

CSCI 4140 – Tutorial 7

YouTube IFrame Player API

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SHB 118

Office Hour: Wednesday, 3-5 pm

2016.03.10

Outline

- Overview
- Requirements
- Getting started
- Operations
 - Play, Pause, Stop, Mute, Unmute, Fast Forward, Rewind, Next Video, Previous Video
- The `onStateChange` event
- Destroying the player
- Reference

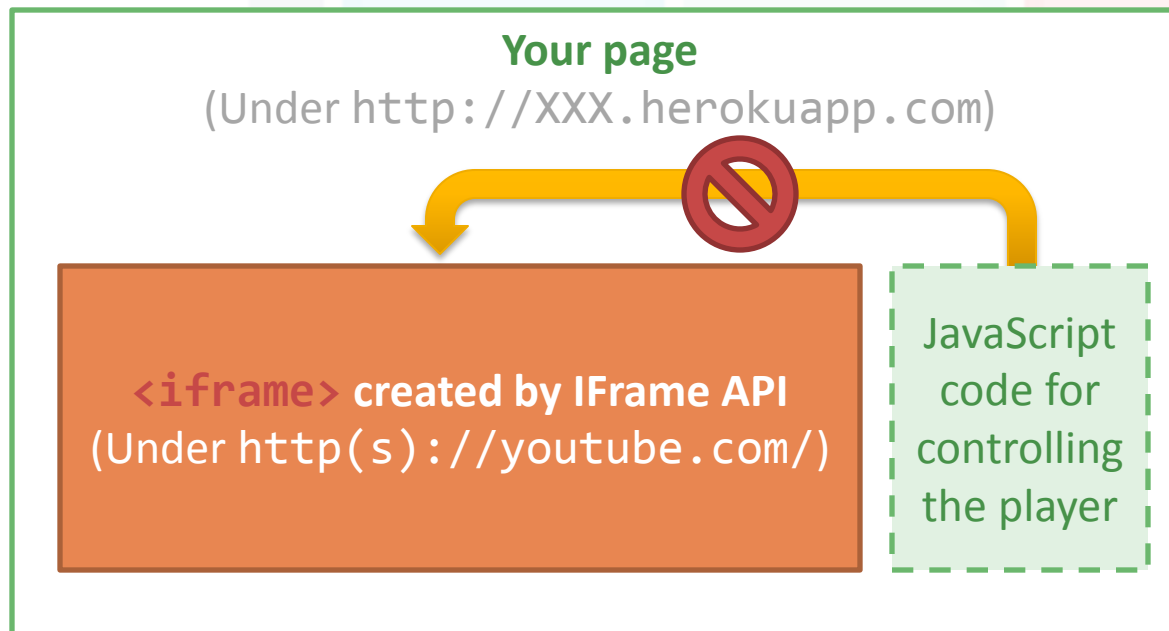


Overview: What is YouTube IFrame API?

- The **IFrame player API** lets you **embed** and **control** a YouTube video player on your website using **JavaScript**
- It posts content to an **<iframe>** tag on your page
 - It provides more **flexibility** because YouTube can either serve an **HTML5 player** or a Flash player
 - You do not need to care about which player is used!
- The API
 - Provides **operations** for video playback
 - Triggers **events** that can be handled by your **event listeners**

Requirements

- Browsers that support the HTML5 **postMessage** feature
 - Chrome / Safari / Firefox support it (forget about IE 7 or below...)
 - Why HTML5?

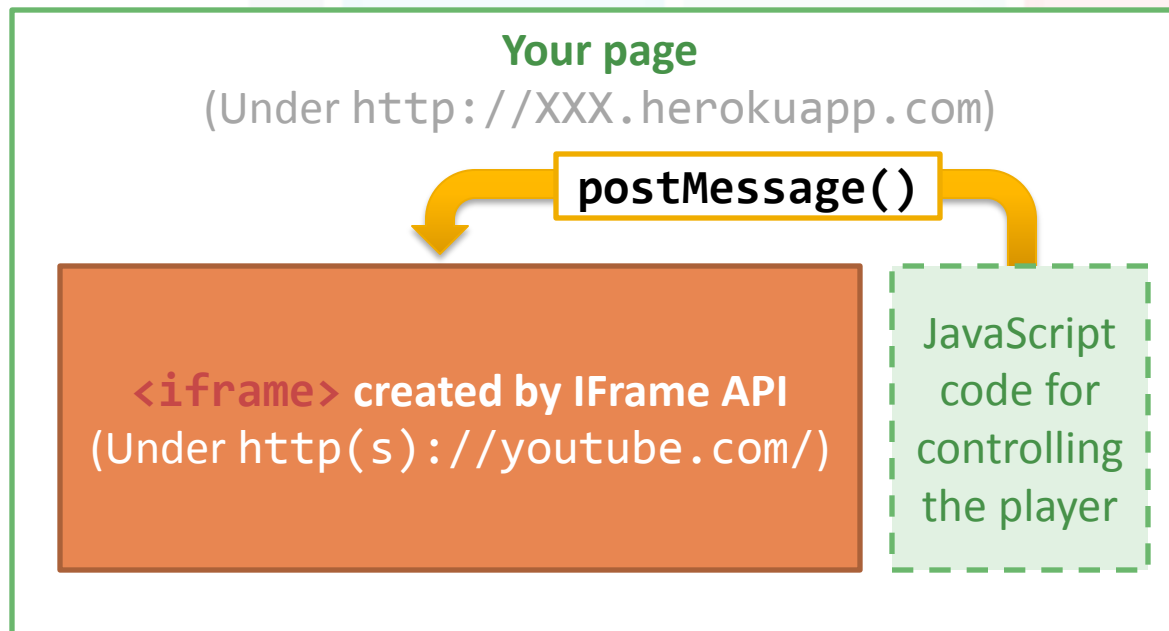


Before HTML5, it is impossible for the scripts on a site to access resources (e.g., DOM) from other sites from different origin due to security reasons.

This is called the same-origin policy (SOP).

Requirements

- Browsers that support the HTML5 **postMessage** feature
 - Chrome / Safari / Firefox support it (forget about IE 7 or below...)
 - Why HTML5?



HTML5 defines the `window.postMessage()` method which enables cross-origin communication. In this example, the YouTube site tells the browser that it is going to receive messages from other sites. Then, a site on Heroku can send messages to it.

Requirements

- Browsers that support the HTML5 **postMessage** feature
 - Chrome / Safari / Firefox support it (forget about IE 7 or below...)
- **Viewport** that is at least 200px by 200px
 - This ensures that the player can be fully displayed
 - In Assignment 2, you don't need to check this as the player is only displayed on desktop view (i.e., device width = **md** or **lg** in Bootstrap)
- Implemented **onYouTubeIframeAPIReady** JS function
 - The API calls this function when the JavaScript code for the player API has been downloaded
- Now let's see how to use the API

Getting started: Sample HTML page

```
<!DOCTYPE html>  
<html>  
  <body>  
    <div id="player"></div>  
    <script src="player.js"></script>  
  </body>  
</html>
```

Tell the browser that you are using HTML5 (also required by Bootstrap).

This <div> serves as a placeholder, which will be replaced by the <iframe> and video player later.

Embed the JavaScript code to the page.
Note: It is a good practice to separate the JavaScript from the document content.

[youtube-iframe-api/index.html](https://www.youtube.com/iframe-api/index.html)

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
firstScriptTag.parentNode.insertBefore( tag, firstScriptTag );
var player;
function onYouTubeIframeAPIReady() {
    player = new YT.Player( 'player', {
        height : '390',
        width : '640',
        playerVars: { 'controls' : 0 },
        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```



This code loads the IFrame API code asynchronously.

[youtube-iframe-api/player.js](https://www.youtube.com/iframe_api/player.js)

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
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        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

Once the IFrame API code is loaded, the `onYouTubeIframeAPIReady()` function is invoked automatically. (So, never call this function yourself!) This function creates an `<iframe>` and YouTube player.

[youtube-iframe-api/player.js](https://www.youtube.com/iframe_api/player.js)

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_";
var firstScriptTag = document.getElementsByTagName( 'script' )[0];
firstScriptTag.parentNode.insertBefore( tag, firstScriptTag );
var player;
function onYouTubeIframeAPIReady() {
    player = new YT.Player( 'player', {
        height : '390',
        width : '640',
        playerVars: { 'controls' : 0 },
        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

The first parameter specifies either the DOM element or the id of the HTML element where the API will insert the `<iframe>` tag containing the player.

In this example, this refers to the element:

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

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
firstScriptTag.parentNode.insertBefore( tag, firstScriptTag );
var player;
function onYouTubeIframeAPIReady() {
    player = new YT.Player( 'player', {
        height : '390',
        width : '640',
        playerVars: { 'controls' : 0 },
        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

The second parameter is an object which specifies player options.

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
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        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

[Optional] Let's disable the control bar inside the player. We only control the video playback on our remote in Assignment 2.

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
firstScriptTag.parentNode.insertBefore( tag, firstScriptTag );
var player;
function onYouTubeIframeAPIReady() {
    player = new YT.Player( 'player', {
        height : '390',
        width : '640',
        playerVars: { 'controls' : 0 },
        videoId : 'M71c1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

Specify the ID of the YouTube video to be loaded by the player. In Assignment 2, this should be the first entry in the playlist.

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```

var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
firstScriptTag.parentNode.insertBefore( tag, firstScriptTag );
var player;
function onYouTubeIframeAPIReady() {
    player = new YT.Player( 'player', {
        height : '390px',
        width : '640px',
        playerVars : {
            'v': 'vJMMt7FyI2s',
            'autoplay': 1,
            'controls': 1,
            'fs': 0,
            'rel': 0,
            'showinfo': 1,
            'start': 0,
            'end': 0
        },
        events : {
            'onReady' : onPlayerReady,
            'onStateChange' : onPlayerStateChange
        }
    } );
}

```

In case you don't know, the video ID of an YouTube video can be retrieved from its URL:

<https://www.youtube.com/watch?v=vJMMt7FyI2s>

The GET parameter of “v” (i.e., v=XXXXXXXXXXXX) contains the video ID.

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```

var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[0];
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        height : '390',
        width : '640',
        playerVars: { 'controls' : 0 },
        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}

```

To set up event listeners, pass the function to the “events” object.

Note: Read the complete source code for the implementation of the event listeners (i.e., `onPlayerReady()` & `onPlayerStateChange()`).

Event name

Event listener

youtube-iframe-api/player.js

Getting started: Sample JavaScript

```
var tag = document.createElement( 'script' );
tag.src = "https://www.youtube.com/iframe_api";
var firstScriptTag = document.getElementsByTagName( 'script' )[ 0 ];
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        height : '390',
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        videoId : 'M7lc1UVf-VE',
        events : {
            'onReady': onPlayerReady,
            'onStateChange': onPlayerStateChange
        }
    } );
}
```

Remember to save the player object returned from **new YT.Player()** such that you can control the player later.

youtube-iframe-api/player.js

Operations

- After getting a **reference** to the player object (stored in the **player** variable), you can use the player API methods to control the video playback
- Operations required in Assignment 2:
 - Play
 - Pause
 - Stop
 - Mute
 - Unmute
 - Fast forward
 - Rewind
 - Previous video
 - Next video

Operations: Play, Pause, Stop, Mute, Unmute

- Suppose the player has loaded a video
- Methods for performing these operations:

– Play:

```
player.playVideo();
```

– Mute:

```
player.mute();
```

– Pause:

```
player.pauseVideo();
```

– Unmute:

```
player.unMute();
```

– Stop:

```
player.stopVideo();
```

Operations: Fast Forward, Rewind

- Implementing **fast forward** and **rewind** is a bit tricky as the API does not provide these methods directly
- However, there is a **seekTo()** method which allows you to seek to a **specified time** in the video

```
player.seekTo(seconds:Number, allowSeekAhead:Boolean);
```

Time to which the player should advance (in seconds)

Allow or disallow the player to seek beyond the currently buffered portion of the video
For simplicity, please set it to true!

- We can also use **getCurrentTime()** to get the **elapsed time** of the currently playing video in seconds:

```
currentTime = player.getCurrentTime();
```

Operations: Fast Forward, Rewind

- Combining these two methods:

Note: This is a our simplified version of fast forward and rewind in Assignment 2.

When the user click the “Fast Forward” button:

```
currentTime = player.getCurrentTime();  
player.seekTo( currentTime + 2.0 ); // Seek to 2 seconds later
```

End

When the user click the “Rewind” button:

```
currentTime = player.getCurrentTime();  
player.seekTo( currentTime - 2.0 ); // Seek to 2 seconds before
```

End

Pseudocode

- Note: You can assume that the user will never “fast forward” or “rewind” out of the video, i.e.,

$$2 < currentTime < Video\ Length\ (in\ seconds) - 2$$

Operations: Next Video, Previous Video

- User manages the playlist in our application (by either adding or removing videos from the playlist)



Warning: Don't use `nextVideo()` or `previousVideo()`

- They are for loading and playing the next/previous video in a *YouTube* playlist
 - Example:
<https://www.youtube.com/watch?v=V9Glijy4q3wk&list=PL8F997915F5135BF3>
- This is totally different from the playlist managed in our application
- So, how to implement this feature?
- **Answer:** Use the `player.loadVideoById()` method

Operations: Next Video, Previous Video

- Let's say we store the playlist in an array called "playlist"
- The video currently playing corresponds to the i -th entry of the playlist

When the user click the "Next Video" button:

```
var id = playlist[ i + 1 ]; // Get the next video ID in the playlist
player.loadVideoById( id ); // Change the current video
i++; // Update current index of the playlist
```

End

When the user click the "Previous Video" button:

```
var id = playlist[ i - 1 ]; // Get the previous video ID in the playlist
player.loadVideoById( id ); // Change the current video
i--; // Update current index of the playlist
```

End

Pseudocode

The onStateChange event

- Note that the player will just stop when the currently playing video ends (which is not the expected behavior)
 - The player should **play the next video in the playlist!**
 - How can we **detect** that a video has stopped playing?

```
function onYouTubeIframeAPIReady() {  
  player = new YT.Player( 'player', {  
    height : '390',  
    width : '640',  
    playerVars: { 'controls' : 0 },  
    videoId : 'M71c1UVf-VE',  
    events : {  
      'onReady': onPlayerReady,  
      'onStateChange': onPlayerStateChange  
    }  
  } );  
}
```

Do you remember the event listeners set in the onYouTubeIframeAPIReady() method?

We will use the onStateChange event to detect the change in player state .

The onStateChange event

```
function onPlayerStateChange(event){
    switch( event.data ) {
        case YT.PlayerState.ENDED:
            // ...
            break;
        case YT.PlayerState.PLAYING:
            // ...
            break;
        case YT.PlayerState.PAUSED:
            // ...
            break;
        case YT.PlayerState.BUFFERING:
            // ...
            break;
        case YT.PlayerState.CUED:
            // ...
            break;
        default:
            // ...
    }
}
```

- This is the event listener of the event “onStateChange”
- The event is triggered when the player changes its state (e.g., from playing to pause/stop)
- The argument of the event listener (**event**) has an attribute called “data”
- By checking its value, we know the current state of the player, and we can act accordingly

The onStateChange event

```
function onPlayerStateChange(event){  
  switch( event.data ) {  
    case YT.PlayerState.ENDED:  
      // ...  
      break;  
    case YT.PlayerState.PLAYING:  
      // ...  
      break;  
    case YT.PlayerState.PAUSED:  
      // ...  
      break;  
  }  
}
```

```
case YT.PlayerState.BUFFERING:  
  // ...  
}
```

You need to load the next video in the playlist when the current state of the player is “ENDED”.

Note: For other state changes, you may handle or ignore them (depends on your implementation)

- This is the event listener of the event “onStateChange”
- The event is triggered when the player changes its state (e.g., from playing to pause/stop)
- The argument of the event listener (**event**) has an attribute called “data”
- By checking its value, we know the current state of the player, and we can act accordingly

Destroying the player

- When the device width is below **md** or **lg** in Bootstrap (i.e., tablet and mobile view), the player should not be displayed
- If the player is already loaded, you are strongly suggested **destroying** the player when it is not shown
 - This avoids the video player to keep on playing videos even it is not displayed
- To destroy a player object: `player.destroy();`
- Remember to re-create the player object when the page is restored to **desktop view** later

Destroying the player

- To detect the width of the window, use `window.innerWidth`
- Use an event listener to detect the “`resize`” event in `window`
 - **Warning:** The resize event is triggered many times while you resize the window!
 - Yet, you can only create the player once
- When the device width is below `md` or `lg` in Bootstrap (i.e., tablet and mobile view), the player should not be displayed
 - i.e., the player is displayed only if `window.innerWidth >= 992`
- Alternatively, you can use jQuery `$(window).resize()`

Destroying the player

```
window.addEventListener( 'resize', function() {  
    if ( window.innerWidth >= 992 ) {  
        if ( player === null ) {  
            (Display the video player)  
        }  
    } else {  
        player.destroy(); // Destroy the video player  
        player = null;  
    }  
} );
```

Pseudocode

Destroying the player

In the “resize” event listener, detect the width of the window and show/hide the video player

```
window.addEventListener( 'resize', function() {  
  if ( window.innerWidth >= 992 ) {  
    if ( player === null ) {  
      (Display the video player)  
    }  
  } else {  
    player.destroy(); // Destroy the video player  
    player = null;  
  }  
} );
```

Check whether the player is already created while the window is resized.

Set **player** to **null** to indicate that the player is destroyed.

Pseudocode

References

- YouTube Player API Reference for iframe Embeds:
 - https://developers.google.com/youtube/iframe_api_reference?hl=en
 - Most of the contents of this tutorial come from this page
- YouTube Player Demo:
 - https://developers.google.com/youtube/youtube_player_demo

– End –