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The Choir and the Soundsystem

Bundesministerium Kunst, Kultur, öffentlicher Dienst und Sport



Workshop @ 'Immersive Sounds - External Worlds' research student meeting **ARS ELECTRONICA FESTIVAL @ ANTON BRUCKNER PRIVATUNIVERSITÄT** Sept 9th 2022

Introducing SADISS

a tool for bundling smartphones into monumental yet intricate sound systems or choirs.

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Funded by: 'CALL 2021 – Kunst und Kultur im digitalen Raum'; Land Öberösterreich & Bundesministerium für Kunst, Kultur, öffentlicher Dienst und Sport





ANTON BRUCKNER PRIVATUNIVERSITÄT OBERÖSTERREICH





SADISS

Socially aggregated, digitally integrated sound system

Dienst und Sport

sound

Integrating the audience's phones into a performance -> immersive sound system

No additional hardware needed

No additional software needed (Browser-based)

- Research project 'The choir & the sound system', funded by 'CALL 2021 Kunst und Kultur im digitalen Raum'; Land Öberösterreich & Bundesministerium für Kunst, Kultur, öffentlicher
- Starting point: Highly spatial, experimental spectral re-synthesis (not playback) of any given

The ways of SADISS' workings (A first overview)

- Sound System
 - Spectral Re-Synthesis (using the analysis of any given sound)
 - Synthesis (e.g. using Midi as a source)
- Choir
 - Different voices/partials \bullet
 - Sound Synthesis
 - Text To Speech Synthesis

Technology stack **Client-server model**



Technology stack Frameworks









Technology stack Web audio API

const audioCtx = new AudioContext() osc.type = 'sine' osc.frequency.value = 440osc.start() osc.connect(audioCtx.destination)

- const osc = audioCtx.createOscillator()

Technology stack Web audio API - browser compatibility





Technology stack License



License: AGPL 3

Source code:

github.com/ wildyeast/ sadiss

🖫 wildyea	st / sadiss Public
<> Code	⊙ Issues 24 រ៉ੀ Pull requests 📿
	<mark>} [°] master →</mark> ਮੈ 2 branches ⊽
	viruslight Fix: QR codes can't b
	Client
	server
	C READM
	i≡ README.md
	\$ 3] \$ \$ A socially aggregate
	SADISS is a set of web applica Bruckner university (Linz, Aust choirs.
	Unsure what this means? Take
	License

Stephen Pin	⊙ Unwatch 1 - ♀ Fork 0
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d distributed sound system.	Packages No packages published Publish your first package
tions developed in the research project 'The Choir & the Sound System' at Anton ria) that bundles smartphones into monumental yet intricate sound systems or	Contributors 2
a look at sadiss.net to get an idea.	viruslight Mathias
	wildyeast Lukas



The sound system mode of SADISS Working with audio files

- 1. Take an audio file (wav, mp3, aiff..)
- 2. Analyze the file (split it into partials)
- 3. Filter/extract relevant audio information
- 3. Export data into text format (Translation)
- 4. Re-synthesize on the phones

The sound system mode of SADISS Analyzing audio files

Working with SPEAR

https://www.klingbeil.com/spear/downloads/

Strength of colour = amplitude

Length = duration in seconds



The sound system mode of SADISS Filtering with SPEAR

- Amplitude threshold: below 50 db
- Duration 0.1. sec



• Export partials into text file

The sound system mode of SADISS

Listen to the original audio file and filtered one

The sound system mode of SADISS Export data into text format (Translation)

The .txt file contains

- Partial count = number of partials
- Partials Data = time, frequency and amplitude for each partial

par-text-partials-format point-type time frequency amplitude partials-count 689 partials-data 0 57 0.237500 0.937500 0.237500 402.139740 0.000083 0.250000 397.725616 0.001459 0.262500 393.669647 0.006925 0.275000 392.403107 0.017793 0.287500 392.038025 0.030688 0.300000 391.916351 0.039793 0.312500 391.85925 0.043168 0.325000 391.818024 0.042508 0.337500 391.855469 0.039124 0.350000 391.968201 0.032576 0.362500 392.139923 0.023174 0.375000 391.969971 0.013172 0.387500 390.345795 0.005538 0.400000 386.630310 0.001669 0.412500 413.832458 0.000533 0.425000 408.734528 0.000345 0.437500 410.47052 0.000351 0.450000 409.338348 0.002817 0.462500 392.067383 0.014877 0.475000 392.601868 0.040166 0.487500 392.507812 0.070544 0.500000 392.365509 0.090408 0.512500 392.204224 0.091342 0.525000 392.024628 0.075487 0.537500 391.080505 0.049087 0.550000 402.244171 0.027113 0.562500 402.50402 0.022879 0.575000 395.274597 0.032987 0.587500 394.571381 0.046359 0.600000 394.095184 0.050395 0.612500 392.323212 0.046528 0.625000 386.577118 0.038696 0.637500 380.451721 0.040541 0.650000 382.091827 0.041590 0.662500 387.431793 0.045477 0.675000 389.904053 0.053039 0.687500 391.09201 0.060928 0.700000 392.251648 0.071297 0.712500 391.843964 0.081679 0.725000 390.286255 0.099345 0.737500 390.578857 0.142084 0.750000 392.127502 0.214521 0.762500 392.950165 0.291701 0.775000 392.570709 0.335092 0.787500 392.192383 0.341623 0.800000 392.151825 0.330096 0.812500 392.20993 0.316329 0.825000 392.190918 0.302233 0.837500 392.205566 0.281520 0.850000 392.243652 0.244910 0.862500 392.167389 0.184424 0.875000 391.809906 0.110942 0.887500 390.498627 0.047681 0.900000 386.236420 0.012989 0.912500 378.861084 0.002944 0.925000 354.850616 0.002465 0.937500 354.85061 0.000000 1 572 0.237500 7.400000 0.237500 213.857468 0.000054 0.250000 238.043533 0.000647 0.262500 255.616852 0.002621 0.275000 260.400391 0.007951 0.287500 262.068024 0.018800 0.300000 262.467133 0.034509 0.312500 262.46112 0.050276 0.325000 262.312286 0.059870 0.337500 261.649963 0.061009 0.350000 260.318268 0.057518 0.362500 259.109344 0.055183 0.375000 258.737579 0.055276 0.387500 259.010742 0.055701 0.400000 259.208496 0.054622 0.412500 259.049713 0.051785 0.425000 258.373535 0.047452 0.437500 256.92239 0.042187 0.450000 255.843460 0.038598 0.462500 256.214996 0.039376 0.475000 257.675201 0.045271

Next: Uploading text file to the server

The sound system mode of SADISS Text to SADISS Server

Upload to SADISS Server https://sadiss.net/api/login





The sound system mode of SADISS Uploading to SADISS

 Log into the SADISS Server via browser https://sadiss.net/api/login

≑ 0∶] \$\$	TRACKS	PERFORMANCES				ASTRID <astri< th=""><th>ID@SIL./</th></astri<>	ID@SIL./
TRAC	KS							
ID	UPDATED_A	λT	TITLE	TTS_INSTRUCTIONS	IS_CHOIR	EDIT	DELETE	DE
112	02.09.2022 13	3:09	ars audio test		false	\		
109	02.09.2022 12	2:09	Arpeggio prova		false	•		
107	01.09.2022 1	7:09	Testing Pauses	Voices: 3 TTS languages: en-US, de- DE	true	•		



Add your track

ADD TRACK

Track	title
Ars	electronica Test Track Audio
Track	description
For	the Presentation
Partia	al file
	Upload a SPEAR partials file
	Durchsuchen Ars electronica Soudio test file.tx
TTC f	
1131	
	Halaada Tart Ta Caasah in turutian dila
	Optoad a Text-To-Speech Instructions file
	Durchsuchen Keine Datei ausgewählt.
	Is choir
	Submit

The sound system mode of SADISS Setting up a performance



PLAYING TRACK		
18 / No track playing inactive	/ 18 inactive	
PARTIALS DISTRIBUTION	PERFORMANCE PARTIALS	CLIENTS
0 all partials to all devices 0 time 0 waveform SIN SG	0 0 0	online max at start

onica TTS Choir	
	Î



The sound system mode of SADISS Working with MIDI

 From MIDI to partial text with **Reaper and Max MSP**

 Launch Reaper and create/or insert a Midi Track





The sound system mode of SADISS Working with MIDI

Export Midi Format 1 from your DAW (check your manual, if and how possible)



Reaper

Reaper

The sound system mode of SADISS Working with MIDI

Transcoding the MIDI file into the SADISS partial format with MAX/ Msp



Make sure to save as .txt file when the save dialog opens

Midi2Sdif_06 (presentation)

v.:vk 2022-08-03

More information on Sadiss, developed at the Institut für Komposition, Dirigieren und Computermusik of the Anton Bruckner University you can find here: (www.sadiss.net)

The choir mode of SADISS Working with the ,choir' mode

The Choir mode offers a wide range of possibilities

Instantaneous participative choir performances with individual voices

Providing Text to a mass of participants on an individual level including internationalization

The choir mode of SADISS Working with the ,choir' mode

Partial 0

Example for a choir performance setting with four voices



Client 1

'Choir' mode distributes one single partial to each individual registered client.



The choir mode of SADISS Setting up a file

Special Format for ,choir' files

The SADISS track to be played back in *choir* mode need to be structured in a very specific way. (It is not enough simply to export an .sdif file from Spear in 'Text - Partials' format.)

- 1 par-text-partials-format
- 2 point-type time frequency amplitude
- 3 partials-count 4
- 4 partials-data
- 5 0 75 0.000000 56.100000
- 6 0.000000 261.625565 0.000001 0.010000 261.625565 0.14454
- 12.020000 261.625565 0.004571 12.070000 261.625565 0.004
- 261.625565 0.004571 24.100000 261.625565 0.000001 28.000
- 40.000000 261.625565 0.000001 40.010000 261.625565 0.144
- 261.625565 0.144544 52.020000 261.625565 0.004571 52.070
- 7 1 75 1.000000 57.127000
- 8 1.000000 329.627557 0.000001 1.012700 329.627557 0.23442
- 13.025400 329.627557 0.005623 13.088900 329.627557 0.005
- 329.627557 0.005623 25.127000 329.627557 0.000001 29.000

4 voices are playing back one partial each (partials 0 - 3). Given each partial needs to contain the entire information to be played via one client, it needs to span the entire track, only scaling volume down to 0.000001 to become inaudible

The choir mode of SADISS Registering clients

Registration for each client individually

The individual clients need to register with a specific partial_id to the performance (to make this easier, you can create different QR Codes for each of the files voice in https://sadiss.net/api/performances/





The choir mode of SADISS Workflow

Creating musical content for each individual voice is done via midi and works the same way as shown before in the soundsystem mode

The choir mode of SADISS Text to speech integration

Text to Speech via JSON

When creating a track, Text-To-Speech commands can be uploaded in form of a JSON file, in other words, it must have a .json file extension and follow one of two given formats.

```
"0":{
2
          "en-US":"This is spoken at timestamp 0 by all clients in Er
3
          "de-DE":"Das wird zu Sekunde 0 von allen clients auf Deutsc
4
5
      },
       "2":{
6
          "en-US":"This is spoken at timestamp 2 by all clients in Er
          "de-DE":"Das wird zu Sekunde 0 von allen clients auf Deutsc
8
```

The top level keys (0 and 2 in the example) are the timestamps in seconds at which you'd like the text to start being spoken. The next level keys are languages in ISO encoding. At the time of writing, the language the text will be spoken in can be selected from the Performance view in the Admin Panel before starting the track. Depending on the selected language Zero or Null is the text that will be spoken at timestamp 0 in this example.



It is possible to use text to speech integration also in non choir mode. Every client will then get the same text in all specified languages on a given timestamp

The choir mode of SADISS Text to speech integration

Text to Speech to individual clients

```
"0": {
  "0":{
        "en-US":"This is spoken at timestamp 0 by the client with partial
        "de-DE":"Das wird zu Sekunde 0 von allen clients mit partial_id 0
     },
     "1":{
       "en-US":"This is spoken at timestamp 0 by the client with partial_
       "de-DE":"Das wird zu Sekunde 0 von allen clients mit partial_id 1
ζ,
"2":{
  "0":{
    "en-US":"This is spoken at timestamp 2 by the client with partial_id
    "de-DE":"Das wird zu Sekunde 2 von allen clients mit partial_id 0 auf
     },
     "1":{
       "en-US":"This is spoken at timestamp 2 by the client with partial_:
       "de-DE":"Das wird zu Sekunde 2 von allen clients mit partial_id 1 a
```

In this example, the first level is the timestamp, the second level is the partial_id of the client, and the third level is the language key and the text that should be spoken.

The choir mode of SADISS Setting up a choir performance

Setting up a choir performance works similar to setting up a performance for the soundsystem mode as the described before.

Track title	
Ars electronica Test Track Audio	per
Track description	
For the Presentation	
Partial file	
Upload a SPEAR partials file Durchsuchen Ars electronica Soudio test file.txt	
TTS file	
Upload a Text-To-Speech instructions file	Also
Durchsuchen Keine Datei ausgewählt.	

uploading all tracks, which includes also the tts N) file in case of TTS use, tracks can be put in a omance.

"is choir" has to switched on

SADISS **Issues / further developments**

- Browser / App
- Synchronisation at the moment via a 3rd party
- Latency in Web Audio \bullet
- Workflow
 - .json for Text to Speech created manually at the moment
 - Spear closed source
 - Midi to partial.txt

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SADISS - a Socially aggregated, digitally integrated sound system

sadiss.net wiki.sadiss.net github.com/wildyeast/sadiss

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OBERÖSTERREICH

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