforeend", "<p>New content</p>");
```

## Deleting HTML Elements:

##### 1. **removeChild** Method:

- **Purpose:** Removes a child element from its parent.
- **Example:**

```
var childElement = document.getElementById("child");
parentElement.removeChild(childElement);
```

##### 2. **remove** Method (Modern Browsers):

- **Purpose:** Removes the element itself.
- **Example:**

```
var elementToRemove = document.getElementById("toRemove");
elementToRemove.remove();
```

##### 3. **replaceChild** Method:

- **Purpose:** Replaces a child element with a new element.
- **Example:**



#### 4. **innerHTML** Property (Setting to an Empty String):

- **Purpose:** Sets the HTML content inside an element to an empty string, effectively removing its content.
- **Example:**

```
parentElement.innerHTML = "";
```

#### 5. **outerHTML** Property:

- **Purpose:** Replaces an element with its HTML content.
- **Example:**

```
var newHTML = "<p>New content</p>";
parentElement.outerHTML = newHTML;
```

## Query Selectors

Query Selectors allows developers to select and manipulate HTML elements in a document using CSS-like syntax. They provide a powerful and flexible way to target specific elements based on various criteria, such as element type, class, ID, or attribute.

Here are some common examples of using Query Selectors:

- **Selecting by Element Type:**

```
var paragraphs = document.querySelectorAll('p');
```

- **Selecting by Class Name:**



- Selecting by ID:

```
var elementWithId = document.querySelector('#elementId');
```

- Selecting by Attribute:

```
var elementsWithAttribute = document.querySelectorAll('[data-custom]');
```

- Combining Selectors:

```
var complexSelection = document.querySelectorAll('ul li.active');
```

Query Selectors return either a NodeList (for `querySelectorAll`) or a single element (for `querySelector`). NodeList is a collection of nodes, which can be iterated through using methods like `forEach`.

In summary, Query Selectors provide a concise and versatile way to interact with HTML elements in a document, making it easier for developers to manipulate the content and structure of a webpage dynamically.

## DOM Node & Methods

The DOM (Document Object Model) is a programming interface that represents the structure of a document as a tree of objects, where each object corresponds to a part of the document. A DOM Node is a fundamental interface in the DOM hierarchy, representing a generic node in the tree structure. All elements, attributes, and text content in an HTML or XML document are nodes.

Here are some key points about DOM Nodes and their methods:

### Key Points:

#### 1. Node Types:



- The `parentNode` property allows you to access the parent node of a given node.
- The `childNodes` property provides a NodeList of child nodes.

### 3. Traversal:

- The `nextSibling` and `previousSibling` properties allow traversal to adjacent nodes.
- The `firstChild` and `lastChild` properties give access to the first and last child nodes.

## Types Of Nodes

In the DOM (Document Object Model), nodes represent different parts of an HTML or XML document, forming a tree structure. There are various types of nodes, each serving a specific purpose. Here are the common types of nodes in the DOM:

### 1. Element Nodes:

- **Description:** Represent HTML or XML elements.
- **Access:** Accessed using methods like `getElementById`, `getElementsByName`, or `querySelector`.
- **Example:**

The `<div>` element is an example of an element node.

```
<div id="example">This is an element node</div>
```



### 2. Attribute Nodes:

- **Description:** Represent attributes of an HTML or XML element.
- **Access:** Attributes can be accessed through the `attributes` property of an element node.
- **Example:**

In this example, `src` and `alt` are attribute nodes of the `<img>` element.

```

```





This node is a text node. It is a text node with the text: <p> This node.

```
<p>This is a text node</p>
```

#### 4. Comment Nodes:

- **Description:** Represent comments within the HTML or XML document.
- **Access:** Accessed through the `comment` property of a comment node.
- **Example:**

The content within `<!--` and `-->` is a comment node.

```
<!-- This is a comment -->
```



#### 5. Document Node:

- **Description:** Represents the entire document.
- **Access:** The document node is the entry point for accessing the DOM tree.
- **Example:**

The `<html>` element serves as the document node in this example.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Document Node Example</title>
  </head>
  <body>
    <p>This is the document node.</p>
  </body>
</html>
```



#### 6. Document Type Node:

- **Description:** Represents the document type declaration.
- **Access:** Accessed through the `doctype` property of the document node.
- **Example:**



# DOM Events

DOM events are interactions or occurrences that take place in a web page, such as a user clicking a button, pressing a key, resizing the browser window, or the content of an input field changing. The HTML DOM (Document Object Model) allows JavaScript to respond to these events, enabling developers to create interactive and dynamic web applications. Here's an overview of DOM events and how JavaScript can react to them:

## Key Concepts:

### 1. Event Types:

- Events can be triggered by various actions, such as mouse clicks (`click`), keyboard presses (`keydown`, `keyup`), form submissions (`submit`), document loading (`load`), and more.

### 2. Event Targets:

- Events are associated with specific HTML elements, known as event targets. For example, a `click` event might be associated with a button, and a `change` event might be associated with a form input.

### 3. Event Handlers:

- JavaScript can respond to events by using event handlers. Event handlers are functions that get executed when a specific event occurs.

## Reacting to Events:

### 1. Inline Event Handlers:

- You can define event handlers directly within HTML elements using inline attributes like `onclick`, `onmouseover`, etc.

```
<button onclick="myFunction()">Click me</button>
```



### 2. DOM Level 0 Event Handling:

- You can assign event handlers directly to JavaScript properties of DOM elements.



```
// Handle the click event  
};
```

### 3. DOM Level 2 Event Handling:

- The `addEventListener` method is used to attach event handlers to elements. This method provides more flexibility and allows multiple handlers for the same event.

```
var button = document.getElementById("myButton");  
button.addEventListener("click", function() {  
    // Handle the click event  
});
```



### 4. Event Object:

- Event handlers typically receive an event object that provides information about the event, such as the target element, mouse coordinates, key codes, etc.

```
button.addEventListener("click", function(event) {  
    console.log("Button clicked!", event.target);  
});
```



## Common Events:

### 1. Click Event:

- Triggered when a mouse button is clicked.

### 2. Keydown and Keyup Events:

- Fired when a key on the keyboard is pressed or released.

### 3. Submit Event:

- Triggered when a form is submitted.

### 4. Change Event:

- Fired when the value of an input field changes.

### 5. Load Event:



```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Event Handling Example</title>
</head>
<body>

    <button id="myButton">Click me</button>

    <script>
        var button = document.getElementById("myButton");

        // Using DOM Level 2 event handling
        button.addEventListener("click", function() {
            alert("Button clicked!");
        });
    </script>

</body>
</html>
```

In this example, a click event handler is attached to a button using the `addEventListener` method. When the button is clicked, an alert is displayed.

Understanding DOM events and how to handle them is crucial for creating interactive and responsive web applications. Developers use events to capture user actions and trigger appropriate JavaScript functionality in response.

## The `onload` and `onunload` functions:

The `onload` and `onunload` events are part of the HTML DOM (Document Object Model) and are used to execute JavaScript code when a document or a page finishes loading (`onload`) or unloading (`onunload`).



to ensure that all resources, such as images and scripts, have been fully loaded before executing specific JavaScript code.

Example:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>onload Event Example</title>
    <script>
        window.onload = function() {
            // Code to execute after the page has fully loaded
            alert("Page loaded!");
        };
    </script>
</head>
<body>
    <h1>Hello, World!</h1>
</body>
</html>
```

In this example, the `onload` event is used to display an alert when the page has finished loading.

## onunload Event:

The `onunload` event is triggered just before a document or a webpage is about to be unloaded, such as when the user navigates away from the page or closes the browser tab. This event is often used to perform cleanup tasks or prompt the user for confirmation before leaving the page.

Example:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
```



```
        };
    </script>
</head>
<body>
    <h1>Thanks for visiting!</h1>
</body>
</html>
```

In this example, the `onunload` event is used to display an alert just before the page is unloaded.

These events play a crucial role in managing the lifecycle of a web page and allow developers to execute code at specific points during the page's existence.

## DOM Event Listeners

DOM Event Listeners provide a more flexible and powerful way to handle events compared to traditional event attributes (e.g., `onclick`). Event Listeners allow you to attach multiple event handlers to a single event, making your code more modular and easier to maintain.

### Using `addEventListener` :

The `addEventListener` method is used to attach an event listener to an HTML element. It takes three parameters: the event type, the function to be executed when the event occurs, and an optional third parameter indicating whether the event should be captured during the event propagation phase.

### Syntax:

```
element.addEventListener(eventType, eventHandler, useCapture);
```

- **eventType** : A string representing the type of event (e.g., "click", "keydown", "change").
- **eventHandler** : A function that will be called when the event occurs.



button that changes its color and displays a message when clicked, and it resets to its default state when the mouse leaves it:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Multiple Event Listeners Example</title>
    <style>
        #myButton {
            padding: 10px;
            font-size: 16px;
            cursor: pointer;
        }
    </style>
</head>
<body>

    <button id="myButton">Click me</button>

    <script>
        // Get the button element
        var button = document.getElementById("myButton");

        // Event listener for the "click" event
        button.addEventListener("click", function() {
            // Change the button color
            button.style.backgroundColor = "green";
            // Display a message
            alert("Button clicked!");
        });

        // Event listener for the "mouseenter" event
        button.addEventListener("mouseenter", function() {
            // Change the button color on mouse enter
            button.style.backgroundColor = "yellow";
        });
    </script>

```



```
</body>  
</html>
```

In this example:

- Clicking the button changes its color to green and triggers an alert.
- Hovering over the button changes its color to yellow.
- Moving the mouse away from the button resets its color to the default state.

Using multiple event listeners allows you to handle different aspects of user interaction separately, promoting cleaner and more organized code.

## Event Bubbling & Event Capturing

Event bubbling and event capturing are two phases of event propagation in the HTML DOM. When an event occurs on an HTML element, it goes through these two phases:

### 1. Event Capturing (Capture Phase):

- In this phase, the event travels from the root of the DOM tree to the target element.
- Event handlers attached with `useCapture` set to `true` are triggered during this phase.

### 2. Event Bubbling (Bubbling Phase):

- In this phase, the event travels from the target element back up to the root of the DOM tree.
- Event handlers attached without specifying `useCapture` or with `useCapture` set to `false` are triggered during this phase.

## Example of Event Capturing:

In the following example, we have a nested set of div elements, and we attach event listeners to the document capturing phase ( `useCapture` set to `true` ). When you click on the innermost div, you'll see that the event handlers for the capturing phase are triggered from the root to the target:



```

</neaa>
<body>

    <div id="outer" style="border: 1px solid red; padding: 10px;">
        Outer
        <div id="middle" style="border: 1px solid green; padding: 10px;">
            Middle
            <div id="inner" style="border: 1px solid blue; padding: 10px;">
                Inner
            </div>
        </div>
    </div>

    <script>
        document.getElementById("outer").addEventListener("click", function() {
            console.log("Outer Capturing");
        }, true);

        document.getElementById("middle").addEventListener("click", function() {
            console.log("Middle Capturing");
        }, true);

        document.getElementById("inner").addEventListener("click", function() {
            console.log("Inner Capturing");
        }, true);
    </script>

</body>
</html>

```

When you click on the "Inner" div, you'll see in the console that the capturing phase event handlers are triggered in the order: Outer Capturing, Middle Capturing, Inner Capturing.

## 1 Comment Example of Event Bubbling:

[Most upvotes](#) [All comments](#)

In this example, event listeners are attached without specifying `useCapture` or with `useCapture` set to `false`. When you click on the innermost div, the event handlers are triggered in the bubbling phase from the target back up to the root:

[Add a comment](#)



M <title>Event Bubbling Example</title>

```
</head>
<body>

    <div id="outer" style="border: 1px solid red; padding: 10px;">
        Outer
        <div id="middle" style="border: 1px solid green; padding: 10px;">
            Middle
            <div id="inner" style="border: 1px solid blue; padding: 10px;">
                Inner
            </div>
        </div>
    </div>

<script>
    document.getElementById("outer").addEventListener("click", function() {
        console.log("Outer Bubbling");
    });

    document.getElementById("middle").addEventListener("click", function() {
        console.log("Middle Bubbling");
    });

    document.getElementById("inner").addEventListener("click", function() {
        console.log("Inner Bubbling");
    });
</script>

</body>
</html>
```

When you click on the "Inner" div, you'll see in the console that the bubbling phase event handlers are triggered in the order: Inner Bubbling, Middle Bubbling, Outer Bubbling.

In practice, event bubbling is more commonly used, and the `useCapture` parameter is often omitted or set to `false` when attaching event listeners. Event capturing is less commonly used and is mainly applicable in specific scenarios where capturing is explicitly needed.