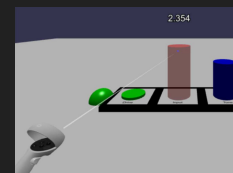
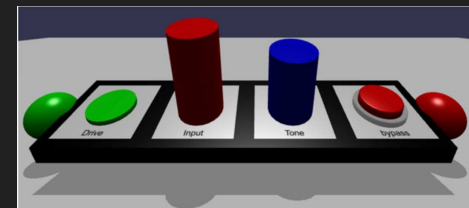
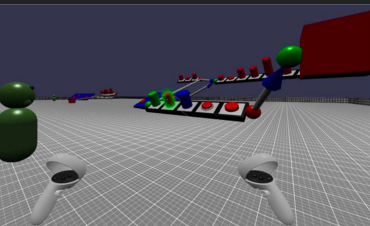
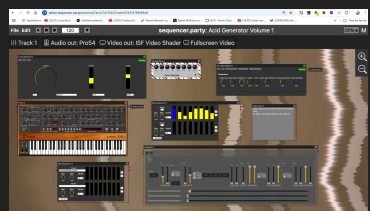


FAUST-Based Web Audio Modules In (sometimes unexpected) Online Hosts



International Faust Conference

22 November 2024

Link to this presentation:

<https://tinyurl.com/4xyuruny>

Michel Buffa, Ayoub Hofr, Dorian Girard, Quentin Escobar
Université Côte d'Azur / Laboratoire I3S / INRIA, WIMMICS group,
first_name.name@univ-cotedazur.fr

This work has been supported by the French government, through the France 2030 investment plan managed by the "Agence Nationale de la Recherche", as part of the "UCA DS4H" project, reference ANR-17-EURE-0004

Who am I? What is our group?

- Professor / researcher at Université Côte d'Azur (UCA), France
 - Member of the WIMMICS research group common to INRIA and I3S lab from CNRS
 - W3C Advisory Committee Representative for my university
 - **Member of the W3C WebAudio Working Group since 2014**
 - michel.buffa@univ-cotedazur.fr, @micbuffa
- **Involved in the Web Audio Modules (WAM) plug-in standard**
...along with folks from GRAME/FAUST
+ other academics and developers.



SpectrumModalModule Presets Modulations

Time Fdbk Wet Contour Bow Blow Strike Model Modal

0.30 0.60 0.30 0.00 0.00 1.00

Base Width Stereo Mallet Geometry Brightness

0.00 0.00 0.00 0.50 0.69 0.30

Bow Timbre Blow Timbre Strike Timber Damping Position Space

0.00 0.00 0.50 0.30 0.30 1.28

PingPong

webCZ-101

P-01 BRASS ENS.1

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3



webOBXD // bank ABS-OBXD-Custom Shop v1.fwb patch #2 ABS * Synth

OBXD VIRTUAL ANALOG SYNTHESIZER

MASTER VOLUME TUNE TRANSP

OSCILLATORS OSC 1 OSC 2 OSC 3

MIX OSC 1 OSC 2 OSC 3

FILTER CUTOFF RESO ENV

AMPLIFIER ENVELOPE AMP A D E

MODULATION RATE SYNC

VOICE VARIATION FILTER OSC 1 OSC 2

VOICE PAN

KEEP ALL B

GLOBAL LIGATO VOICES

CONTROL BRND I2 BRND I2 BRND I2

FuzzFace Level

Distortion Wah

Harmonizer Effect

Humbucker Sim Effect

TEMPERK

High Highland mDepth

mid lowband mfreq

lowt

JPVerb

damp size wet 160

START

RESONANCE



VoxAmp 30

Clean / Crunch

Volume Bass Middle Treble Master

DualPitchShifter

Mix Shift

Shift Windows Size



TS9 Overdrive

QuadraFuzz

Frequency High Low

Frequency Dry/Wet

Sweet Wah

DECAY DISTOR

PitchShifter

Pitch Formant

DISTO MACHINE

VOLUME MASTER DRIVE BASS MIDDLE TREBLE REVERB PRESENCE

GREYHOLE

damping diffusion modFreq

delayTime feedback size

modDepth

UTILITY

INPUT GAIN

Noise Gate

LEAK OUT

CLEAN MACHINE

HOLDS STRAITS RHYTHM STRIKE STRIKE STRIKE STRIKE STRIKE STRIKE

StereoFreqShifter

L-R Offset Mix

Shift Scalar Shift

TimeZeroFlanger

Depth Feedback

J-RoFoot Rate

WetPhaser

Rate Scales Rate

DEXED

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

AUGUR (TRACK 1)

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

OSC 1 OSC 2 OSC 3

Blues Machine

Volume Master Drive Bass Middle Treble Reverb Presence

MODERN METAL MACHINE

VOICE MASTER DRIVE BASS MIDDLE TREBLE REVERB PRESENCE

SHIMMER TONE

FaustEQ

Low Bandwidth Peak Bandwidth High Bandwidth

Threshold Frequency Peak 6 Threshold Frequency Peak 6

KBVerb

Delay Feedback Interoptation

Smooth Delay

Delay Feedback Interoptation

DEAD ZONE

NOISE GATE

DRUM SAMPLER

OH Crash Ride

Low Tom Mid Tom High Tom CH

Output Tone Pan Gain

-0.74 0.00 0.41

PianoRollModule

Settings



ENV MATRIX WAVES



STONE PHASER

LFO FREQ RESONANCE DEPTH

RESONANCE DEPTH DEPTH

MODE STEER PHASE BIVARY PHASE

Portamento LFO Oscillator Mixer Filter

Time Rate Tune Mod PW PWM Pulse Saw Sub Noise Freq Res Env Mod Kbyd

Mode Waveform Range Sub Range

Off Triangle 32° 0.00 0.00 -10ct

DRUM SAMPLER

OH Crash Ride

Low Tom Mid Tom High Tom CH

Output Tone Pan Gain

-0.74 0.00 0.41

Fuzz

Resonance

Low Med High

Freq 200.00 2000.00 800.00

Gain 0.00 0.00 0.00

Vibrato **OscTube**

Fuzz

Resonance

Low Med High

Freq 200.00 2000.00 800.00

Gain 0.00 0.00 0.00

Vibrato **OscTube**

docs.google.com/spreadsheets/d/1Ln4E4mW12p6WqTejdLzq0wEcti4Cl_P8CJX0ClzcjhA/edit?gid=0#gid=0

Applications (2537) Louis Berti... Untitled notebook... (2530) Coding Ad... Neural Network Le... Daniel Shiffman su... MTG - Music

Wam plugins status ☆ 📁 🌐

Fichier Édition Affichage Insertion Format Données Outils Extensions Aide

G24:G25

	A	B	C	D	E	F	G	H
1	PLUGINS	Techno	Type	WAP	WAM2	WAM-BANK	Sequencer.party	Pedalbo
2	Faust Delay	FAUST	Delay	x	x	x		x
3	Ping Pong delay JS	JS	Delay	x	x	x		x
4	Octaver	FAUST	Octaver		x	x		
5	GCompressor	FAUST	Compresseur		x	x		
6	Equalizer	JS	EQ	x	x	x		x
7	Greyhole	FAUST	Reverb	x	x	x		x
8	Disto Machine	JS	Amp Sim	x	x	x		x
9	Vox Amp 30	FAUST	Amp Sim		x	x		
10	Stone Phaser	FAUST	Modulation	x	x	x		
11	TS9 Overdrive	FAUST	Overdrive	x	x	x		x
12	Sweet Wah	FAUST	Auto-Wah	x	x	x		x
13	Smooth Delay	FAUST	Delay	x	x	x		x
14	Temper Disto	FAUST	Distortion	x	x	x		x
15	OSC tube	FAUST	Distortion	x	x	x		x
16	Stone Phaser 2	FAUST	Modulation	x	x	x		x
17	Owl Shimmer	FAUST	Reverb	x	x	x		x
18	Distorder	FAUST	Distorsion	x	x	x		x
19	Overdrive Rix	FAUST	Overdrive	x	x	x		x
20	Owl Dirty	FAUST	Reverb / Overdrive	x	x	x		x
21	Kpp Fuzz	FAUST	Fuzz		x	x		
22	Deathgate	FAUST	Noise gate	x	x	x		x
23	KBVerb	FAUST	Reverb		x	x		
24	Blipper	FAUST	Pitch follower	x	x	x		x
25	Dual Pitch Shifter	FAUST	Pitch shifter	x	x	x		x
26	Stereo Freq Shifter	FAUST	Frequency Shifter	x	x	x		x
27	Weird Phaser	FAUST	Phaser	x	x	x		x
28	Thru Zero Flanger	FAUST	Flanger	x	x	x		x
29	Stereo Flanger	FAUST	Flanger	x		potentiellement		x
30	7th D...	FAUST	D...					

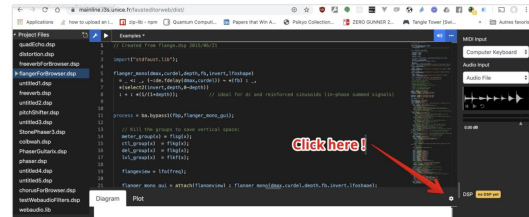
Most of the WAM plugins are FAUST-Based !

So easy to make WAMs with the online FAUST IDE!

Create your own Web Audio Modules plugins with the FAUST IDE

1 - Open the FAUST IDE and enable the new experimental / beta GUI Builder

- Go to <https://faustide.grame.fr/>
- Click on the setting menu to enable the GUI Builder.



Can you DAW it online?



IEEE International Symposium
on the Internet of Sounds 2024

October 1

(Link of this presentation :

<https://tinyurl.com/2e86wxbx>)



Michel Buffa, Samuel Demont
Université Côte d'Azur / Laboratoire I3S / INRIA, WIMMICS group,
michel.buffa@univ-cotedazur.fr, @micbuffa
samueldemont83@gmail.com

This work has been supported by the French government, through the France 2030 investment plan managed by the "Agence Nationale de la Recherche", as part of the "UCA DS4H" project, reference ANR-17-EURE-0004

Real-time collaborative improvisation !



To join:

1. Create an account in <https://sequencer.party>
2. Click this invitation link: <https://sequencer.party/users/invite/26fc7a19d2a948bfc9181a203601d32e>
3. Join the session named "Demo Session" (click on the title)



IFC 2024 demo OWNER Public

Demo for International Faust Conference

Sessions +

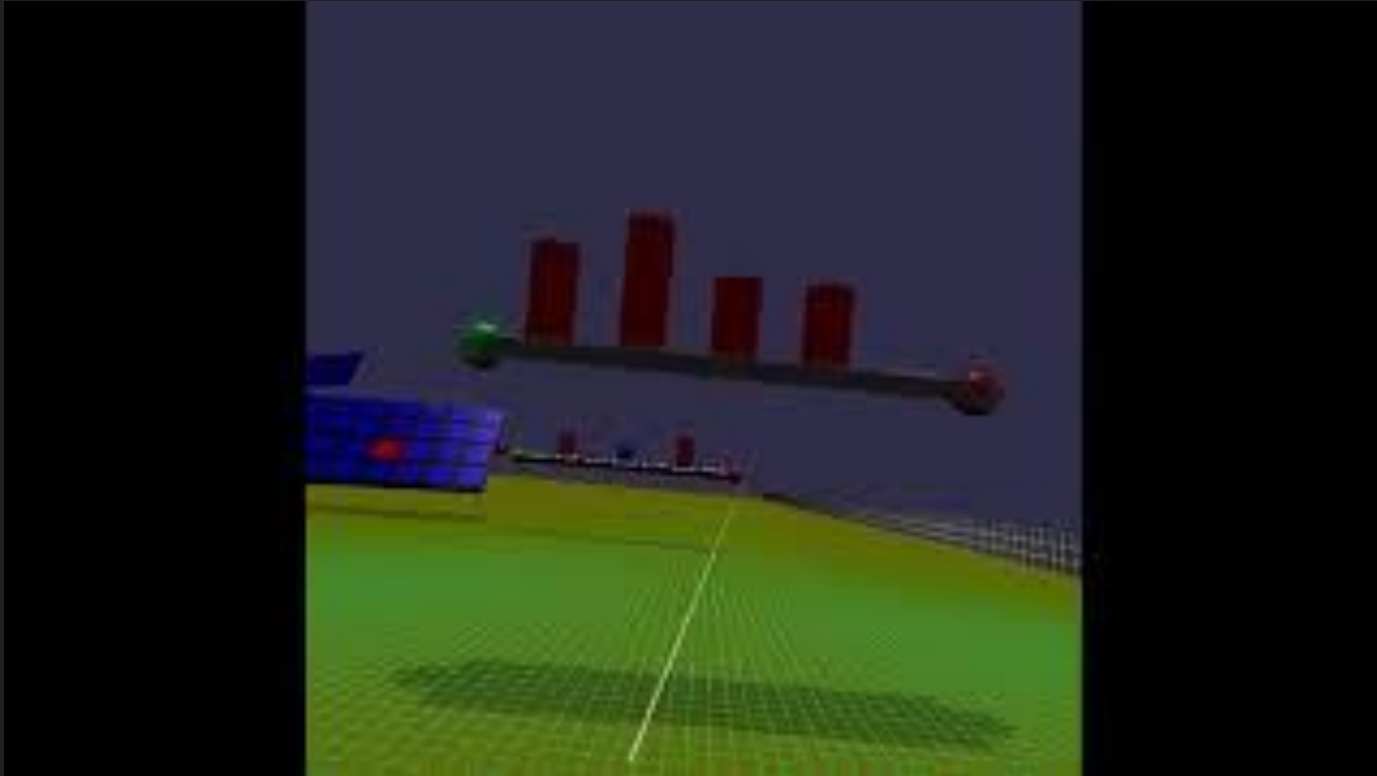
Demo session
updated 16 hours ago

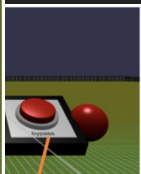
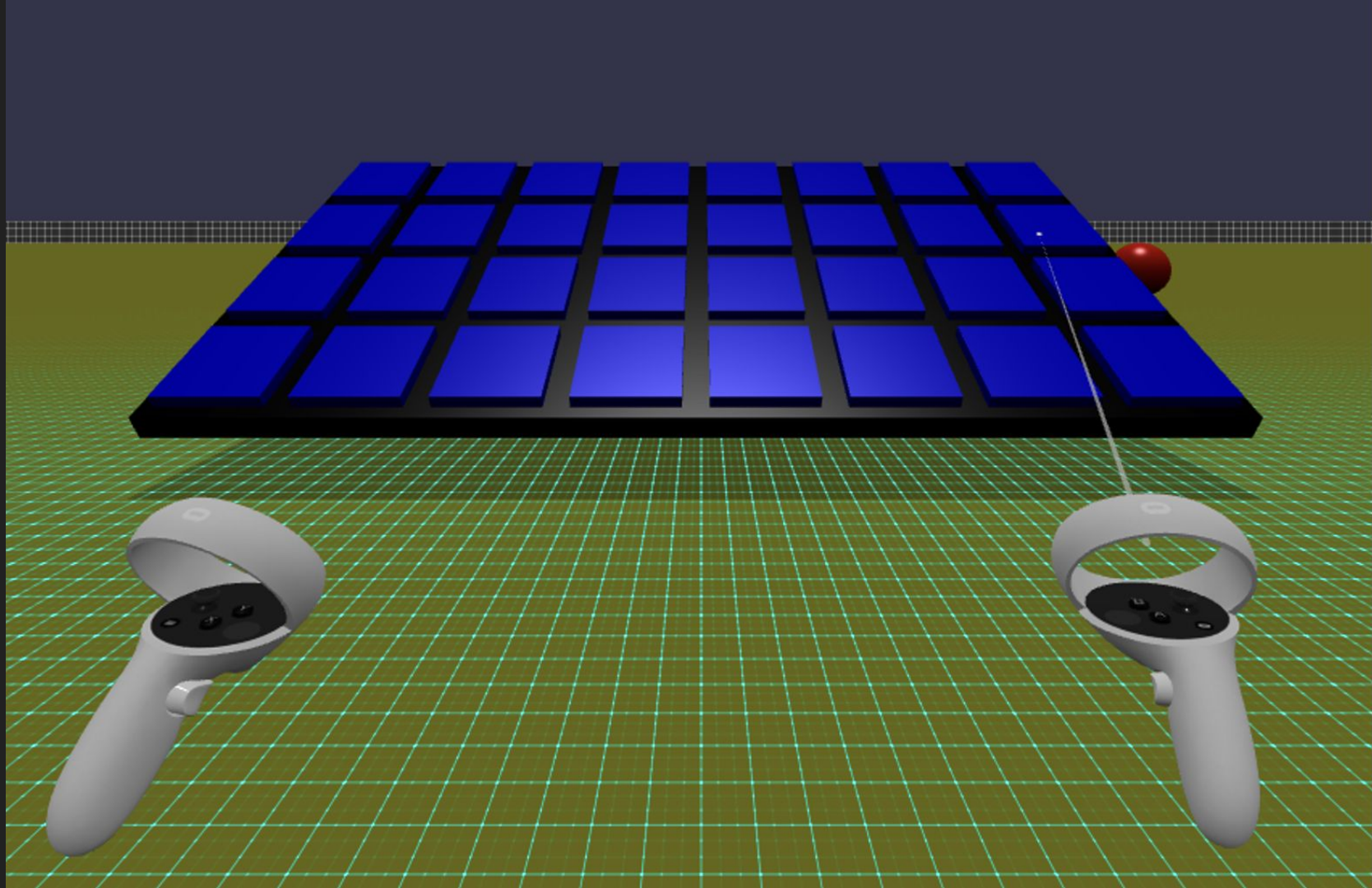
Invitation link (JUMBO size)

[**https://tinyurl.com/bdf3fry6**](https://tinyurl.com/bdf3fry6)

Also in 3D immersive playgrounds !

WAM JAM PARTY: immersive version of sequencer.party !





Conflict-free Replicated Data Types (CRDT) for synchronizing peers

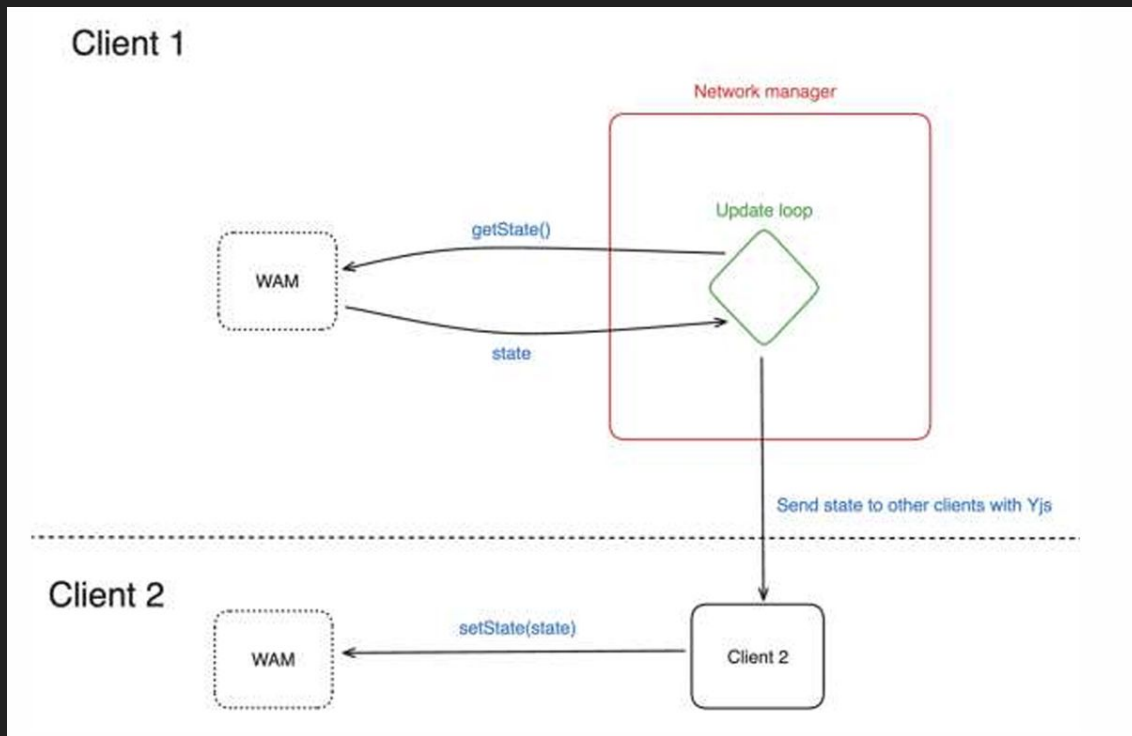
- Operation Transformation (OT) and CRDT: used by collaborative text editors (i.e Google Docs),
- CRDT better suited for distributed systems,
 - Shapiro, M., Preguiça, N., Baquero, C., & Zawirski, M. (2011). Conflict-free Replicated Data Types. In Proceedings of the 13th International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS '11).
- Sequencer.party and WAM Jam Party use [the YJS implementation](#) of CRDT
 - Jahns, K. (2019). Yjs: A CRDT Implementation for Building Collaborative Applications. Retrieved from <https://yjs.dev/>.
 - Allows P2P/WebRTC or websockets/server based architectures,
 - Allows persistence,

CRDT strategy

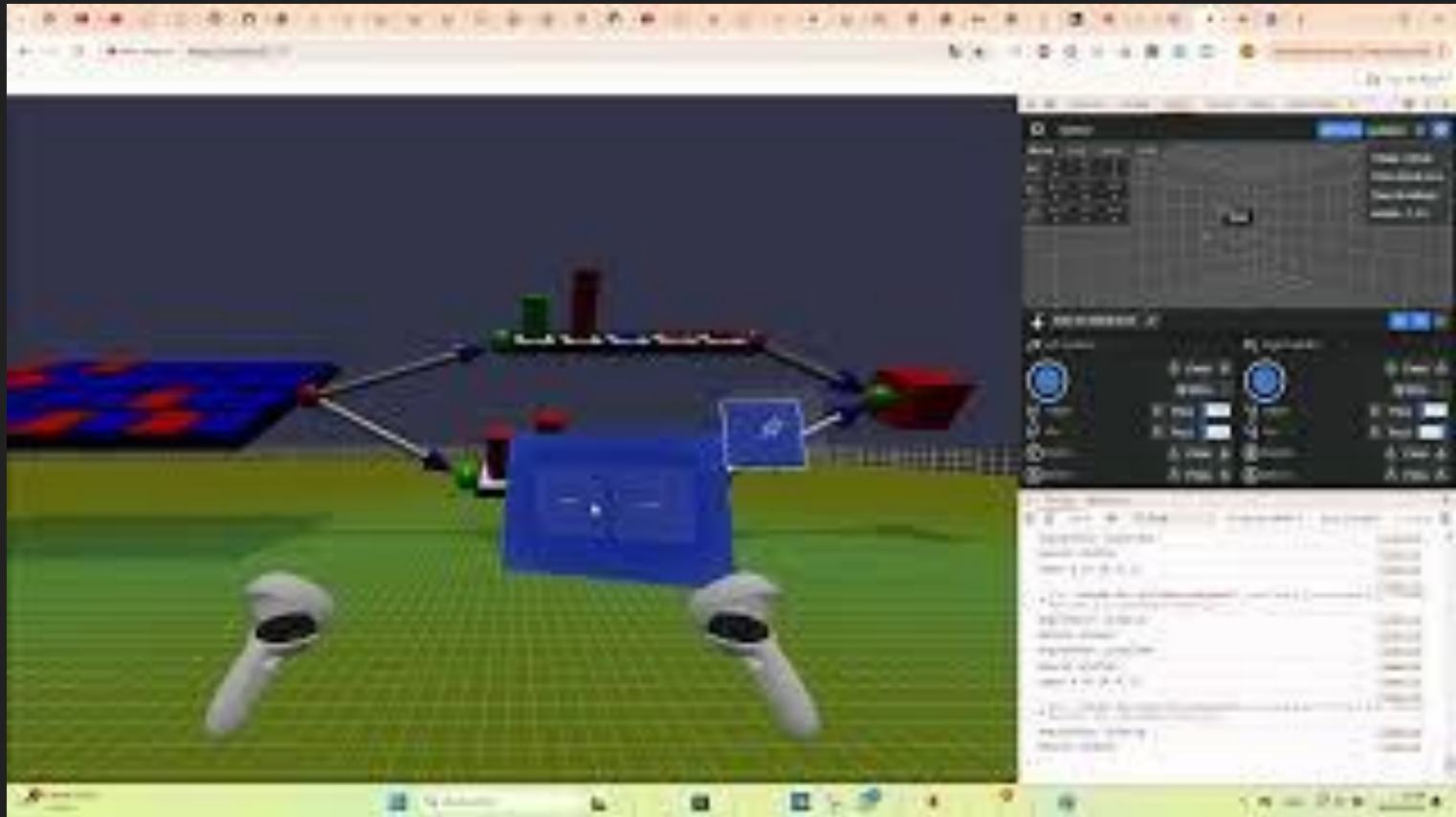
Each WAM state, player state, host state is considered as a text document.

3 times per second, we call `getState()` on each WAM, and state changes are propagated.

Clients receives events when states need to be updated.

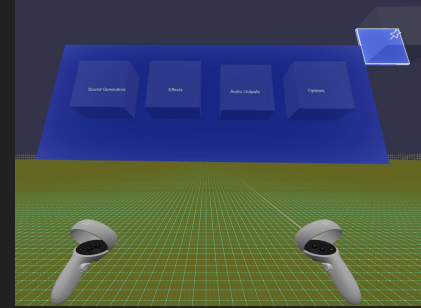


Other kind of interactions



Used technologies

- **BabylonJS** for the 3D rendering and webXR implementation
- **MRTK Toolkit** for the floating menus
- **YJS** for the network layer
- **NodeJS** for STUN server (WebRTC) or websockets
- **Web Audio Modules** for the audio / MIDI components
 - Developed using many different approaches (JavaScript, FAUST, C-Major, etc.)



CONCLUSION

- Promising design, but this is a very first prototype.
- Compared to other MM works with WebXR, our approach is extensible and can benefit from the many WAMs already available. It is a “world builder”.

FUTURE WORKS (already started)

- More work needed about UX interactions, 3D GUI design (collaboration for a state of the art on this subject will follow), and of course user testing campaigns.
- WAM to 3D interactive editor for previewing and for generating config files.
- New menu system capable of handling dozens of entries.
- Performance measurements (how many users, how many WAMs, latency, etc.)
- Persistence and multiple sessions in parallel (instances).