WEB AUDIO API

AIST2010 Lecture 8P
OUTLINE

Web Audio API  Main Components  Going Further
WEB AND AUDIO

Web Audio API
- W3C Candidate Recommendation (2018)

Everything nowadays are on the web
- Popular use of JavaScript — interactivity and real-time responses
The Audio Context

As a platform of all the audio events

- Audio signal graph of connections between AudioNodes

```javascript
var audioCtx = new (window.AudioContext || window.webkitAudioContext); // browser compatibility
```

AudioContext

Audio Source
- Synthesized or sound recording
- Streamed media

Modification
- Delay, reverb, etc.
- Frequency filters

Destination
- Sound output


**Audio Sources**

Waveform Synthesizer
- OscillatorNode

Audio data
- AudioBufferSourceNode

HTML5 audio/video
- MediaElementAudioSourceNode

```javascript
// In the AudioContext,
// create an oscillator which is
// a sine wave of 261 Hz frequency.
// Start it and put it to the destination.

var sine = audioCtx.createOscillator();
sine.frequency.value = 261;
sine.type = "sine";
sine.start();
sine.connect(audioCtx.destination);

// the properties .frequency and .type
// can be changed easily by other functions
```
**AUDIO EFFECTS**

- **BiquadFilterNode**
  - lowpass, highpass, bandpass, ...

- **ConvolverNode**
  - Convolution reverb with impulse

- **DelayNode**
- **DynamicsCompressorNode**
  - Compressor to prevent clipping

- **GainNode**
  - Change in volume

- **WaveShaperNode**
  - Distortion effect

```javascript
// sine.connect(audioCtx.destination);
var volume = audioCtx.createGain();
sine.connect(volume);

volume.gain.value = 0.5;
volume.connect(audioCtx.destination);
```
AnalyserNode interface

- `fftSize`
  - Adjustable size of FFT analysis
- `getFloatFrequencyData()`
- `getByteFrequencyData()`
- `getFloatTimeDomainData()`
- `getByteTimeDomainData()`
  - Retrieving FFT results into JavaScript arrays

Note: More techniques with HTML5 canvas drawing is needed to actually visualize the raw data
In the community of web developers, people often rely on other libraries to make JavaScript API calls easier (and lazier)

**Tone.js**
- Easy generation of synthesized sounds
- Time management
- Instruments

Here are some libraries for working with web audio:
- **Pizzicato.js** - Pizzicato aims to simplify the way you create and manipulate sounds via the Web Audio API
- **webaudio.js** - webaudio.js is a bunch of helpers that will make working with the WebAudio API easier
- **howler.js** - Javascript audio library for the modern web
- **WAD** - Use the HTML5 Web Audio API for dynamic sound synthesis. It’s like jQuery for your ears
- **Tone.js** - A Web Audio framework for making interactive music in the browser

Text from: https://css-tricks.com/introduction-web-audio-api/
To use Tone.js, add it using a script tag
<script src="https://unpkg.com/tone@13.8.25/build/Tone.js"></script>

A simple synth (single oscillator, single envelope)
var synth = new Tone.Synth().toMaster(); // connected to destination synth.triggerAttackRelease('C4', '4n'); // a C4 quarter note // the note can be in Hz or pitch name // and the time can be in seconds or 4n,8n,…

Learn more: https://tonejs.github.io/docs/
POSSIBLE IMPLEMENTATIONS

While the Web Audio API provides backend data handling, all UI needs to be handled by HTML/CSS/JavaScript

You may explore further if you are already a web developer

A demonstration of the Web Audio API

[https://webaudioplayground.appspot.com](https://webaudioplayground.appspot.com)
WEB MIDI API

The Web MIDI API allows MIDI hardware to be driven directly within the browser


Not widely supported by browsers yet
- Can be enabled by installing extensions

Question: How useful is a MIDI keyboard driven by the web browser?
TRENDS IN WEB DEVELOPMENT

JavaScript and Web apps
- Still in active development, likely to remain popular
- Highly volatile!

Libraries and Frameworks
- “A new JS library is made every hour”

Browsers
- Non-standard drafts are already supported by various browsers
We have discussed:

- Basics of Web Audio API
- Audio Context, oscillator, effects
- Supplementary libraries for audio
READ FURTHER

Useful websites:

- https://www.w3.org/TR/webaudio/
- https://tonejs.github.io