Sonification: Bringing Data to your Audiences’ Ears

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National Press Foundation
Data & Accountability Journalism Training

January 12, 2022
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- PhD Candidate in Information Science at the University of Colorado, Boulder
- Researches how to communicate data using all of our senses, especially sound 🎧
- Former data journalist at a small public media news organization, Inside Energy

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Roadmap for Today

- What is sonification?
- Examples (let's listen!)
  - What kind of data works best?
  - Dimensions of sound to play with
  - Narrative patterns for engaging audiences
- Tools for getting started
- Resources

Throughout: Get ready for some hands-on and ears-on activities!
SONIFICATION is...

communicating data with sounds — charts that you can listen to
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communicating data with sounds — charts that you can listen to

- alarms
- sonic logos
- sound tracks
- auditory icons
- foley
- data-driven sound art

AUDITORY DISPLAY

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WHY SOUND?

- Highlight different dimensions of data & new ways to engage
- Sound & visuals together reinforce insights
- “Slow data” — invite people to linger
- Accessibility

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A SOCIAL DATA + SOUND RECIPE
ABOUT HOW MUCH TIME WE SPEND INSIDE/OUTSIDE

1. Think about 6 am to noon today and write down when you were INSIDE & when you were OUTSIDE:
   6:00 - 7:30 = INSIDE (breakfast etc.)
   7:30 - 8:15 = OUTSIDE (walking dogs)
   8:15 - noon = INSIDE (working)

2. Play video that counts 6 am to noon

3. As the video plays, make a SOUND for your corresponding INSIDE/OUTSIDE state

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SONIFICATION EXAMPLES

What characteristics of data work well with sonification
SONIFICATION EXAMPLES

Representing **frequency** or **timing** of events in data

Larry Buchanan, Jon Huang and Adam Pierce, “Nine Rounds a Second.” *New York Times*,
https://nyti.ms/3zv7Fgh
SONIFICATION EXAMPLES

Representing **frequency** or **timing** of events in data


Representing **magnitude** or **scale** of data points
SONIFICATION EXAMPLES

Physical/tactile properties of data → sonic metaphor

Elias Elmquist, “OpenSpace Sonification,”
https://vimeo.com/528822742
## DIMENSIONS OF SOUND

<table>
<thead>
<tr>
<th>Sonic Parameters</th>
<th>Compositional Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch</td>
<td>Auditory icons &amp; sonic events</td>
</tr>
<tr>
<td>Timbre</td>
<td>Key (minor v. major)</td>
</tr>
<tr>
<td>Loudness</td>
<td>Complexity &amp; layering</td>
</tr>
<tr>
<td>Tempo</td>
<td>Looping / repetition</td>
</tr>
<tr>
<td>Spatial audio / panning</td>
<td>Ambience v. attention</td>
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</tbody>
</table>
ACTIVITY: VISUAL & SONIC SKETCHING
BRAINSTORMING WAYS TO REPRESENT ORDINAL SCALES
DIMENSIONS OF SOUND

Sonic Parameters

Compositional Qualities

Some conventions and best practices do exist, but the rules are much less established than in visualization.

And this will be totally new for most people.

So... **how do you teach audiences how to listen to data??**
LEARNING TO LISTEN

Marketplace,

Here’s what the crescendo of unemployment sounds like
Kai Ryssdal and Alli Fam  |  Jun 24, 2020

Representing magnitude or scale of data points...with BIG changes
How to **represent unemployment claims data**?

- **New claims**
  - 211,000
- **Continuing claims** (in millions)
  - 0 - 5
  - 5-10
  - 10-15
  - 15-20
  - 20-25
  - 25+

How to **teach audiences how to listen** to this data?

12 million = 5 rattle drums + 5 drumsticks + 2 tom drums
Unemployment claims radio piece for Marketplace

Entire 2020 sonification (gestalt)

Decomposing sonification into component parts

Entire 2020 sonification (with a new ear)

New data (2009)

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Representing **cyclic data** (loops) with interesting **evolutions**
LEARNING TO LISTEN

1. Explain sounds through a narrative:
   - *Story of how you made it*
   - *Story of how to learn (teacher/student dichotomy)*
2. Speech-based annotations
3. Break down into component layers (then put back together)
4. Highlight notable examples
5. Repetition (with variation)
6. Invite audience to gesture / karaoke along with you (embodiment)
ACTIVITY: BRAINSTORMING WITH A DATASET

HOW MIGHT YOU USE SOUND TO COMMUNICATE DATA FOR A STORY YOU ARE WORKING?
TOOLS FOR MAKING SONIFICATIONS

MAKING THE SOUNDS FROM THE DATA

No coding required
TwoTone.io
Highcharts Sonification Studio
Audiographs (Google Sheets plug-in)

Coding platforms
Sonic Pi
MIDI Time (Python)
SuperCollider
MAX

AUDIO EDITING & MIXING

Garage Band
Audacity
Adobe Audition
ProTools
and on and on…

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LIVE DEMO: TWOTONE.IO
UPLOADING DATA, TWEAKING SETTINGS, EXPORTING AUDIO

LIVE DEMO: HIGHCHARTS
UPLOADING DATA, TWEAKING SETTINGS, EXPORTING AUDIO
SONIFICATION RESOURCES

International Community for Auditory Display
The Sonification Handbook
Data Sonification Archive
The Programming Historian's “Sound of Data"
Coursera: Sound & Sonification Design for Interactive Learning Tools
Loud Numbers (podcast) (sonification festival)
Sound libraries: freesound.org | Library of Congress | British Library
GET INVOLVED (with my research!)...

Participate in a design research project:

How might we design new interactions with data, sound, and narrative storytelling that can help people understand themselves, each other and their world...

...using voice user interfaces as sites for exploration?

Seeking participants for **90-minute design workshops** with activities including sonic sketching + brainstorming interactions with data and sound.

Email [wirfsbro@colorado.edu](mailto:wirfsbro@colorado.edu) to sign up
Thank you :-) 

Email me at wirfsbro@colorado.edu

Additional sound + music credits:
Sound of Picture Library
Fanto8BC (via Looperman)