Cooperation experiments in web-based audiovisual works

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ABSTRACT
Network possibilities are inherently ready for real-time cooperation among the users of the same website, in order to participate in running a multimedia installation, webaudio instrument, or audio-game. In this paper I summarize my works in this field, starting from web-only projects (Webcards, Forgattató, WebSynth), finishing at communication between locative installations and the web (Ring the Web!). Most of them are radically cooperative, which means that they aren't running stand-alone or even off-line because of their multi-user approach. With this initiative I argue that networked audiovisual artworks and instruments realize a communicative way of performing.

1. INTRODUCTION
Web and networked cooperation use the same technology: anonymous, asynchronous communication between server and client, UDP protocol for quick access. But the peer-to-peer communication among users of the web has been limited for decades for file sharing. With the spread of node.js's websocket and socket.io [1], these boundaries have been overriden, starting to making the web really decentralized and transparently communicative. In this paper, I focus on my audio-visual projects, while mentioning, that it's only a first sign of opening the client-(server)-client hierarchy toward a community-based, self-regulated (or regulation-free) network.

2. WEB-BASED COOPERATIVE WORKS
Networked collaboration in media art has a long history: with the beginning of the internet, we meet with several ideas starting from the telepresence-gardening of Ken Goldberg [2], through decentralized network orchestras [3] and cooperative composition solutions like Playsound.space [4] or EarSketch [5] to distributed audio performances.

2.1 Webcards (2016)
In my definition webcards are contemporary postcards: they're multimedia/network-based ones, including variuos visual, textual and auditory data. My first experiment with webaudio and node.js was created during a scholarship at ICEM-Folkwang Hochschule, Essen, Germany, where I used the website to present audio-visual collages controlled by multiple users. The visual and audio materials were collected on-site Essen and mostly in Kettwig, and the materials are processed and manipulated real-time indirectly and anonymously by the users of the webpage[1] while they explore the content.

Figure 1. User interface of the Kettwig Webcards.

2.2 Pattogtattató and Forgattató (2018)
Inspired by Plink [6] and similar web-based cooperative audio games, I focused on the field between cooperative instruments and games for the Web. Since 2016 I'm working with interactive web projects. I present two of the latests. Both of them use browser-native Webaudio API for audio, CSS and Javascript for animation, and they experiment with physics, degradation and data-loss in the virtual space.

The first one is the **Pattogtattató**[2] (bouncererer). The user unleashes new balls by clicking somewhere, and they bounde by the amount of gratavation etc., until they fade. Meanwhile they generate sounds, depending their position, speed, fade-position.

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[1] http://kbalazs.periszkopradio.hu/works/webcards/

[2] http://kbalazs.periszkopradio.hu/egyeb/pattogtattato.html

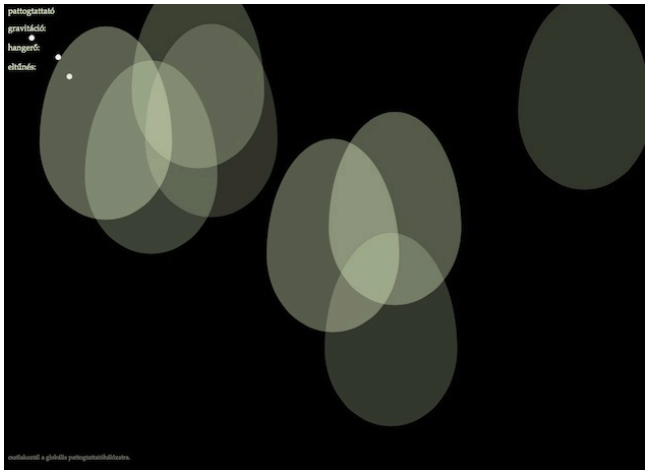

Figure 2. User interface of the Pattogtattató.

The second one is coming from the first, but it simulates rotation, with several upgrades. It's called **Forgattató**[3] (rotaterer), where You can rotate forms, making sounds. The fade-out depends on You also: it's possible to restart the rotation by hovering the objects. The sound is also depending by the position and other factors, resulting a rich toned fm sound.

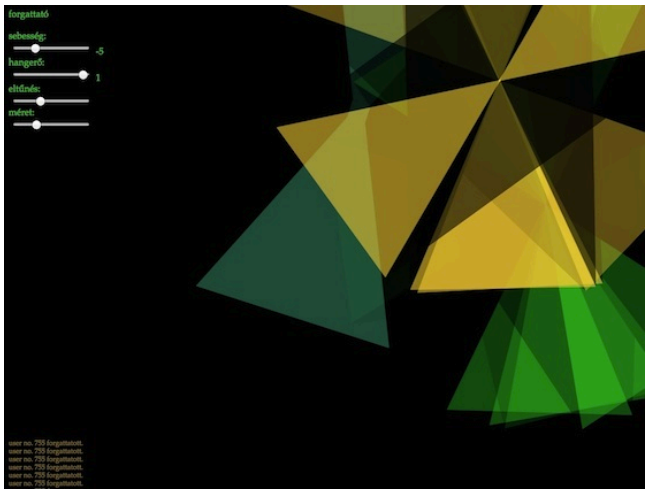

Figure 3. Multiple users on Forgattató.

Forgattató is natively multi-user: transparently connects to the socket.io network, sharing informations among other users. The rotating objects with different colors show different users' activity.

2.3 Websynth and his Webseq (2018)

While looking for network-specific audio instruments instead of adopting an existing synth for a website, I decided to split sound creation among different users, to reach the same audio output on different locations. Websynth[4] and the sequencer created for it is a first experiment in this field. Any user can join in, and able to control one common synthesizer. They hear the same sound, and see one shared interface. Controllable parameters: freq + length; modFreq + ratio; modDep + ratio. User-specific ratio can be adjusted by clicking on the top left corner. The two-dimensional sequencer works the same way, extending the process with an eroding option, where the data is going to be quiet and quick step-by-step. Both of them are mobile-friendly applications.

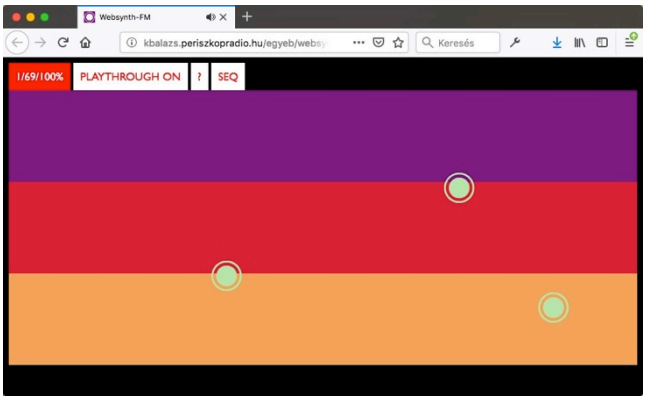

Figure 4. The Interface of WebSynth.

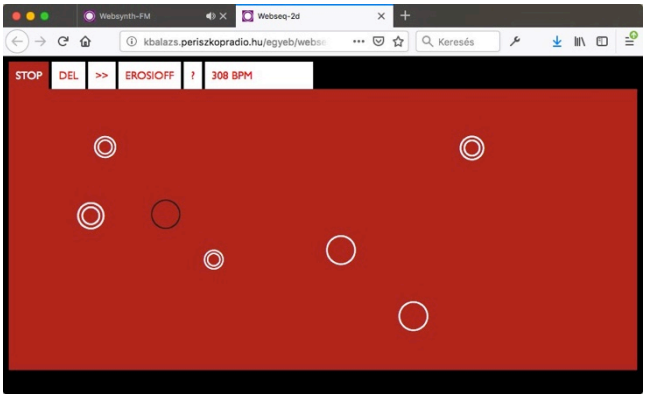

Figure 5. The Interface of WebSynth's sequencer.

2.4 Cooperation in Makkeróni live coding system (2018-)

Makkeróni[5] is a web-based live coding system, presented and described in detail previously [7]. It's inspired by web-based live coding application Gibber [8], but it simulates a linux shell and their shortcuts for efficient use. Makkeróni use full range of the Web Audio API: waveform and FM synthesizers, sampling, low-level effects, extended by command argument parsing, batch running etc., as possible in BASH. The application is natively collaborative, with its "connect", "disconnect" and "wall" commands (see "help" or "wall --help" for detailed documentation). "Wall" command makes it possible to send realtime messages to other connected users, and it's possible as well to run commands on different users' host with the -c argument. For example the "wall -c play" command plays a randomly chosen soundfile on every connected users' computer, except the local computer. It's easy to distribute the playback on multiple connected devices targetting the information with the "-min" and "-max" arguments.

[3] http://kbalazs.periszkopradio.hu/egyeb/forgattato.html

[4] http://kbalazs.periszkopradio.hu/egyeb/websynth/

[5] http://makker.hu/makkeroni/

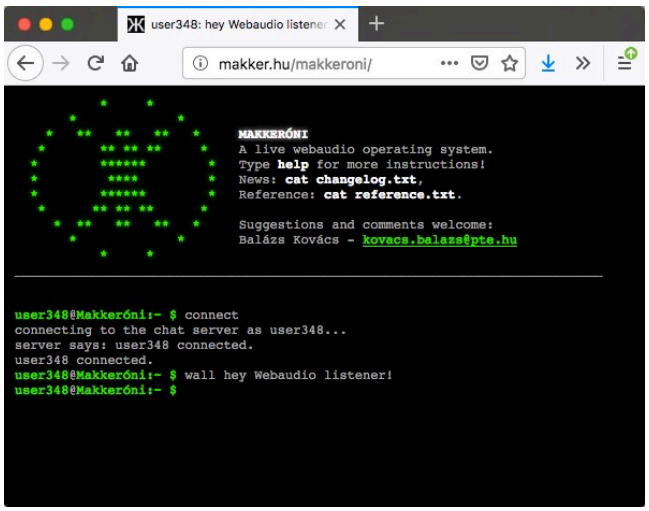

Figure 6. Makkeróni connecting to the chat server.

3. DISTRIBUTED AUDIO EXPERIMENTS

Peer-to-peer network control of audio events makes it easily possible to share audio playback on different (mobile) devices, creating a special acoustic environment and let the audience be a creative part of the process as well. Andrey Bundin's Concert for Smartphones utilizes the smartphones of the audience as speaker of the whole piece, addressing mass or unique devices for playback the piece 'conducted" by the author.[6] SoundSling [9] implements audio distribution in an installation, where the different devices makes possible spatial movements of the sound, without any loudspeaker array used by ambisonic or wave front synthesis solutions. I realize my distributed works in a different way: they are participatory and 'democratic' meaning that every participant has the same role in creating audio events for other users, because there is hierarchy among participants, and there is no pre-existing work to perform. All of these example built for and tested on mobile devices.

Számháború (war of numbers)[7] is a first example of them: a network edition of a real-world game, where the participants should say the enemies' numbers in order to exclude them from the combat. In this realization the participants' numbers should be clicked to disable them, while it's easy for everybody to re-enable him-/herself by clicking the lost number's place.

Figure 7. Screenshot and topology of Számháború.

[6] https://www.youtube.com/watch?v=jtf4I1yB46c

[7] http://mumia.art.pte.hu/webaudio/athallasok/4/

Similar technology but cooperative approach is used in the **Pingpopong** network dataflow game.[8] Every connected participant of the network is able to start a data packet, which jumps around on every client; every clients's device can stop or forward it, and also start a new stream of data. The result is a slow erosion or development of high-pitched sounds' cloud.

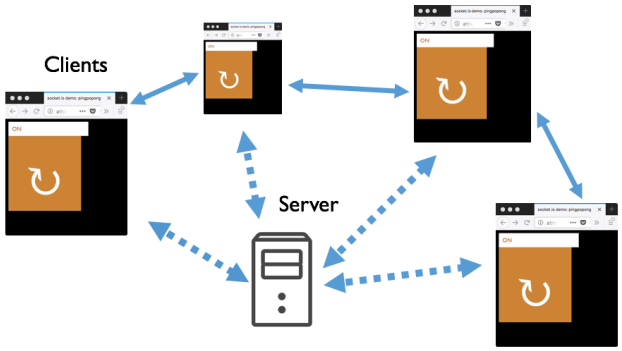

Figure 8. Topology of Pingpopong.

As a last experiment with distributed audio, **Netpan** has been created for directly controlling sound playback on seperate devices. Its interface is very basic: a number which shows a position on a virtual axis, and a slider what controls playback centered for a target position. For example, if the user has number 5 as position, and the slider moves from 5 to 1, it can listen a sound 'moving' from that device to devices with lower numbers. The closer the numbers, the highest amplitude the devices are playing back. It can be utilized to create a choir of sounds, controlled by every participants.

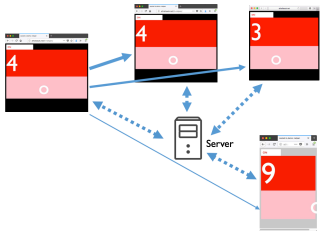

Figure 9. Topology of Netpan.

4. LOCATIVE TO WEB COMMUNICATION

Since 2011 I work on anonymous, one-way, web-to-real world communication projects (web-controlled harddrive and light organ etc). In 2018 I turned back the direction of the communication, and created the Ring the Web instrument, a publically placed real ringbell, which can be used to ring a virtual place, usually a website. The idea behind it is that the virtual space is a delocalized interpretation of reality. While we're full of IoT (internet-controlled real) objects, there's a need for Really Controllable Virtual Entities, or: Reality of Codes. Therefore came Ring the Web project real. Ring the Bell is a public art (ever in real and virtual means of public space) project is a place for listen to existing web objects ('bells') placed somewhere in the world. They can interact with this or with any other websites. In

[8] http://mumia.art.pte.hu/webaudio/athallasok/3/

this case, the test object changes the style of this page while give a sound as well.

Figure 10. The bell of the Ring the Web! project, using an RPi Zero.

The project is stopped now due to closing the hosting institution Makker, but the documentary can be seen on the Ring the Web page.[9] And also there are temporary installations, for example on the "DAN u Radničkom domu" exhibition in Novi Sad, where the ring manipulated the website of the whole festival,[10] and it was extended with an independent web→real-world gate for controlling LED lights on place.

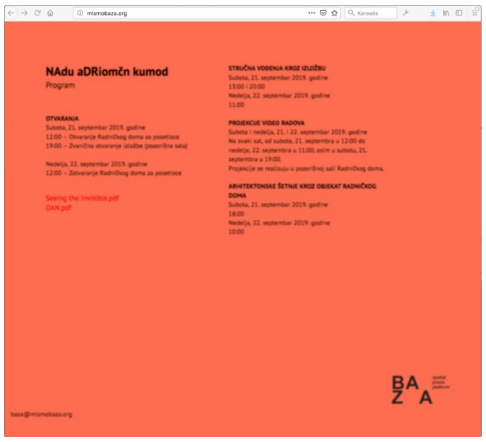

Figure 11. http://mismobaza.org/ manipulated by Ring the Web!

While looking for cooperative project, I found the way to the real-world to virtual world communication projects more and more important. They express my opinion: the virtual place is the current public space.

5. DISCUSSION

Networked instruments (even audio-visual projects or simulated ones) open up the way for thinking about performing in a cooperative and dislocative fashion. Cooperation can be realized between real and virtual places as well, extending webaudio into the realms of web-mediated acoustic or kinetic events. We're on the way to extend the definition of interaction towards a location-free peer-to-peer meaning. Here we have new, open questions:

1/ How we can differentiate audio instruments, games and artworks?

2/ What to do with anonymity among participants? Is it necessary to have a nickname/number/real name/avatar instead of other informations that in the world of the application are relevant (eg. physical distance from each other)?

3/ Could we interpret distributed sessions as a network-connected locative performance which has no sense for users out of that place? How we could implement non-local participants' contribution?

4/ In one-way Web→real world interactions, how we could deal with the lack of feed-back? Why users prefer to *not* have a feed-back about their activity?

While looking for answers to these questions, we'll found inspirations for new artworks upon new constellations of the above.

[9] http://makker.hu/RingTheWeb/

[10] Mismobaza.org manipulation's graphical effect has been realized by Ivan Mesaroš.

6. ACKNOWLEDGMENTS

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