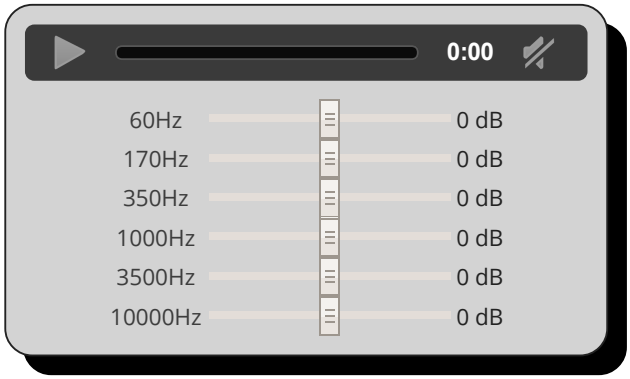
Writing an equalizer using biquad filters

EXAMPLE 1: AN AUDIO EQUALIZER WITH AN<AUDIO> ELEMENT

Example at JSBin, or you can try it in your browser:



This example uses six `BiquadFilter` nodes with `type="peaking"`.

If you read the description of this filter type: *"Frequencies inside the range get a boost or an attenuation; frequencies outside it are unchanged."* This is exactly what we need to write a multi band equalizer! We're going to use several sliders, each of which boosts one range of frequency values.

The definition says that:

- the `frequency` property value of a filter will indicate the middle of the frequency range getting a boost or an attenuation, each slider corresponds to a filter whose frequency will be set to 60Hz, 170Hz, 350Hz, 1000Hz, 3500Hz, 10000Hz.
- the `gain` property value of a filter corresponds to the boost, in dB, to be applied; if negative, it will be an attenuation. We will make the sliders' event listeners change the `gain` value of the corresponding filter.
- the `Q` property values control the width of the frequency band. The greater the Q value, the smaller the frequency band. For this example, we did not use this property.

HTML code extract:

```
    <h2>Equalizer made with the Web Audio API</h2>

    <div class="eq">
      <audio id="player" controlscrossorigin="anonymous" loop>
```

```
      <sourcesrc="http://mainline.i3s.unice.fr/mooc/drums.mp3">
      Your browser does not support the audio tag.
    </audio>
    <div class="controls">
      <label>60Hz</label>
      <input type="range"
             value="0" step="1" min="-30"max="30"
             oninput="changeGain(this.value, 0);">
      </input>
      <output id="gain0">0 dB</output>
    </div>
    <div class="controls">
     <label>170Hz</label>
     <input type="range"
            value="0" step="1" min="-30"max="30"
            oninput="changeGain(this.value,1);">
     </input>
     <output id="gain1">0 dB</output>
    </div>
    <div class="controls">
      <label>350Hz</label>
      <input type="range"
             value="0" step="1" min="-30"max="30"
             oninput="changeGain(this.value, 2);">
      </input>
      <output id="gain2">0 dB</output>
    </div>
  ...
  </div>
```

JavaScript code:

```
  //Builds an equalizer with multiple biquad filters

  var ctx = window.AudioContext ||window.webkitAudioContext;
  var context = new ctx();

  var mediaElement =document.getElementById('player');
  var sourceNode =context.createMediaElementSource(mediaElement);

  // Creates the equalizer, comprised of a set of biquad filters

  var filters = [];
```

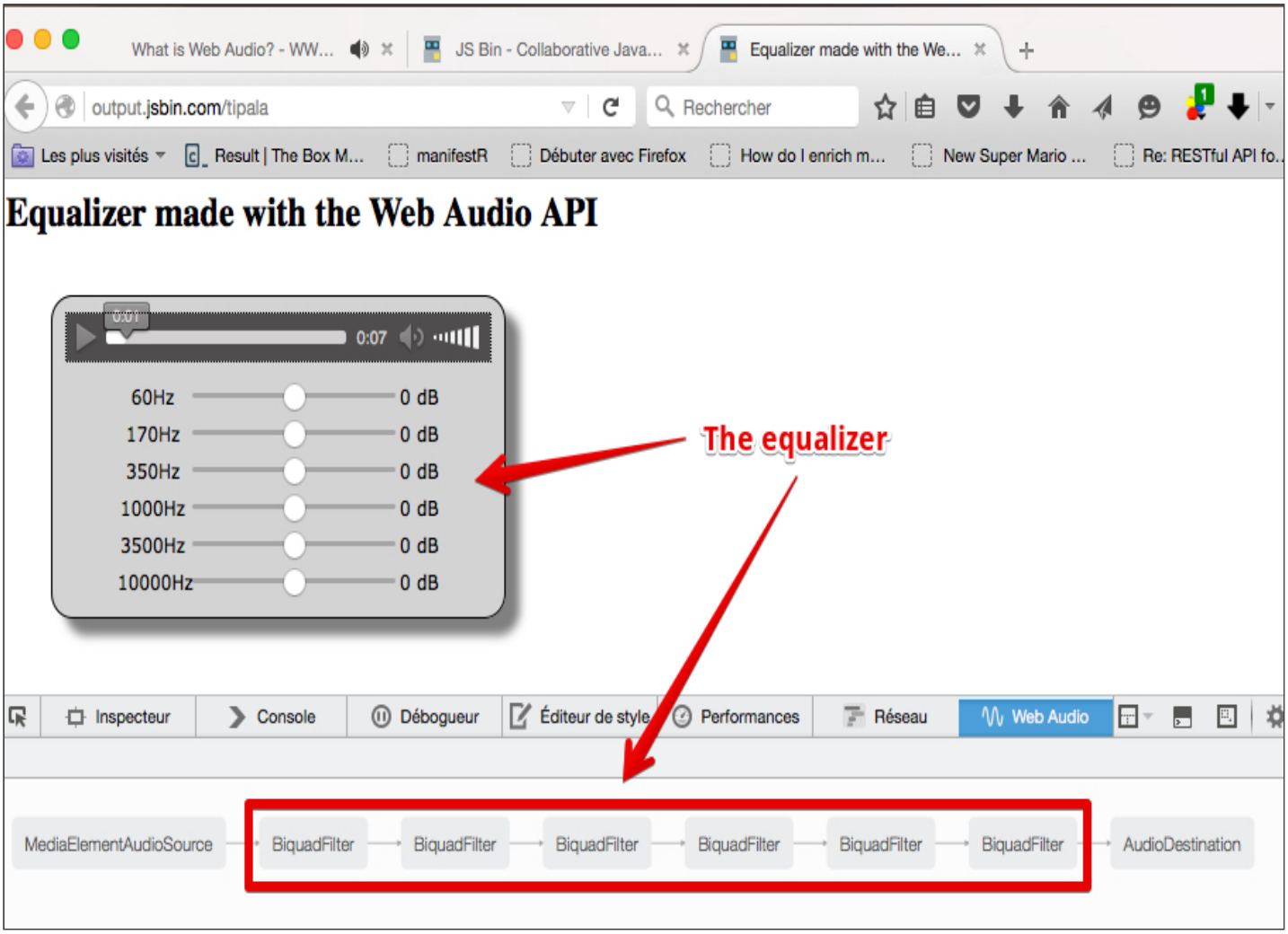
```
    // Set filters
    [60, 170, 350, 1000, 3500,10000].forEach(function(freq, i) {
       var eq = context.createBiquadFilter();
       eq.frequency.value = freq;
       eq.type = "peaking";
       eq.gain.value = 0;
       filters.push(eq);
});

    // Connects filters in sequence
    sourceNode.connect(filters[0]);
    for(var i = 0; i < filters.length - 1;i++) {
       filters[i].connect(filters[i+1]);
    }

    // Connects the last filter to the speakers
    filters[filters.length -1].connect(context.destination);

    // Event listener called by the sliders
    function changeGain(sliderVal,nbFilter) {
       var value = parseFloat(sliderVal);
      filters[nbFilter].gain.value = value;
      // Updates output labels
      var output =document.querySelector("#gain"+nbFilter);
      output.value = value + " dB";
    }
```

Here is the final audio graph:



EXAMPLE 2: THE SAME EXAMPLE BUT WITH A<VIDEO> ELEMENT

We cloned the previous example and simply changed the<audio>...</audio> part of the HTML code by:

```
<video id="player" width="320"height="240" controlscrossOrigin="anonymous">
    <sourcesrc="http://mainline.i3s.unice.fr/mooc/elephants-dream-medium.mp4" >
</video>
```

And the example works in the same way, but this time with a video. Try moving the sliders to change the sound!

Example at JSBin:


05:12
60Hz
0 dB
170Hz
0 dB
350Hz
0 dB
1000Hz
0 dB
3500Hz
0 dB
10000Hz
0 dB